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New Forest District Council and New Forest National Park Authority

Ecological Consultancy Advice on Air Quality Risks

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1 Introduction

Overview

1.1 Air Quality Consultants Ltd (AQC) and BSG Ecology were appointed by New Forest District Council and the New Forest National Park Authority on 28 July 2017 to undertake an air quality assessment in relation to the impacts of traffic on European designated nature conservation sites. This work has been commissioned to inform the respective local plans of the two planning authorities.

Scope

1.2 The work is to support the emerging New Forest District Council and New Forest National Park Authority local plans. There are no standard criteria for determining the spatial scope of an air quality assessment and so the decision to include or exclude European sites from an assessment needs to be supported by application of the source-pathway-receptor model, which highlights whether there is any potential pathway that connects development to any European sites. In this case the spatial scope of the assessment is informed by the predicted increases in road traffic.

1.3 The two planning authorities have advised that the following European sites need to be considered in the assessment (Figure 1, Section 11):

- The New Forest Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site
- Solent and Southampton Water SPA and Ramsar site
- Solent Maritime SAC
- Dorset Heaths SAC and Dorset Heathlands SPA and Ramsar site

1.4 The two planning authorities have also advised that the following European sites do not need to be considered in the assessment:

- Solent and Isle of Wight Lagoons SAC
- River Avon SAC and Avon Valley SPA and Ramsar site

Limitations

1.5 The effects of pollutants on plants may occur as, for example, changes in species composition, an increased dominance of undesirable species, loss of mosses, liverworts and lichens, physical damage, increased risk of insect damage etc. These effects can only be detected through appropriate monitoring: currently this information is limited in its availability.

1.6 Reference has been made to the results of condition assessments that have been completed for component Sites of Special Scientific Interest (SSSIs) within the European sites. Natural England assesses the condition of SSSIs using Common Standards Monitoring (CSM), which was developed by the Joint Nature Conservation Committee (JNCC) for the whole of the UK. For the purpose of monitoring all SSSIs are divided in to one or more monitoring 'units' and condition is recorded at this unit level for all features. Whilst monitoring may consider species distribution and abundance, it may not look at plant health. Consequently there may be limited information available to indicate that plant health is stable or deteriorating.

2 European sites

2.1 In the following sections the various European sites identified in Section 1.3 are described (see Figure 1). The reasons for their designation are set out together with information about the current condition. Condition assessments have not been done for the European sites; however, they have been done for the units of the component SSSIs. Reference has been made to the results of the condition assessments as they provide an indication of the likely condition of the European site; however, care needs to be taken when interpreting these data as the assessments vary widely in terms of when they were carried out.

New Forest SAC

Reasons for Selection

2.2 Annex I habitats[1] that are a primary reason for the selection of this site:

- Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- Depressions on peat substrates of the *Rhynchosporion*
- Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*)
- *Asperulo-Fagetum* beech forests
- Old acidophilous oak woods with *Quercus robur* on sandy plains
- Bog woodland
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

2.3 Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Transition mires and quaking bogs
- Alkaline fens

2.4 Annex II species that are a primary reason for selection of this site:

- Southern damselfly *Coenagrion mercuriale*
- Stag beetle *Lucanus cervus*

2.5 Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Great crested newt *Triturus cristatus*

Condition Assessment

2.6 The New Forest SAC comprises the New Forest SSSI, which has been divided into 582 units covering an area of 28,924.51 ha. The most recent condition assessment varies in age between the different units: some units have been assessed as recently as 2016 but some units have not been assessed since 2008.

[1] Annex 1 of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

2.7 The results of the most recent condition assessment indicate that 96.72% of the site is either in favourable condition or in unfavourable condition but is recovering: 2.14% is unfavourable no change, 1.13% is unfavourable declining and 0.01% is reported to have been destroyed.

2.8 Where SSSI units are unfavourable the main issues relate to site management. Reported issues for neutral grassland habitat include: loss of extent of the grassland features, insufficient species diversity and frequency, high cover of bare ground, tall rank sward and high cover of trees and scrub. Tree and shrub management and appropriate grazing are cited as key actions required to achieve recovery.

2.9 Areas of fen, marsh and swamp have undergone restoration works in recent years and recovery is being assisted by appropriate grazing, although some impacts associated with livestock poaching are reported. There are no indications of adverse impacts on this habitat arising from nutrient input.

2.10 Where broadleaved, mixed and yew woodland is reported to be in unfavourable condition, this is attributed to various reasons including a high conifer component and current grazing levels, mainly by deer. There are no indications of negative impacts on this habitat arising from nutrient input.

2.11 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not highlight any pollution issues within the SAC. The form does identify other issues in line with those identified in the SSSI condition assessments.

2.12 Natural England's Site Improvement Plan for the New Forest (Natural England, 2014) identifies the following threats and pressures as being the main ones that are currently affecting the site:

- A significant long term reduction in grazing pressure through loss of commoning, leading to a dramatic change in the flora and fauna of the New Forest and the impoverishment of the special features for which is was designated.
- Impacts of recreation including disturbance to qualifying Natura 2000 species and compaction, abrasion and other modifications to vegetation, soils and watercourses.
- Historic drainage of wetlands which leads to a loss of extent of wetland habitats such as wet heath, mire, riverine and bog woodland.
- Sylviculture plantations with recognisable remnants of SAC Annex 1 habitats such as heathland, mire, lawn, riverine and bog woodland.
- Loss of traditional management practices which can lead to a loss of extent and diversity of open habitats.

2.13 Air pollution is not identified as one of the main threats or pressures; however, the Site Improvement Plan does identify the impact of atmospheric nitrogen deposition as an issue. The Plan indicates that this needs to be addressed by controlling and reducing the impacts of atmospheric nitrogen deposition, although there is no indication of what these impacts are.

Conservation Objectives

2.14 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 and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

New Forest SPA

Reasons for Selection

2.15 This site qualifies under Article 4.1 of the Directive[2] by supporting populations of European importance of the following species listed on Annex I of the Directive:

2.16 During the breeding season;

- Dartford Warbler *Sylvia undata*, 538 pairs representing at least 33.6% of the breeding population in Great Britain
- Honey Buzzard *Pernis apivorus*, 2 pairs representing at least 10.0% of the breeding population in Great Britain
- Nightjar *Caprimulgus europaeus*, 300 pairs representing at least 8.8% of the breeding population in Great Britain
- Woodlark *Lullula arborea*, 184 pairs representing at least 12.3% of the breeding population in Great Britain (Count as at 1997)

2.17 Over winter;

- Hen Harrier *Circus cyaneus*, 15 individuals representing at least 2.0% of the wintering population in Great Britain

Condition Assessment

2.18 The New Forest SPA falls within the boundary of the SAC and SSSI. As a specific condition assessment has not been carried out for the SPA, reference has been made to the SSSI condition assessment. This is considered to be a reasonable approach as this describes the condition of the habitats that support the SPA bird population.

2.19 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not highlight any pollution issues within the SPA. The form does identify other issues in line with those identified in the SSSI condition assessments.

Conservation Objectives

2.20 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

New Forest Ramsar

Reasons for Selection

2.21 The site satisfies a number of Ramsar criteria as follows:

- Ramsar criterion 1: It supports valley mires and wet heaths.
- Ramsar criterion 2: The site supports a diverse assemblage of wetland plants and animals including several nationally rare species.

[2] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

- Ramsar criterion 3: The site supports mire habitats of high ecological quality and diversity that support an important invertebrate fauna.

2.22 Important faunal species that are present include the following species that is regularly supported during the breeding season:

- Dartford warbler, *Sylvia undata*, Europe 538 pairs, representing an average of 33.6% of the GB population

2.23 The site also supports the following species with peak counts in winter:

- Hen harrier, *Circus cyaneus*, Europe 15 individuals, representing an average of 2% of the GB population

2.24 The site supports internationally important populations of the southern damselfly *Coenagrion mercuriale*, stag beetle *Lucanus cervus*, great crested newt *Triturus cristatus*, brook lamprey *Lampetra planeri* and bullhead *Cottus gobio*.

Condition Assessment

2.25 The New Forest Ramsar falls within the boundary of the SAC and SSSI. As a specific condition assessment has not been carried out for the Ramsar, reference has been made to the SSSI condition assessment. This is considered to be a reasonable approach as this describes the condition of the habitats that support the SPA bird population.

Solent Maritime SAC

Reasons for Selection

2.26 The Solent is a large extensive estuarine system that includes Langstone Harbour, Chichester Harbour, the north coast of the Isle of Wight, the Lymington area, the western shores of Southampton Water and the Hamble Estuary. The reasons for its designation are that it supports the following Annex 1 habitats:

- Estuaries
- Cord-grass swards (Spartina swards *Spartinion maritimae*)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- Subtidal sandbanks (sandbanks which are slightly covered by seawater all the time)
- Intertidal mudflats and sandflats (mudflats and sandflats not covered by seawater at low tide)
- Lagoons (coastal lagoons)
- Annual vegetation of drift lines
- Coastal shingle vegetation outside the reach of waves (perennial vegetation of stony banks)
- Glasswort and other annuals colonising mud and sand (*Salicornia* and other annuals colonising mud and sand)
- Shifting dunes with marram (shifting dunes along the shoreline with *Ammophila arenaria* 'white dunes')

2.27 The Solent also supports the following Habitats Directive Annex II species:

- Desmoulin's Whorl Snail *Vertigo moulinsiana*

Condition Assessment

2.28 The Solent Maritime SAC is a very large and extensive site covering an area of 11,325.09 ha. It comprises 16 component SSSIs; however, in the context of this study only the following 5 SSSIs are considered to be relevant due to their location.

2.29 Eling and Bury Marshes SSSI covers an area of 112.26 ha. The most recent condition assessment indicates that 11.45% is in favourable condition and 88.55% is unfavourable recovering. The reason for the current condition is that the site includes a large area of mainly intertidal mud with areas of pioneer salt marsh, which are habitats that are affected significantly by sea level rise and 'coastal squeeze'. A significant part of the SSSI is backed by hard sea defences so that the habitats are unable to retreat landward as levels rise.

2.30 Hurst Castle and Lymington River Estuary SSSI covers an area of 1,077.25 ha. The most recent condition assessment indicates that 27.09% is in favourable condition, 70.03% is unfavourable recovering, and 2.88% is unfavourable declining. The poor condition of some habitats varies locally, and includes the loss of intertidal habitat, lack of scrub management and damage due to the construction of sea defences.

2.31 Hythe to Calshot Marshes SSSI covers an area of 591.80 ha. This site is reported to be 100% unfavourable recovering. It is an extensive area of intertidal mud and saltmarsh where the habitat is affected significantly by sea level rise and 'coastal squeeze' as much of the unit is backed by hard sea defences so that the habitat is unable to retreat landward as sea levels rise.

2.32 Lower Test Valley SSSI covers an area of 142.04 ha. The most recent condition assessment indicates that the site is 100% in favourable condition.

2.33 North Solent SSSI covers an area of 1,186.65 ha. The most recent condition assessment indicates that 64% of the site is in favourable condition, 34.15% is unfavourable recovering, 0.93% is unfavourable with no change, and 0.91% is unfavourable declining[3]. The reason for the current condition is that there has been erosion of intertidal habitats.

2.34 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not highlight any pollution issues within the SAC. The form does identify other issues in line with those identified in the SSSI condition assessments.

Conservation Objectives

2.35 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 and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

Solent & Southampton Water SPA

Reasons for Selection

2.36 Solent and Southampton Water qualifies as a SPA for its breeding and wintering bird species. The site supports the following breeding species:

- Common tern *Sterna hirundo*, 267 pairs representing at least 2.2% of the breeding population in Great Britain (5 year peak mean, 1993-1997).
- Little tern *Sterna albifrons*, 49 pairs representing at least 2.0% of the breeding population in Great Britain (5 year peak mean, 1993-1997).
- Mediterranean gull *Larus melanocephalus*, 2 pairs representing at least 20.0% of the breeding population in Great Britain (5 year peak mean, 1994-1998).

[3] Figures are as reported by Natural England.

- Roseate tern *Sterna dougallii*, 2 pairs representing at least 3.3% of the breeding population in Great Britain (5 year peak mean, 1993-1997).
- Sandwich tern *Sterna sandvicensis*, 231 pairs representing at least 1.7% of the breeding population in Great Britain (5 year peak mean, 1993-1997).

2.37 The site also supports the following over-wintering species:

- Black-tailed godwit *Limosa limosa islandica*, 1,125 individuals representing at least 1.6% of the wintering Iceland - breeding population (5 year peak mean, 1992/3-1996/7).
- Dark-bellied brent goose *Branta bernicla bernicla*, 7,506 individuals representing at least 2.5% of the wintering Western Siberia/Western Europe population (5 year peak mean, 1992/3-1996/7).
- Ringed plover *Charadrius hiaticula*, 552 individuals representing at least 1.1% of the wintering Europe/Northern Africa - wintering population (5 year peak mean, 1992/3-1996/7)
- Teal *Anas crecca*, 4,400 individuals representing at least 1.1% of the wintering North-western Europe population (5 year peak mean, 1992/3-1996/7).

2.38 The area also qualifies as an SPA by supporting 53,948 individual waterfowl (5 year peak mean 1991/2 - 1995/6).

Condition Assessment

2.39 The Solent & Southampton Water SPA falls within the boundaries of the various SSSIs listed previously for Solent & Southampton Water SAC. As a specific condition assessment has not been carried out for the SPA, reference has been made to the SSSI condition assessment. This is considered to be a reasonable approach as this describes the condition of the habitats that support the SPA bird population.

2.40 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not highlight any pollution issues within the SPA. The form does identify other issues in line with those identified in the SSSI condition assessments.

Conservation Objectives

2.41 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

Solent & Southampton Water Ramsar

Reasons for Selection

2.42 Solent and Southampton Water meets four Ramsar site selection criteria, which identify the site's importance for breeding and wintering bird species, coastal and estuarine habitats and rare plants and invertebrate species. The four criteria are as follows:

- Ramsar criterion 1: The site is noted as being a major sheltered channel between a substantial island and the mainland, for exhibiting an unusual strong double tidal flow, and for supporting many wetland habitats including: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs.
- Ramsar criterion 2: The site supports an important assemblage of rare plants and invertebrates, including at least 33 British Red Data Book invertebrates and eight British Red Data Book plants.

- Ramsar criterion 5: The site supports a population of waterfowl with peak counts in winter of 51,343 (5 year peak mean 1998/99-2002/2003).
- Ramsar criterion 6: The site supports the following qualifying species/populations (as identified at designation). Species with peak counts in spring/autumn:
    - Ringed plover, *Charadrius hiaticula*, Europe/Northwest Africa 397 individuals, representing an average of 1.2% of the GB population (5 year peak mean 1998/9-2002/3).

  Species with peak counts in winter:
    - Dark-bellied brent goose, *Branta bernicla bernicla*, 6456 individuals, representing an average of 3.0% of the population (5 year peak mean 1998/9-2002/3).
    - Eurasian teal, *Anas crecca*, NW Europe 5514 individuals, representing an average of 1.3% of the population (5 year peak mean 1998/9-2002/3).
    - Black-tailed godwit, *Limosa limosa islandica*, Iceland/W Europe 1240 individuals, representing an average of 3.5% of the population (5 year peak mean 1998/9-2002/3).

Condition Assessment

2.43 The Solent & Southampton Water Ramsar falls within the boundaries of the various SSSIs listed previously for Solent & Southampton Water SAC. As a specific condition assessment has not been carried out for the Ramsar, reference has been made to the SSSI condition assessment. This is considered to be a reasonable approach as this describes the condition of the habitats that support the SPA bird population.

Dorset Heaths SAC

Reasons for Selection

2.44 Annex I habitats that are a primary reason for selection of this site:

- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- Depressions on peat substrates of the *Rhynchosporion*

2.45 Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- Alkaline fens
- Old acidophilous oak woods with *Quercus robur* on sandy plains

2.46 Annex II species that are a primary reason for selection of this site:

- Southern damselfly *Coenagrion mercuriale*

2.47 Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Great crested newt *Triturus cristatus*

Condition Assessment

2.48 The Dorset Heath SAC is a very large and extensive site covering an area of 5719.54 ha. It comprises 37 component SSSIs; however, in the context of this study only the following 11 SSSIs are considered to be relevant due to their location.

2.49 Bourne Valley SSSI covers an area of 73.04 ha. The most recent condition assessment indicates that 25% is unfavourable recovering, 38.04% unfavourable no change and 36.53% is unfavourable declining[4]. The reason for the current condition is linked to urban effects such as arson, enrichment, soil erosion and high levels of recreational disturbance. There are also local issues with scrub management.

2.50 Canford Heath SSSI covers an area of 413.51 ha. The most recent condition assessment indicates that 53.94% is unfavourable recovering, 45.08% is unfavourable no change and 0.98% is destroyed. The reason for the current condition is linked to urban effects including nutrient enrichment, arson, motorcycling and vandalism. There are also local issues with scrub management and control of non-native species.

2.51 Ferndown Common SSSI covers an area of 64.42 ha. The most recent condition assessment indicates that 100% is unfavourable no change. The reason for the current condition is linked to urban effects including nutrient enrichment, arson, unauthorised access and vandalism. There are also local issues with scrub management and control of non-native species.

2.52 Holt and West Moors Heaths SSSI covers an area of 767.21 ha. The most recent condition assessment indicates that 11.58% is in favourable condition, 61.55% is unfavourable recovering, 21.74% is unfavourable no change and 4.88% is unfavourable declining: 0.25% is destroyed. The reason for the current condition is linked to urban effects including nutrient enrichment, arson, motorcycling and vandalism. There are also local issues with scrub management and control of non-native species.

2.53 Holton and Sandford Heaths SSSI covers an area of 277.15 ha. The most recent condition assessment indicates that 15.28% is in favourable condition, 63.88% is unfavourable recovering, 12.14% is unfavourable no change and 8.49% is unfavourable declining: 0.21% is partially destroyed. The reason for the current condition is linked to land use and management including scrub management and grazing.

2.54 Hurn Common SSSI covers an area of 83.61 ha. The most recent condition assessment indicates that 100% is in unfavourable recovering. The recovery of the habitats is due to intervention that that has resulted in scrub/tree clearance and the re-introduction of grazing.

2.55 Parley Common SSSI covers an area of 164.07 ha. The most recent condition assessment indicates that 7.24% is in favourable condition, 22.20% is unfavourable recovering, 61.27% is unfavourable no change and 8.86% is unfavourable declining: 0.42% is destroyed. The reason for the current condition is due to a number of urban related and neglect effects, including arson, fly tipping, nutrient enrichment and invasive alien species. The extent of dry and wet heath is reduced by scrub and bracken. Grazing is required in some areas.

2.56 Slop Bog and Uddens Heath SSSI covers an area of 44.64 ha. The most recent condition assessment indicates that 48.45% is unfavourable recovering, 1.47% is unfavourable no change and 36.39% is unfavourable declining: 13.68% is destroyed. Tree clearance, gorse and scrub management, bracken control measures and management of people pressures are required to achieve favourable status.

2.57 St Leonards and St Ives Heaths SSSI covers an area of 529.89 ha. The most recent condition assessment indicates that 0.39% is in favourable condition, 72.61% is unfavourable recovering, 18.29% is unfavourable no change and 8.71% is unfavourable declining. The reason for the current condition is due to site management of trees and shrubs and non-native species.

2.58 Town Common SSSI covers an area of 256.86 ha. The most recent condition assessment indicates that 1.34% is in favourable condition, 53.91% is unfavourable recovering, 39.74% is unfavourable no change and 5.01% is unfavourable declining. The reason for the current condition is due to a requirement for the management of trees and shrubs and non-native species. Grazing is required in some areas.

[4] Figures are as reported by Natural England

2.59 Upton Heath SSSI covers an area of 218.89 ha. The most recent condition assessment indicates that 55.11% is unfavourable recovering, 13.97% is unfavourable no change and 30.92% is unfavourable declining. The reason for the current condition is due to a number of urban related and neglect effects, including arson, fly tipping, nutrient enrichment and invasive alien species. The extent of dry and wet heath is reduced by scrub and bracken. Grazing is required in some areas.

2.60 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not highlight any pollution issues within the SAC. The form does identify other issues in line with those identified in the SSSI condition assessments.

Conservation Objectives

2.61 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 and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

Dorset Heathlands SPA

Reasons for Selection

2.62 This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

2.63 During the breeding season;

- Dartford Warbler *Sylvia undata*, 418 pairs representing at least 26.1% of the breeding population in Great Britain (Three count mean, 1991-2 & 1994)
- Nightjar *Caprimulgus europaeus*, 386 pairs representing at least 11.4% of the breeding population in Great Britain (Two year mean 1991-1992)
- Woodlark *Lullula arborea*, 60 pairs representing at least 4.0% of the breeding population in Great Britain (Count as at 1997)

2.64 Over winter;

- Hen Harrier *Circus cyaneus*, 20 individuals representing at least 2.7% of the wintering population in Great Britain (Count, as at 1991/2)
- Merlin *Falco columbarius*, 15 individuals representing at least 1.0% of the wintering population in Great Britain (Count, as at 1991/2)

Condition Assessment

2.65 The Dorset Heaths SPA falls within the boundary of the SAC and component SSSIs. As a specific condition assessment has not been carried out for the SPA, reference has been made to the SSSI condition assessment. This is considered to be a reasonable approach as this describes the condition of the habitats that support the SPA bird population.

2.66 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not highlight any pollution issues within the SPA. The form does identify other issues in line with those identified in the SSSI condition assessments.

Conservation Objectives

2.67 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

Dorset Heathlands Ramsar site

Reasons for Selection

2.68 The site satisfies a number of Ramsar criteria as follows:

- Ramsar criterion 1: The site contains particularly good examples of (i) northern Atlantic wet heaths with cross-leaved heath *Erica tetralix* and (ii) acid mire with *Rhynchosporion*. It also contains largest example in Britain of southern Atlantic wet heaths with Dorset heath *Erica ciliaris* and cross-leaved heath *Erica tetralix*.
- Ramsar criterion 2: The site supports 1 nationally rare and 13 nationally scarce wetland plant species, and at least 28 nationally rare wetland invertebrate species.
- Ramsar criterion 3: The site has a high species richness and high ecological diversity of wetland habitat types and transitions.

2.69 As well as supporting important populations of rare higher plants, lower plants and invertebrates, the site also supports the following bird species, which currently occur at levels of national importance:

2.70 Species regularly supported during the breeding season:

- Dartford warbler *Sylvia undata*, Europe 418 pairs, representing an average of 26.1% of the GB population (Three count mean 1991-2 & 1994)

2.71 Species with peak counts in winter:

- Hen harrier *Circus cyaneus*, Europe 20 individuals, representing an average of 2.6% of the GB population (Count as at 1991/2)
- Merlin *Falco columbarius*, Europe 15 individuals, representing an average of 1.0% of the GB population (Count as at 1991/2)

2.72 The site also supports an internationally important population of southern damselfly *Coenagrion mercuriale*.

Condition Assessment

2.73 The Dorset Heaths Ramsar falls within the boundary of the SAC and component SSSIs. As a specific condition assessment has not been carried out for the Ramsar site, reference has been made to the SSSI condition assessment. This is considered to be a reasonable approach as this describes the condition of the habitats that support the SPA bird population.

3 Methodology

Air Quality Modelling

3.1 A detailed description of the modelling methodology that has been used in this study is presented within a separate report (Air Quality Consultants, 2017). A summary is provided below for reference.

3.2 Two future assessment years have been considered within this report; 2026 and 2036, which are related to the delivery timeframe for the proposed New Forest District Council Local Plan and the New Forest National Park Authority Local Plan and their associated land allocations. The approximate total supply of housing delivered by the two Local Plans during the Plan Period is 10,500 – 13,000, with an estimated 60 – 65% of the supply being delivered by 2026: the remaining 35 – 40% will be delivered after 2026. This includes an approximate total supply of housing delivered by the New Forest National Park Authority Local Plan during the Plan Period of 800.

3.3 AQC (Air Quality Consultants, 2017) states that 'The Environment Agency's Air Emissions Risk Assessment guidance discounts as insignificant any impact on a national or European designated ecological site from an individual permit application if:

- the change in annual mean concentration or deposition flux is <1% of a long-term (e.g. annual mean) environmental standard; or
- the change in mean concentration or deposition flux is <10% of a short-term (e.g. 24-hour mean) environmental standard.

3.4 The Environment Agency does not suggest that impacts will necessarily be significant above these criteria: they provide a threshold above which there is a potential for significant impacts to occur, which should be subject to further consideration. The 1% and 10% thresholds have been applied to this modelling exercise.

3.5 The report by AQC (Air Quality Consultants, 2017) provides a detailed description of the modelling work that has been carried out. The following extract from the AQC report summarises the scenarios that have been used and which are subsequently referred to in this report:

3.6 '*Predictions of all pollutants have been carried out for a current base year (2015), and future assessment years of 2026 and 2036. Predictions for 2026 and 2036 have been made for two scenarios:*

- *the Do-Minimum, which includes committed development and background traffic growth to each assessment year, but no Local Plans; and*
- *the Do-Something, which includes committed development, background traffic growth to each assessment year, and the Local Plans.*

3.7 In addition, predictions have been made for an adapted-2015 scenario, which involves combining the base year (2015) traffic flows with 2026 and 2036 vehicle emission factors to allow the 'In-Combination' impacts to be calculated (see below).

3.8 The results for these scenarios have been compared against one-another to show the impacts of the Local Plans, and also the impacts of the Local Plans 'In-Combination' with committed development and background traffic growth. This has been done as follows:

- *the impacts of the Local Plans in 2026 and 2036 have been determined by comparing the Do-Something scenarios in these years against the concurrent Do-Minimum scenarios; and*
- *the 'In-Combination' impacts in 2026 and 2036 have been determined by comparing each Do Something scenario against the predictions made in these years using the 2015 traffic flows and the relevant future-year emissions factors.*

3.9 *In addition to this set of predictions, a sensitivity test has been carried out for nitrogen dioxide and NOx. This involves assuming much higher NOx emissions from certain vehicles than have been used by Defra, using AQC's Calculator Using Realistic Emissions for Diesels (CURED v2A) tool (AQC, 2016a).'*

3.10 The roads where modelling has been undertaken and which are referred to in subsequent sections of this report, are shown on Figure 1 in Section 11.

Terminology

3.11 Within this report reference is made to critical loads (expressed as kg Nitrogen ha^{-1} $year^{-1}$) and critical levels (expressed as µg m^{-3}). These terms are defined as follows (source: APIS - http://www.apis.ac.uk/, accessed 12 November 2017):

3.12 *Critical loads* are defined as "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge".

3.13 *Critical levels* are defined as "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge".

3.14 There is an important distinction to be made between a critical load and a critical level: the critical load relates to the quantity of pollutant deposited from air to the ground, whereas the critical level is the gaseous concentration of a pollutant in the air.

3.15 The total concentrations or total deposition rates presented are the sum of the absolute change and the corresponding background concentration or background deposition rate. The percentage change would then be the absolute change over the corresponding critical level or critical load.

Ecological Assessment

3.16 As noted above, the critical load is a quantitative estimate of exposure below which significant harmful effects are unlikely to occur. The critical level is the concentration of a pollutant above which direct adverse effects may occur. To assist with permitting the Environment Agency (EA) concluded that there is a level of emission that is so small as to be inconsequential in terms of its effects. The EA chose to set this level at 1% of the long-term critical load or critical level and 10% of the short-term critical level. In the absence of any other guidance this is the approach that has been used.

3.17 The 1% or 10% criterion is intended to be a trigger for further consideration by an ecologist to determine whether there is likely to be a significant effect on a receptor, i.e. the exceedance of the 1% threshold does not necessarily mean that a significant effect will occur.

3.18 AQC has provided a filtered data set that only shows those modelled receptors where the screening criteria (either 1% or 10%) are not met and where exceedances[5] of the relevant critical level or critical load occur for the following pollutants: nutrient nitrogen deposition, NOx, ammonia and acid deposition. For each pollutant, data are provided for the modelling scenarios described above. The filtered data show where exceedance has occurred at various receptor locations along a particular road and at various receptor locations along a transect extending away from the road. These data allow the spatial extent of exceedance to be determined.

[5] Throughout this report the term 'exceedance' has been used with reference to the relevant screening criteria.

3.19 The approach that has been adopted for the ecological assessment can be summarised as follows:

- The relative importance of the different pollutants has been considered.
- Habitat mapping has been used to assess the distribution of habitat features in relation to the roads where exceedance is predicted.
- The sensitivity of the habitat features has been assessed with reference to published information.
- Review the critical loads and levels for the key pollutants and the relevant habitat features that are present alongside each road section[6].
- Review the total concentrations or deposition rates predicted from the implementation of the two Local Plans.
- Where appropriate, consider dose-response relationships on key habitats.

Habitat Mapping Data

3.20 This assessment has focussed on the impacts on the SAC habitats as these are the features that are most vulnerable to impacts arising from airborne pollutants. Faunal species that are the reasons for designation of an SAC, SPA or Ramsar, are unlikely to be directly affected by airborne pollutants: it is most likely that any effects will be indirect as a consequence of changes to the habitats that the faunal species rely upon (APIS - http://www.apis.ac.uk/, accessed 12 November 2017). For example, Southern damselfly is not considered to be vulnerable to changes in airborne pollutants; however, its favoured habitats, such as rivers and streams, may be affected by these pollutants.

3.21 Spatial polygon data are available for priority habitats, i.e. habitats identified under Section 41 of the Natural Environment and Rural Communities Act 2006 as being of principal importance for the purpose of conserving biodiversity (and which have superseded the priority habitats identified in the UK BAP). The National Biodiversity Network has prepared a dictionary of habitat correspondences (http://jncc.defra.gov.uk/files/NBNdictionary_habitat_correspondances_20080205.zip, accessed 12 November 2017), which has been used to identify the Annex 1 habitats[7] of interest that correspond with a particular priority habitat.

3.22 Habitat maps have not been provided for the Dorset Heaths and Solent designated areas. For these sites the habitats have been assessed with reference to both aerial and Street View imagery that is available on the internet (https://www.bing.com/maps, accessed 21 November 2017) and professional judgement.

3.23 The Air Pollution Information System (APIS - http://www.apis.ac.uk/, accessed 12 November 2017) has adopted a range of generic habitat types, which are summarised in Table 1. This includes an indication of the Annex 1 habitats and priority habitats that correspond with each generic habitat type. Throughout this report reference has been made to the advice and guidance that has been published by APIS, and this refers to the habitats described in Table 1

[6] If, for example, the roadside habitat is woodland then the exceedance is more than 1% of the lower level of the critical load for that habitat.
[7] Annex 1 of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

Table 1: A summary of habitat types referred to by the APIS website (source: http://www.apis.ac.uk/)

APIS Habitat	**APIS broad ecosystem**	**Habitats Directive Annex 1**	**BAP** (priority habitats and broad habitats in **bold**)
Bogs	Bogs, wetland and heath	• Depressions on peat substrates of the *Rhynchosporion*	• **Bogs** • Blanket bog • Lowland raised bog
Broadleaved, Mixed and Yew Woodland	Woodland and hedgerow	• Old acidophilous oak woods with *Quercus robur* on sandy plains • Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*) • *Asperulo-Fagetum* beech forests • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*	• **Broadleaved, mixed and yew woodland** • Upland oakwood • Lowland wood-pasture and parkland • Lowland beech and yew woodland • Upland mixed ashwoods • Wet Woodland • Upland birchwoods
Coastal and Floodplain Grazing Marsh	Grassland	n/a	• **Improved grassland** • Coastal and floodplain grazing marsh
Coastal saltmarsh	Coastal and rocky habitats	• Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Spartina swards • Salicornia and other annuals colonising mud and sand • Mudflats and sandflats not covered by seawater at low tide	• **Littoral sediment** • Coastal saltmarsh • Intertidal mudflats • Seagrass beds • Sheltered muddy gravels • Peat and clay exposures
Dwarf Shrub Heath	Bogs, wetland and heath	• European dry heaths • Northern Atlantic wet heaths with *Erica tetralix*	• **Dwarf Shrub Heath** • Lowland heathland • Upland heathland
Fen, Marsh and Swamp	Bogs, wetland and heath	• Alkaline fens • Transition mires and quaking bogs • *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils	• **Fen, marsh and swamp** • Upland Flushes, Fens and Swamps • Lowland Fens • Purple moor grass and rush pastures • Reedbeds
Rivers and streams	Freshwater	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	• **Rivers and streams** • Rivers
Standing Open Water and Canals	Freshwater	• Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	• **Standing open water and canals** • Mesotrophic lakes • Eutrophic standing waters • Aquifer fed naturally fluctuating water bodies • Ponds • Oligotrophic and Dystrophic Lakes

4 Evaluation of Aerial Pollutants

Air Pollution Types

4.1 The effects of airborne pollutants occur through a process of emission, chemical transformation and deposition. APIS (APIS - http://www.apis.ac.uk/, accessed 12 November 2017) identifies SO_2, NO and NO_2 as the key primary pollutants that are oxidised in the atmosphere, while NH_3 reacts with these oxidised pollutants to form ammonium. Once these pollutants occur as aerosols[8] they can potentially travel long distances, and can interact with vegetation in two ways:

- Removal from the atmosphere by precipitation (wet deposition); and
- Direct capture (dry deposition).

4.2 The most significant pollutant effects (in terms of effects on vegetation) are acid deposition and eutrophication by nitrogen deposition.

4.3 Acid deposition: caused by oxides of nitrogen (NOx) (or sulphur dioxide, SO_2) reacting with water in the atmosphere to form nitric (or sulphuric) acid. Both wet and dry acid deposition have been implicated in the damage and destruction of vegetation and in the degradation of soils and watercourses.

4.4 Eutrophication by nitrogen deposition: consists of the input of nitrogen from NOx (and sometimes ammonia, NH_3) emissions by deposition. Nitrogen deposition can cause direct damage to sensitive plant species, whilst deposition can also lead to long term compositional changes in vegetation and reduced diversity.

4.5 While plants are able to detoxify and assimilate low exposure to atmospheric concentrations of NOx, high levels of uptake can lead to detrimental impacts including:

- Inhibition of pigment biosynthesis, leading to reduced rates of photosynthesis;
- Water soaking as NO_2 molecules attach to lipids in membranes, causing plasmolysis (removal of water) and eventually necrosis;
- Inhibition of lipid biosynthesis, leading to reduced rates of regeneration and growth;
- Injury to mitochondria and plastids, essential to internal processing of energy and proteins;
- Decrease in stomatal conductance of air and water vapour; and
- Inhibition of CO_2 fixation (at least under low light levels).

4.6 This study has considered the consequences of implementing the two Local Plans on the following pollutants: nutrient nitrogen deposition, NOx, ammonia and acid deposition. Each of these is considered in turn in the following sections. In this study SO_2 has not been considered as road traffic is not a key source of this pollutant (http://www.apis.ac.uk/, accessed 12 November 2017).

Nitrogen deposition

4.7 APIS (http://www.apis.ac.uk/, accessed 12 November 2017) describes Nitrogen (N) deposition as the input of reactive nitrogen from the atmosphere to the biosphere as gases, dry deposition and in precipitation as wet deposition. Vascular plants take up most of their N through their roots but gaseous nitrogen can be absorbed via stomata or the cuticle. Non vascular plants, e.g. lichens and bryophytes, can absorb N through their entire surface.

4.8 If carbon (C) assimilation is restricted, e.g. by insufficient phosphorous (P), light or water, then N can potentially accumulate to excess and become toxic, i.e. nitrogen acts as a pollutant rather than a nutrient. Excess nitrogen has been shown to be one of the main drivers of biodiversity change.

[8] An aerosol is a colloidal suspension of particles dispersed in air or gas.

4.9 Some plants do not have the capacity to assimilate excess nitrogen when it is available (from N deposition) and these species can be outcompeted by plants that can, such as certain grass species.

4.10 Key concerns (APIS - http://www.apis.ac.uk/, accessed 12 November 2017):

- Changes in species composition with a marked decline in heather *Calluna vulgaris* and ericoids, and an increased dominance of grasses.
- Loss of mosses, liverworts and lichens which receive their nutrients from the atmosphere directly.
- Decline in *Racomitrium. lanuginosum* heath, one of the most extensive terrestrial near- natural plant communities in Britain, and its replacement with grasses.
- Increased risk of heather beetle attacks on *Calluna vulgaris*, encouraged by higher N levels in foliage.
- Initial N stimulated growth for *Calluna*, increased litter, N return and mineralization.
- Negative effects on ericoid mycorrhiza and increase in drought sensitivity.
- Impacts linked to increased attractiveness to insect pests, and opening up of the canopy due to frost.

NOx

4.11 Nitrogen oxide (NOx) can have effects on vegetation. APIS (http://www.apis.ac.uk/, accessed 12 November 2017) has summarised the effects on vegetation as follows:

- Eutrophication leading to changes in species assemblages; increase in N loving species (e.g. grasses) and species that can up regulate their carbon assimilation at the expense of species that are conservative in their N use.
- Shift in dominance from mosses, lichens and heath species towards grasses like *Deschampsia flexuosa*, *Molinia caerulea* and ruderal species, e.g. *Chamerion angustifolium*, *Rumex acetosella*, *Rubus idaeus*.
- Increased risk of frost damage in spring (van der Eerden et al 1991).
- Increased winter desiccation levels in *Calluna* and summer drought stress.
- Increase in N loving epiphytes, e.g. *Xanthoria parietina*, at the expense of epiphytes that prefer acid bark.
- Increased incidence of pest and pathogen attack, e.g. heather beetle outbreaks.
- Direct damage and death of sensitive species, e.g. lichens and mosses, *Sphagnum*, *Pleurozium schreberi*.
- Reduced root growth and mycorrhizal infection leading to reduced nutrient uptake, sensitivity to drought and nutrient imbalance with respect to N that is taken up via the foliage.
- Increase in soil pH follows acidification.

Ammonia

4.12 Ammonia excess will lead to increases in nitrification and denitrification, and deposition can ultimately lead to effects on vegetation. APIS (http://www.apis.ac.uk/, accessed 12 November 2017) describes Ammonia (NH_3) as being a highly reactive and soluble alkaline gas. Excess nitrogen can cause eutrophication and acidification effects on semi-natural ecosystems, which in turn can lead to species composition changes and other deleterious effects.

4.13 Ammonia can have effects on vegetation and APIS (http://www.apis.ac.uk/, accessed 12 November 2017) has summarised the effects as being the same as reported previously for NOx.

4.14 Effects and implications:

- Ammonia can be directly phytotoxic to vegetation.
- Effects will vary depending on, for example, the exposure concentration, the length of time of exposure has been emitting and whether other pollutant deposition has also been increased.
- Direct damage to sensitive species, e.g. bleaching and leaf discoloration, observed in *Cladonia* lichens e.g. *Cladonia portentosa* at high concentrations. Bleaching is a particularly likely consequence of NH_3 exposure and quite distinct (cf component of hair dye).
- Reduced ability of stomata to close under drought conditions, leading to plant water stress highly visible as greatly increased amount of grey foliage in *Calluna* a consequence of winter desiccation.
- Changes in species composition, species swapping.
- Subtle changes in plant morphology, physiology and biochemistry which not only increases growth, but also increases sensitivity to environmental factors such as wind, frost, drought and pests (e.g. increased tissue N concentrations can predispose plants to insect attack).
- Increased likelihood of heather beetle attacks.
- Change from heath to grassland

Acid Deposition

4.15 Effects and implications (APIS - http://www.apis.ac.uk/, accessed 12 November 2017):

- Reduction of acid sensitive bryophyte species, where acid deposition is high or concentrated.
- Change in species composition and frequency of ground floor bryophytes. Mosses can be sensitive to acid deposition which leaches base cations from cell membranes, leading to loss of membrane integrity and damage.
- Low soil pH which means lower base cations and higher metal cation concentrations in the soil solution (especially aluminium Al^{3+}) and potentially lower P availability.
- Below-ground damage, particularly to fine roots. Stunted fine roots and loss of ericoid mycorrhiza; probably requires significant acidification to bring pH towards 3 before such effects would be expected.
- Root damage may increase sensitivity of *Calluna* to winter desiccation.

Critical levels and critical loads for NOx, N Dep, NH_3 and Acid Dep

4.16 Critical load and critical level data are available for all European site interest features, i.e. qualifying habitats and species (source: http://www.apis.ac.uk/, accessed 12 November 2017). A summary is provided in Appendix 1 – this has focussed on SAC habitats as in all cases the SAC, SPA and Ramsar site boundaries coincide, i.e. the SPA and Ramsar species are supported by the SAC habitats.

4.17 Critical Levels for air pollutants are shown in Table 2 (source: http://www.apis.ac.uk/, accessed 12 November 2017). These values are not habitat specific, as in critical loads, but have been set to cover broad vegetation types (e.g. forest, arable), often with critical values set for sensitive lichens and bryophytes.

4.18 Critical loads for acid deposition are also available for all European site interest features, i.e. qualifying habitats and species (source: http://www.apis.ac.uk/, accessed 12 November 2017). To model acid deposition AQC has taken the MinCLMaxN value for each habitat type. The model derives acid deposition values by applying a conversion factor to the nitrogen deposition values, the derived values then being compared to the relevant MinCLMaxN value.

Table 2: Critical levels for key pollutants

Pollutant	Receptor	Time Period	Critical Level
NOx	All	Annual mean	30 µg/m^3
NOx	All	24 hour mean	75 µg/m^3
Ammonia	Lichens and bryophytes (where they form a key part of the ecosystem integrity)	Annual mean	1 µg/m^3
Ammonia	Other vegetation	Annual mean	3 µg/m^3 (with an uncertainty range of 2-4 µg/m^3)

5 New Forest SAC

Baseline Conditions

5.1 APIS has published the full range of pollutant deposition rates and concentrations across the New Forest SAC for each interest feature and these are summarised in Table 3 below. These data show that there is already exceedance across the site for nitrogen deposition for all interest features.

5.2 The range of nitrogen deposition values reported for oligotrophic waters are above the empirical critical load for these habitats (3-10 kg N/ha/yr for oligotrophic waters on sandy plains and 5-10 kg N/ha/yr for oligotrophic to mesotrophic standing waters). The range of nitrogen deposition values reported for woodland habitats are also above the critical loads for these habitats (the critical load ranges from 5-10 kg N/ha/yr for bog woodland to 10-20 kg N/ha/yr for *Asperulo-Fagetum* beech forests).

5.3 Nitrogen deposition values for other receptors indicate that current loadings fall mostly within the empirical critical load range for each habitat type. Current loadings for *Molinia* meadows are mostly below the empirical critical load for this habitat. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* are not reported to be sensitive to nitrogen deposition.

Table 3: Critical loads and Critical Levels (full range of pollutant deposition rates and concentrations across the site for each feature) (source: http://www.apis.ac.uk/, accessed 12 November 2017).

Feature	Pollutant	Critical load / critical level	Maximum Kg/N/ha/yr	Minimum Kg/N/ha/yr	Average Kg/N/ha/yr
Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoeto-Nanojuncetea*	N Dep	3-10 kg N/ha/yr	18.2	9.8	15.49
	Acid Dep N | S	n/a	1.3 | 0.35	0.7 | 0.18	1.11 | 0.22
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	N Dep	5-10 kg N/ha/yr	18.2	9.8	15.49
	Acid Dep N | S	n/a	1.3 | 0.35	0.7 | 0.18	1.11 | 0.22
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Bog woodland	N Dep	5-10 kg N/ha/yr	26.46	16.8	20.12
	Acid Dep N | S	MinCLminN: 0.321 MaxCLminN: 0.321 MinCLMaxS: 0.226 MaxCLMaxS: 0.314 MinCLMaxN: 0.547 MaxCLMaxN: 0.635	1.89 | 0.39	1.2 | 0.2	1.44 | 0.24
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81

Table 3 (cont.)

Feature	Pollutant	Critical load / critical level	Maximum Kg/N/ha/yr	Minimum Kg/N/ha/yr	Average Kg/N/ha/yr
Transition mires and quaking bogs	N Dep	10-15 kg N/ha/yr	16.94	10.5	12.91
	Acid Dep N | S	MinCLminN: 0.321 MaxCLminN: 0.321 MinCLMaxS: 0.226 MaxCLMaxS: 0.314 MinCLMaxN: 0.547 MaxCLMaxN: 0.635	1.21 | 0.33	0.75 | 0.17	0.92 | 0.2
	Amm	1 µg/m^3	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Depressions on peat substrates of the *Rhynchosporion*	N Dep	10-15 kg N/ha/yr	16.94	10.5	12.91
	Acid Dep N | S	MinCLminN: 0.321 MaxCLminN: 0.321 MinCLMaxS: 0.226 MaxCLMaxS: 0.314 MinCLMaxN: 0.547 MaxCLMaxN: 0.635	1.21 | 0.33	0.75 | 0.17	0.92 | 0.2
	Amm	1 µg/m^3	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Alkaline fens	N Dep	15-30 kg N/ha/yr	16.94	10.5	12.91
	Acid Dep N | S	Not sensitive	1.21 | 0.33	0.75 | 0.17	0.92 | 0.2
	Amm	1 µg/m^3	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Old acidophilous oak woods with *Quercus robur* on sandy plains	N Dep	10-15 kg N/ha/yr	26.46	16.8	20.12
	Acid Dep N | S	MinCLminN: 0.142 MaxCLminN: 0.357 MinCLMaxS: 0.777 MaxCLMaxS: 11.900 MinCLMaxN: 1.620 MaxCLMaxN: 11.358	1.89 | 0.39	1.2 | 0.2	1.44 | 0.24
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81

Table 3 (cont.)

Feature	Pollutant	Critical load / critical level	Maximum Kg/N/ha/yr	Minimum Kg/N/ha/yr	Average Kg/N/ha/yr
Northern Atlantic wet heaths with *Erica tetralix*	N Dep	10-20 kg N/ha/yr	16.94	10.5	12.91
	Acid Dep N | S	MinCLminN: 0.499 MaxCLminN: 1.350 MinCLMaxS: 0.220 MaxCLMaxS: 4.140 MinCLMaxN: 0.862 MaxCLMaxN: 4.854	1.21 | 0.33	0.75 | 0.17	0.92 | 0.2
	Amm	1 µg/m^3	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
European dry heaths	N Dep	10-20 kg N/ha/yr	16.94	10.5	12.91
	Acid Dep N | S	MinCLminN: 0.499 MaxCLminN: 1.350 MinCLMaxS: 0.220 MaxCLMaxS: 4.140 MinCLMaxN: 0.862 MaxCLMaxN: 4.854	1.21 | 0.33	0.75 | 0.17	0.92 | 0.2
	Amm	1 µg/m^3	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)	N Dep	10-20 kg N/ha/yr	26.46	16.8	20.12
	Acid Dep N | S	MinCLminN: 0.142 MaxCLminN: 0.357 MinCLMaxS: 0.777 MaxCLMaxS: 11.900 MinCLMaxN: 1.620 MaxCLMaxN: 11.358	1.89 | 0.39	1.2 | 0.2	1.44 | 0.24
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Asperulo-Fagetum beech forests	N Dep	10-20 kg N/ha/yr	26.46	16.8	20.12
	Acid Dep N | S	MinCLminN: 0.142 MaxCLminN: 0.357 MinCLMaxS: 0.777 MaxCLMaxS: 11.900 MinCLMaxN: 1.620 MaxCLMaxN: 11.358	1.89 | 0.39	1.2 | 0.2	1.44 | 0.24
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81

Table 3 (cont.)

Feature	Pollutant	Critical load / critical level	Maximum Kg/N/ha/yr	Minimum Kg/N/ha/yr	Average Kg/N/ha/yr
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	N Dep	15-25 kg N/ha/yr	16.94	10.5	12.91
	Acid Dep N | S	MinCLminN: 0.223 MaxCLminN: 0.438 MinCLMaxS: 0.220 MaxCLMaxS: 4.140 MinCLMaxN: 0.586 MaxCLMaxN: 4.578	1.21 | 0.33	0.75 | 0.17	0.92 | 0.2
	Amm	n/a	1.39	0.62	0.8
	NOx	75 µg/m^3	21.51	8.18	10.81
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	N Dep	Not sensitive	26.46	16.8	20.12
	Acid Dep N | S	Not sensitive	1.89 | 0.39	1.2 | 0.2	1.44 | 0.24
	Amm	1 µg/m^3	1.39	0.62	0.8
	NOx	Not sensitive	21.51	8.18	10.81
Southern damselfly *Coenagrion mercuriale*		Broad habitat type: dwarf shrub heath (see European dry heaths above) Broad habitat type: rivers and streams (see Oligotrophic waters above)			
Stag beetle *Lucanus cervus*		Broad habitat type: broadleaved mixed and yew woodland (see Old acidophilous oak woods above)			
Great crested newt *Triturus cristatus*		Broad habitat type: standing open waters and canals (see Oligotrophic waters above)			

Predicted exceedance areas

5.4 In the following section consideration is given to those locations where a pollutant increase is predicted that is above the 1% criterion. The assessment focuses on the extent that the total concentration is above the critical level or critical load.

5.5 Air quality modelling has identified a number of locations where exceedance of the screening criterion for key pollutants is predicted. Within its model AQC has set a critical load at each monitoring point that is based on the Annex 1 habitat that is present at that location (this has been identified through interrogation of the habitat data that are available). APIS has published critical load values for nutrient nitrogen deposition and these are provided as a range (e.g. 10-20 kgN/ha/yr). For the purposes of this assessment the lower value in the range has been used as the threshold against which exceedance is measured.

5.6 Exceedance locations are summarised in Table 4 and are shown on Figures 3a to 3f in Section 11. Within Table 4 each road is identified where exceedance is predicted and in Table 5 information is provided about the spatial extent of the exceedance and the habitats that are at risk. A key consideration is the proximity of sensitive habitats to a given road, and hence the likelihood of an effect occurring.

5.7 When considering the impacts of airborne pollutants on vegetation, as a first step it is necessary to considering the current baseline. In the absence of survey data this is necessarily speculative; however, informed assessment is possible using information about the vegetation that is present and how this might interact with pollutants derived from traffic movement.

5.8 In many cases there are trees and shrubs growing close to the road. This vegetation has the potential to intercept airborne pollutants, thereby reducing the distance over which effects might be expected, and reducing the concentration of individual pollutants. Ricardo AEA (2016) note the role of trees 'in preventing the spread of gaseous pollutants is less clear, although there is some evidence to suggest that they act as a physical barrier to NO_2 transport, changing dispersal patterns rather than taking up the pollutant'.

5.9 Whilst some roads pass through heathland areas, there is often a grass verge, which is sometimes populated with gorse scrub. This area is potentially of reduced ecological importance due to factors such as grazing, impacts from existing traffic (airborne pollution), impacts from road management (such as gritting) etc.

Table 4: Habitat characteristics of locations where pollutant exceedance is predicted (Figure 2, Section 11)

Road	Priority habitats	Comments
M27 (east of Cadnam)	Lowland heathland	Approx. 1.0 km section of the motorway runs alongside the SAC to the north, where heathland is present. A second area of heathland is present c.50m to the south alongside the A31. Trees are present alongside the motorway.
B3080 (North Charford to Pound Bottom)	Lowland heathland	Approx. 2.3 km section of road runs through the SAC. Heathland is adjacent to the majority of this section of the road. Narrow grazed verges are present with some localised scrub.
B3078 (Godshill to Brook)	Lowland heathland at the western end. Small areas of purple moor grass and rush pasture. Woodland west of Brook.	Approx. 11.2 km section of road with 7.5 km heathland, 0.9 km woodland and 1.0 km purple moor grass and rush pasture. Heathland sections have grazed grass verges up to 5m wide.
A31 (M27 to Shobley)	Lowland heathland north-east of Cadnam; heathland, woodland and wet woodland to the south-west.	Approx. 13 km section of road with 10.0 km heathland and 1.7 km woodland. Immature / semi-mature trees and shrubs are present along many sections of verge.
A337 (Cadnam to Battramsley)	Small areas of purple moor grass and rush pasture, woodland and small areas of heathland.	Approx. 9.7 km section of road with 1.2 km purple moor grass and rush pasture, 1.8 km woodland and 0.3 km heathland. Many sections have narrow mown verges: trees encroach close to the road.
A35 (Lyndhurst to Ashurst)	Small areas of purple moor grass and rush pasture, woodland and small areas of heathland.	Approx. 3.8 km section of road with 1.0 km purple moor grass and rush pasture, 0.9 km woodland and 0.3 km heathland. Footpath along the northern side of the road: trees encroach close to the road.
B3056 (Lyndhurst to Beaulieu)	Extensive areas of heathland with some wet woodland.	Approx. 8.7 km section of road with 4.5 km heathland and 0.2 km wet woodland. Grazed grass verges up to 5m wide are present in the heathland sections.

Road	Priority habitats	Comments
A326 (Hythe By-pass at Dibden Purlieu)	Small areas of heathland.	Approx. 3.9 km section of road with 2.3 km heathland. Many sections have narrow grass verges: trees encroach close to the road.
North Lane (Dibden Bottom to A3056)	Heathland on both sides of the road. Some woodland and wet woodland.	Approx. 3.0 km section of road with 2.1 km heathland, 0.5 km wet woodland and 0.2 km woodland. Southern section has narrow grass verges: trees encroach close to the road. Grazed grass verges up to 5m wide are present in the heathland sections.
B3055 (Brockenhurst to Furzey Lodge)	Woodland at the western end and heathland near the eastern end.	Approx. 5.5 km section of road with 2.5 km heathland and 1.8 km woodland. Western section has narrow grass verges: trees encroach close to the road. Grazed grass verges up to 5m wide are present in the heathland sections.
B3054 (Beaulieu to Lymington)	Extensive areas of heathland	Approx. 7.8 km section of road with 6.0 km heathland and 0.3 km purple moor grass and rush pasture. Grazed grass verges up to 5m wide are present in the heathland sections.

5.10 Table 5 provides a summary of the spatial extent of exceedances for the 2036 'In-Combination' with sensitivity test scenario[9]. In all cases the maximum extent of modelled exceedance is reported; however, in many cases this provides a distorted view of the situation as interactions between nearby roads can have significant effects on the results. For example, nitrogen deposition on the A36 at West Wellow predicted exceedance up to 2,560m from the road. It is likely that this is due to a cumulative effect with the M27.

5.11 Examination of the modelling data shows that, exceedance of the 10% screening criterion for 24-hour NOx is predicted to extend up to 2,560m from the carriageway at many locations. Table 5 does not include 24-hour NOx total concentrations as no background 24-hour NOx concentrations are available. Consequently total 24-hour mean concentrations have not been calculated. The worst-case assumption has been made that the 24-hour mean NOx critical level is already exceeded at locations close to the roadside (Air Quality Consultants, 2017).

5.12 Exceedance of the total annual mean NOx critical level and 1% screening criterion is much more limited; the extent to which the screening criterion of 1% is exceeded is up to 80m from the road.

5.13 Exceedance of the 1% criterion and total critical loads for nitrogen deposition extends typically up to 20m from the road; however, the spatial extent of exceedance extends to 2,560m for the A31 and A36 where the influence of nearby roads is likely to be having an additive effect (there are a number of locations where the spatial extent of exceedance appears to have been locally affected by the presence of other roads).

5.14 APIS advises that the main impacts of acid deposition are on soils where leaching decreases the base saturation within the soil. This in turn may result in Al^{3+} becoming more available, which can result in toxic effects in certain plants. It is also possible that acidification of soils may result in the lowering of phosphate availability.

5.15 The dominant soils in the New Forest are described as 'slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils' (http://www.landis.org.uk/soilscapes/, accessed 25 November 2017). There are also smaller localised areas, such as to the south-east of Lyndhurst, where the soils are described as 'Naturally wet very acid sandy and loamy soils'. These naturally acidic soils may be less resistant to the effects of acidification, although some vegetation types, such as those associated with heathland, may be tolerant of acid conditions.

[9] This is the spatial extent over which the difference between the adapted-2015 and Do-something scenarios exceeds the screening criterion AND the total concentration/flux in the Do-something scenario exceeds the critical level or critical load. This has been used as the 'worst case' as it considers all changes that are expected to occur between 2015 and 2036, and includes the sensitivity test.

5.16 AQC (Air Quality Consultants, 2017) reports that 'The critical loads for nutrient nitrogen deposition are at least as stringent as those for acid nitrogen deposition (i.e. the critical load for acid deposition could not be exceeded unless the critical load for nutrient nitrogen deposition was also exceeded)'.

5.17 Taking into account this observation and the mechanisms by which impacts might occur (APIS - http://www.apis.ac.uk/, accessed 12 November 2017), it is considered reasonable that nutrient nitrogen deposition is also used as a surrogate for acid deposition effects.

5.18 Exceedance of the 1% screening criterion and total concentration for ammonia is predicted up to 2,560m from the road at many locations (under the 2036 'In-Combination' with sensitivity test scenario[9]). The main impact on ammonia is likely to be as part of the overall balance of nitrogen deposition (when ammonia reacts to create ammonium ions (NH_4^+), it can contribute to nutrient nitrogen). Whilst this may be the case, it is noted that the modelling results indicate that nitrogen deposition is relatively restricted in its spatial extent.

Table 5: Summary of exceedance distances for nitrogen deposition, ammonia and annual mean NOx for the New Forest SAC (Change in concentrations between the 2015-adapted and 2036 Do-Something scenarios is greater than 1% and 2036 2036 Do-Something total exceeds the critical load / level with sensitivity test scenario)

Road	**Exceedance distance (from carriageway)**		
	N deposition	**Ammonia**	**Annual Mean NOx**
M27	Up to 640m	Up to 1,280m	Up to 80m
B3080 (North Charford to Pound Bottom)	Up to 16m	up to 2,560m	No exceedance
B3078 (Godshill to Brook)	Mostly up to 20m but up to 80m near Longcross Plain.	Up to 2,560m	Up to 5m
A31 (M27 to Shobley)	Up to 2,560m	Up to 640m but some up to 2,560m	Up to 80m
A36 (West Wellow)	Up to 2,560m	Up to 2,560 km	No exceedance
A337 (Cadnam to Battramsley)	Mostly up to 18m – up to 38m north of Lyndhurst.	Up to 2,560 km	Mostly within or near the carriageway. Up to 15m near M27
A35 (Lyndhurst to Ashurst)	Up to 1,260m	Up to 2,560 km	Up to 11m
B3056 (Lyndhurst to Beaulieu)	Up to 20m	No exceedance	No exceedance
A326 (Hythe By-pass at Dibden Purlieu)	Up to 160m near Hardley (road influence)	Up to 20m	No exceedance
North Lane (Dibden Bottom to B3056)	Up to 20m	Within 4m	No exceedance
B3055 (Brockenhurst to Sway)	Up to 20m	Up to 1,280 m	No exceedance
B3054 (Beaulieu to Lymington)	Up to 13m	Up to 11m	No exceedance

5.19 The AQC modelling data for the New Forest SAC are summarised in Table 6 with respect to the absolute change in levels, i.e. the difference between the 'Do Something' and the respective baseline scenarios. The total Do-Something concentrations are also provided.

5.20 The change shows the impact that each of the scenarios will have on pollutant loadings.

Table 6: Model outcomes for locations where exceedance of a screening criterion and total concentration is predicted

Pollutant	**Modelling Scenario**	**Absolute change**	**Total 'Do Something' scenario** [c]	**Relevant Baseline**
N Dep (Kg/N/ha/yr)	2026 'official'	0.10-1.72 [a]	12.85-31.00	11.13-30.89 [d]
	2026 'sensitivity test'	0.10-2.63 [a]	14.47-37.23	11.84-37.07 [d]
	2036 'official'	0.10-0.86 [a]	11.92-31.00	11.82-30.14 [d]
	2036 'sensitivity test'	0.10-1.22 [a]	12.40-38.21	12.30-36.99 [d]
	2026 'In-Combination' ('official')	0.10-2.06 [b]	11.28-31.01	11.18-28.94 [e]
	2026 'In-Combination' ('sensitivity test')	0.10-2.75 [b]	11.66-37.23	11.56-34.48 [e]
	2036 'In-Combination' ('official')	0.10-3.54 [b]	10.53-31.00	10.43-27.45 [e]
	2036 'In-Combination' ('sensitivity test')	0.10-4.96 [b]	10.75-38.21	10.60-33.25 [e]
24-hr NOx ($\mu g/m^3$)	2026 'official'	7.51-173.55 [a]	n/a	n/a
	2026 'sensitivity test'	7.52-284.80 [a]	n/a	n/a
	2036 'official'	7.51-44.30 [a]	n/a	n/a
	2036 'sensitivity test'	7.50-72.89 [a]	n/a	n/a
	2026 'In-Combination' ('official')	7.50-103.20 [b]	n/a	n/a
	2026 'In-Combination' ('sensitivity test')	7.50-158.10 [b]	n/a	n/a
	2036 'In-Combination' ('official')	7.50-177.03 [b]	n/a	n/a
	2036 'In-Combination' ('sensitivity test')	7.51-291.35 [b]	n/a	n/a

Table 6 (cont.)

Pollutant	Modelling Scenario	Absolute change	Total 'Do Something' scenario [c]	Relevant Baseline
Annual Mean NOx (µg/m^3)	2026 'official'	0.30-24.03 [a]	30.07-119.72	13.55-118.50 [d]
	2026 'sensitivity test'	0.30-38.93 [a]	30.11-184.31	17.89-182.44 [d]
	2036 'official'	0.32-9.04 [a]	30.00-122.20	28.57-113.16 [d]
	2036 'sensitivity test'	0.30-15.03 [a]	30.03-200.76	28.41-191.66 [d]
	2026 'In-Combination' ('official')	0.57-20.62 [b]	30.69-119.72	27.76-99.0 [e]
	2026 'In-Combination' ('sensitivity test')	0.93-31.79 [b]	31.42-186.88	30.02-161.23 [e]
	2036 'In-Combination' ('official')	0.90-35.55 [b]	33.42-122.2	30.01-88.79 [e]
	2036 'In-Combination' ('sensitivity test')	1.57-59.0 [b]	32.77-200.76	30.01-155.16 [e]
NH_3 (µg/m^3)	2026 'official'	0.01-0.72 [a]	1.21-4.12	0.86-4.08 [d]
	2026 'sensitivity test'	0.01-1.17 [a]	1.24-5.99	0.97-5.94 [d]
	2036 'official'	0.01-0.27 [a]	1.0-4.22	0.98-4.19 [d]
	2036 'sensitivity test'	0.01-0.45 [a]	1.0-6.67	0.97-6.62 [d]
	2026 'In-Combination' ('official')	0.01-0.62 [b]	1.0-4.29	0.95-3.82 [e]
	2026 'In-Combination' ('sensitivity test')	0.01-0.95 [b]	1.0-6.45	0.93-5.68 [e]
	2036 'In-Combination' ('official')	0.01-1.07 [b]	1.0-4.22	0.91-3.57 [e]
	2036 'In-Combination' ('sensitivity test')	0.01-1.77 [b]	1.0-6.67	0.89-5.52 [e]

a This is the difference between the 'Do-Something' and the 'Do-Minimum' scenario for each assessment year.

b This is the difference between the 'Do-Something' and the 'adapted-2015' scenario for each assessment year.

c The different totals reflect differences in areas considered ('In-combination' refers to a change between two modelled scenarios, therefore, the 'Do-Something' totals across the entire New Forest SAC are the same, however, the areas where exceedances of both the screening criterion and the critical level/load change between the 'standard' and 'in-combination' scenario. The inconsistencies in the total concentrations reflect the changes to the locations of interest).

d The relevant baseline is the 'Do-Minimum' scenario for each assessment year.

e The relevant baseline is the '2015-adapted' scenario with the relevant emission factors for each assessment year (see Paragraph 3.7).

6 Dorset Heaths SAC

Baseline Conditions

6.1 The full range of pollutant deposition fluxes and concentrations across the Dorset Heaths SAC for each interest feature are summarised in Table 7 below (source: http://www.apis.ac.uk/, accessed 12 November 2017). Nitrogen deposition values for key habitats indicate that current loadings fall mostly within or above the empirical critical load range for each habitat type. Current loadings for *Molinia* meadows and calcareous fens are mostly below the empirical critical load for this habitat.

Table 7: Critical loads and critical levels (full range of pollutant deposition rates and concentrations across the site for each feature)

Feature	Pollutant	Critical load / critical level	Maximum	Minimum	Average
Depressions on peat substrates of the *Rhynchosporion*	N Dep	10-15 kg N/ha/yr	19.88	11.62	14.39
	Acid Dep N | S	MinCLminN: 0.321 MaxCLminN: 0.321 MinCLMaxS: 0.226 MaxCLMaxS: 0.314 MinCLMaxN: 0.547 MaxCLMaxN: 0.635	1.42 | 0.24	0.83 | 0.15	1.03 | 0.2
	Amm	1 µg/m^3	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23
Alkaline fens	N Dep	15-30 kg N/ha/yr	19.88	11.62	14.39
	Acid Dep N | S	Not sensitive	1.42 | 0.24	0.83 | 0.15	1.03 | 0.2
	Amm	1 µg/m^3	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23
Old acidophilous oak woods with *Quercus robur* on sandy plains	N Dep	10-15 kg N/ha/yr	33.74	17.64	23.00
	Acid Dep N | S	MinCLminN: 0.142 MaxCLminN: 0.357 MinCLMaxS: 0.777 MaxCLMaxS: 11.900 MinCLMaxN: 1.620 MaxCLMaxN: 11.358	2.41 | 0.28	1.26 | 0.18	1.64 | 0.23
	Amm	n/a	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23

Table 7 (cont)

Feature	Pollutant	Critical load / critical level	Maximum	Minimum	Average
Northern Atlantic wet heaths with *Erica tetralix*	N Dep	10-20 kg N/ha/yr	19.88	11.62	14.39
	Acid Dep N | S	MinCLminN: 0.499 MaxCLminN: 1.350 MinCLMaxS: 0.220 MaxCLMaxS: 4.140 MinCLMaxN: 0.862 MaxCLMaxN: 4.854	1.42 | 0.24	0.83 | 0.15	1.03 | 0.2
	Amm	1 µg/m^3	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23
European dry heaths	N Dep	10-20 kg N/ha/yr	19.88	11.62	14.39
	Acid Dep N | S	MinCLminN: 0.499 MaxCLminN: 1.350 MinCLMaxS: 0.220 MaxCLMaxS: 4.140 MinCLMaxN: 0.862 MaxCLMaxN: 4.854	1.42 | 0.24	0.83 | 0.15	1.03 | 0.2
	Amm	1 µg/m^3	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	N Dep	15-30 kg N/ha/yr	19.88	11.62	14.39
	Acid Dep N | S	Not sensitive	1.42 | 0.24	0.83 | 0.15	1.03 | 0.2
	Amm	n/a	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	N Dep	15-25 kg N/ha/yr	19.88	11.62	14.39
	Acid Dep N | S	MinCLminN: 0.223 MaxCLminN: 0.438 MinCLMaxS: 0.220 MaxCLMaxS: 4.140 MinCLMaxN: 0.586 MaxCLMaxN: 4.578	1.42 | 0.24	0.83 | 0.15	1.03 | 0.2
	Amm	n/a	2.34	0.53	1.17
	NOx	75 µg/m^3	24.54	6.52	10.23

Table 7 (cont)

Feature	Pollutant	Critical load / critical level	Maximum	Minimum	Average
Southern damselfly *Coenagrion mercurial*		Broad habitat type: dwarf shrub heath (see European dry heaths above) Broad habitat type: rivers and streams (see below)			
	N Dep	n/a	15.96	8.54	13.43
	Acid Dep N | S	n/a	1.14 | 0.26	0.61 | 0.16	0.96 | 0.21
	Amm	75 µg/m^3	2.34	0.53	1.17
	NOx		24.54	6.52	10.23
Great crested newt *Triturus cristatus*		Broad habitat type: standing open waters and canals (see river and streams above)			

Predicted exceedance areas

6.2 Air quality modelling has identified a number of locations where an exceedance of the 1% screening criterion and total concentration / flux is predicted for key pollutants: exceedance locations are described in Table 8 (refer to Figures 3a to 3f, Section 11). Within the table each road is identified where exceedance is predicted and information is provided about the spatial extent of the predicted exceedance and the habitats that are at risk. A key consideration is the proximity of sensitive habitats to a given road, and hence the likelihood of an effect occurring.

Table 8: Habitat characteristics of locations where pollutant exceedance is predicted (Figure 2, Section 11)

Road	Priority habitats	Comments
A338	Heathland with woodland further to the west	St Leonards and St Ives Heaths SSSI: Approx. 1.4 km section of road with a c.10m wide verge separating the road from the heathland.
A31	Mostly woodland with heathland to the south. Woodland and heathland	St Leonards and St Ives Heaths SSSI: Two short sections totalling about 250m. Woodland encroaches close to the road, mostly coniferous. Slop Bog and Uddens Heath SSSI: Approx. 1.2 km section in total. Woodland and scrub encroaches close to the road.
A3040	Woodland	Bourne Valley SSSI: Approx. 150m section where the road crosses the SSSI at the east end. Trees and shrubs encroach up to the edge of the road.
A3049	Trees alongside road with heathland beyond	Camford Heath SSSI: Approx. 450m section where the road passes the south-west corner of the SSSI. Immature trees and shrubs are present along the edge of the road and a footpath separates the road from the SSSI.
A35	Trees alongside road with heathland beyond	Upton Heath SSSI: Approx. 1.2 km section where the road passes alongside the southern boundary of the SSSI. Trees and shrubs are present along the edge of the road and there is a grass verge up to c.5m wide in places.

6.3 Table 9 provides a summary of the spatial extent of exceedance of the 1% screening criterion and total concentration / flux for the 2036 'In-Combination' with sensitivity test scenario[9]. As previously noted for Table 5, Table 9 provides a summary of the maximum extent of modelled exceedance; however, in many cases this reflects the interactions between nearby roads, which can have significant effects on the results.

6.4 Examination of the data shows that exceedance of the screening criterion for 24-hour NOx is predicted to extend up to 2,560m from the carriageway at some locations. Table 9 does not include total 24-hour NOx concentrations as no background 24-hour NOx concentrations are available. Consequently the total 24-hour mean concentrations have not been calculated. The worst-case assumption has been made that the 24-hour mean NOx critical level is already exceeded at locations close to the roadside (Air Quality Consultants, 2017).

6.5 There are no exceedances of the annual mean NOx 1% screening criterion and total annual mean concentration (30 $\mu g/m^3$).

6.6 Exceedance of the 1% screening criterion and total concentration for ammonia is predicted at a number of sites at distances of up to 1,280m from the carriageway (where the A31 and A338 passes alongside St Leonards and St Ives Heaths SSSI). At all other locations exceedance is predicted up to 20m from the carriageway and no further. Where the A3049 passes to the north of the Bourne Valley SSSI there is a recorded exceedance that extends to 2,560m and consequently covers the designated site. However, the presence of buildings between the road and the SSSI is likely to reduce the spatial extend of exceedance.

6.7 As noted for the New Forest SAC, whilst ammonia is predicted to disperse over significant distances at some locations, exceedance of nitrogen deposition is much more restricted in its spatial extent. This suggests that the effects of ammonia are most likely to be limited to direct exposure: the effect on nitrogen deposition levels is not significant.

6.8 It is noted that on the A31, where the spatial exceedance of the screening criterion is greatest for ammonia, trees and shrubs encroach to the edge of the carriageway. The air quality modelling that has been carried out does not allow for pollutant interception by vegetation, so the presence of trees is likely to reduce the extent over which pollutants travel (due to interception by the large surface area of the foliage).

6.9 Where the A31 passes to the north of the St Leonards and St Ives Heaths SSSI the designated site is mostly set back from the road and is therefore likely to be protected from the effects of airborne pollution by what is a substantial buffer in places. There are, however, two points where the SSSI encroaches close to the road: at SU 13128 04290 (a 30m section) and at SU 12337 03823 (a 300m section). At both of these locations trees and shrubs are present alongside the road.

6.10 Nitrogen deposition exceedance of the 1% screening criterion and total deposition flux is limited to a small number of locations. On the A338 adjacent to St Leonards and St Ives Heaths SSSI exceedance is predicted at a distance of up to 640m from the carriageway. On the A3049 where it passes the south-east corner of Camford Heath SSSI, and on the A35 where it passes along the southern edge of Upton Heath SSSI, exceedance up to 20m is predicted. Nitrogen deposition exceedance is only observed in those modelling scenarios where the potential 'In-Combination Impacts' are considered (i.e. in situations when the difference between the 2015-adapted scenario and relevant future year Do-Something scenario exceeds 1%, and the total deposition flux for the future year Do-Something scenario exceeds the critical load).

6.11 There are three dominant soil types in the Dorset Heaths SAC, which are described as follows (http://www.landis.org.uk/soilscapes/, accessed 25 November 2017):

- 'Naturally wet very acid sandy and loamy soils.
- 'Freely draining slightly acid loamy soils'.
- 'Freely draining very acid sandy and loamy soils'.

6.12 These naturally acidic soils may be less resistant to the effects of acidification, although some vegetation types, such as those associated with heathland, may be tolerant of acid conditions.

Table 9: Summary of exceedance distances at Dorset Heaths SAC (2036 'In-Combination' with sensitivity test[9])

Road	**Exceedance distance (from carriageway)**		
	N deposition	**Ammonia**	**Annual Mean NOx**
A338 St Leonards and St Ives Heaths SSSI	Up to 640m	Up to 1,280m	No exceedance
A31 St Leonards and St Ives Heaths SSSI	No exceedance	Up to 1,280m	No exceedance
A31 Slop Bog and Uddens Heath SSSI	No exceedance	No exceedance	No exceedance
A3049 Bourne Valley SSSI	No exceedance	Up to 20m	No exceedance
A3049 Camford Heath SSSI	Up to 20m	Up to 20m	No exceedance
A35 Upton Heath SSSI	Up to 20m	Up to 20m	No exceedance

7 Solent Maritime SAC

Baseline Conditions

7.1 APIS has published the full range of pollutant deposition rates and concentrations across the Solent Maritime SAC for each interest feature and these are summarised in Table 10 below. These data show that there is currently limited exceedance for some habitats for nitrogen deposition (coastal shingle vegetation 8-15 kg N/ha/yr and shifting dunes 10-20 kg N/ha/yr). Nitrogen deposition values for shifting dunes and shingle vegetation indicate that current loadings fall within the empirical critical load range for each habitat type (10-20 kg N/ha/yr for shifting dunes and 8-15 kg N/ha/yr for shingle vegetation).

7.2 Nitrogen deposition values for all other receptors indicate that current loadings fall below the empirical critical load range for each habitat type.

Table 10: Critical loads and critical levels (full range of pollutant deposition rates and concentrations across the site for each feature)

Feature	Pollutant	Critical load / critical level	Maximum	Minimum	Average
Estuaries	N Dep	20-30 kg N/ha/yr	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76
Cord-grass swards (Spartina swards *Spartinion maritimae*)	N Dep	20-30 kg N/ha/yr	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	N Dep	20-30 kg N/ha/yr	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76
Subtidal sandbanks (sandbanks which are slightly covered by seawater all the time)	N Dep	20-30 kg N/ha/yr	14.98	7.7	9.74
	Acid Dep N | S	Not sensitive	1.07 | 0.56	0.55 | 0.16	0.7 | 0.23
	Amm	Not sensitive	2.38	0.44	0.7
	NOx	Not sensitive	77.27	7.65	14.76

Table 10 (cont.)

Feature	Pollutant	Critical load / critical level	Maximum	Minimum	Average
Intertidal mudflats and sandflats (mudflats and sandflats not covered by seawater at low tide)	N Dep	n/a	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76
Lagoons (coastal lagoons)	N Dep	20-30 kg N/ha/yr	14.98	7.7	9.74
	Acid Dep N | S	Not sensitive	1.07 | 0.56	0.55 | 0.16	0.7 | 0.23
	Amm	n/a	2.38	0.44	0.7
	NOx	75 µg/m^3	77.27	7.65	14.76
Annual vegetation of drift lines	N Dep	Not sensitive	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	Not sensitive	2.38	0.44	0.70
	NOx	Not sensitive	77.27	7.65	14.76
Coastal shingle vegetation outside the reach of waves (perennial vegetation of stony banks)	N Dep	8-15 kg N/ha/yr	17.22	8.82	11.03
	Acid Dep N | S	MinCLminN: 0.223 MaxCLminN: 0.438 MinCLMaxS: 0.260 MaxCLMaxS: 4.170 MinCLMaxN: 0.626 MaxCLMaxN: 4.680	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76
Glasswort and other annuals colonising mud and sand (Salicornia and other annuals colonising mud and sand)	N Dep	20-30 kg N/ha/yr	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76
Shifting dunes with marram (shifting dunes along the shoreline with *Ammophila arenaria* 'white dunes')	N Dep	10-20 kg N/ha/yr	17.22	8.82	11.03
	Acid Dep N | S	Not sensitive	1.23 | 0.53	0.63 | 0.16	0.79 | 0.22
	Amm	n/a	2.38	0.44	0.70
	NOx	75 µg/m^3	77.27	7.65	14.76

Feature	Pollutant	Critical load / critical level	Maximum	Minimum	Average
Desmoulin's Whorl Snail *Vertigo moulinsiana*		Broad habitat type: Rivers and streams (see Lagoons above)			

Predicted exceedance areas

7.3 Air quality modelling has identified a small number of locations where exceedance of the 1% screening criterion and total concentration / flux is predicted. Exceedance locations are summarised in Table 11 (refer to Figures 3a to 3f, Section 11). Within the table each road is identified where exceedance is predicted and information is provided about the spatial extent of the exceedance and the habitats that are at risk. A key consideration is the proximity of sensitive habitats to a given road, and hence the likelihood of an effect occurring.

Table 11: Habitat characteristics of locations where pollutant exceedance is predicted (Figure 2, Section 11)

Road	Priority habitats	Comments
A35 road bridge at Totton	Coastal saltmarsh, coastal and floodplain grazing marsh, intertidal mudflats	A35 crosses the River Test estuary with habitat features located north and south of the crossing. The river and floodplain is up to 600m wide at this point. To the south of the bridge most areas are tidally inundated.
Bridge Road at Lymington	Coastal saltmarsh	Bridge Road crosses the Lymington River where there is saltmarsh to the north. This area falls within the Solent and Southampton Water SPA and Ramsar site.

7.4 Marine systems are generally nitrogen limited and therefore nitrogen inputs potentially have more significant implications when compared to freshwater systems (APIS - http://www.apis.ac.uk/, accessed 12 November 2017). Notwithstanding this, nitrogen inputs (nutrient nitrogen deposition) from atmospheric sources are likely to be insignificant compared to those from other sources: for example, river systems may have high nitrogen loadings from sources such as agriculture. It therefore follows that atmospheric nitrogen may have a negligible effect on nitrogen inputs into marine systems relative to the inputs from other sources.

7.5 Saltmarsh is present at two locations where exceedance is predicted for nitrogen deposition and NOx. APIS suggests that 'Overall, N deposition [from the atmosphere] is likely to be of low importance for these systems as the inputs are probably significantly below the large nutrient loadings from river and tidal inputs' (APIS - http://www.apis.ac.uk/, accessed 12 November 2017).

7.6 A number of the SAC habitat features are subject to tidal flushing, which may be frequent (such as mudflats, which are covered at every high tide) or occasional (such as some areas of saltmarsh, which may only be covered on spring tides). The process of tidal flushing is likely to remove a proportion of any nitrogen derived from atmospheric sources, and this is likely to apply to the habitats located adjacent to A35 road bridge at Totton and Bridge Road at Lymington (see Table 12).

7.7 The effects of acid deposition have not been considered as the habitats that are present at those locations where exceedance might occur, are not considered to be sensitive to such effects.

7.8 The main location where extensive exceedance is predicted is the A35 road bridge at Totton where nitrogen deposition exceedance is predicted up to 640m to the south and annual mean NOx exceedance is predicted up to 640m to the north. Ammonia exceedance is predicted up to 2,560m to the north and south.

Table 12: Summary of exceedance distances for screening criterion for nitrogen deposition, ammonia and annual mean NOx (2036 'In-Combination' with sensitivity test[9])

Road	**Exceedance distance (from carriageway)**		
	N deposition	**Ammonia**	**Annual Mean NOx**
A35 road bridge at Totton	Up to 640m north of the bridge; up to 160m to the south.	Up to 2,560m	Up to 160m north of the bridge; up to 640m to the south.
Bridge Road at Lymington	Up to 9m	Up to 7m	No exceedance

8 Discussion

8.1 In the following sections the results of the air quality modelling are considered for the following key pollutants: NOx, nitrogen deposition, ammonia and acid deposition. In all cases reference has been made to the worst-case modelling scenario, 2036 'In-Combination' with sensitivity test scenario, which refers to the spatial extent over which the difference between the adapted-2015 and 2036 Do-something scenarios exceeds the screening criterion and the total concentration/flux in the Do-something scenario exceeds the critical level or critical load. This has been used as the 'worst case' as it considers all changes that are expected to occur between 2015 and 2036, and includes the sensitivity test. AQC provides more detailed explanation about the precautionary nature of this scenario, which is likely to over-estimate the air quality impacts (Air Quality Consultants, 2017).

8.2 As a general comment it is noted that exceedance is often only predicted for those modelled scenarios that consider the 'In-Combination Impacts'[10]. Exceedance predictions are significantly reduced, both with respect to their occurrence and spatial extent, when only considering the impacts arising from the direct implementation of the Local Plan against the concurrent baseline (i.e. considering the change in concentrations between the future year Do Minimum and Do Something scenarios, and total Do Something concentrations) (refer to Figures 3a to 3f, Section 11). This is discussed in the following sections with reference to the analysis presented by AQC (Air Quality Consultants, 2017).

8.3 It is likely that, in some locations, the model over-estimates the spatial extent of air quality impacts as it does not take into account the effects of the vegetation that is present immediately adjacent to a road. For example, where a road passes through an open area of heathland then interception of airborne pollutants by vegetation may be limited. By comparison, trees located alongside a road are likely to intercept some airborne pollutants, particularly when the trees are in leaf, i.e. the area of the foliage is at its greatest.

8.4 It is understood that the SAC habitats have been mapped using aerial imagery to define their extent; however, it is not known what 'ground-truthing' has taken place. In some cases it is uncertain if the digitised boundary of a particular habitat coincides with the actual extent of that habitat. An example of this is alongside some roads where the SAC extends up to the edge of the road; however, some verges have been subject to mowing, grazing etc and are unlikely to support SAC habitats.

The New Forest SAC, SPA and Ramsar site

8.5 Data published by APIS show that there is already exceedance across the site for nitrogen deposition for all interest features. For some receptors, such as oligotrophic waters, the range of nitrogen deposition values is above the empirical critical load. Nitrogen deposition values for other receptors indicate that current loadings fall mostly within the empirical critical load range for each habitat type. It is therefore the case that the impacts of any future predicted exceedance need to be considered against a baseline that already appears to be subject to air quality impacts.

8.6 Condition assessment information for the New Forest SSSI units (which coincide with the SAC boundary) is of varying age, ranging from 2008 to 2016. Consequently some SSSI units lack recent data and it is therefore possible that habitat deterioration has occurred in recent years but has not yet been reported (or there has been no change or improvement).

8.7 The results of the most recent condition assessments indicate that 96.72% of the New Forest designated site is either in favourable condition or in unfavourable condition but is recovering. The main reason cited for unfavourable status relates to site management: tree and shrub management and appropriate grazing are identified as key actions required to achieve site recovery.

[10] The 'in-combination' impacts have been determined by comparing each 'Do-Something' scenario against the predictions made in these years using the 2015 traffic flows and the relevant future year emission factors.

8.8 It is possible that appropriate site management is the most important factor in terms of returning the site to favourable condition. Any changes in the health of vegetation that arises as a result of airborne pollutants may therefore be small in scale when compared, for example, with the effects of implementing an appropriate grazing regime or not being able to implement such a scheme.

8.9 Information published by APIS indicates that the effects of pollutants may become apparent in a number of ways, including changes in species diversity and abundance, the poor condition of vegetation and increased risk of insect damage. It is therefore important that condition assessments include consideration of these effects. Whilst Common Standards Monitoring looks at changes in species distribution for example, it does not consider plant health. Consequently it is not known if the SAC vegetation is currently exhibiting the effects of exposure to airborne pollution.

8.10 It is possible that vegetation alongside certain roads within the two Local Plan areas is currently showing the effects of exposure to certain aerial pollutants. In many locations the area adjacent to roads is only 'supporting' habitat within the designated site, i.e. it is not an interest feature (a reason for the designation of the site). For example, whilst heathland and woodland encroaches close to the A31, immature / semi-mature trees and shrubs are present along many sections of verge and it is this vegetation that is most likely to be affected by airborne pollutants.

8.11 Nevertheless, a number of roads that bisect the SAC have SAC interest features (e.g. the habitats that are a reason for the site's designation) that encroach close to the road. For example, the B3054, B3055 and B3056 all pass through areas where dry heath occurs close to the road edge.

NOx

8.12 Examination of the exceedance data (for the worst-case 2036 'In-Combination' with sensitivity test scenario[9]) shows that exceedance of the annual mean NOx screening criterion and total annual mean concentration is only predicted at a few locations with maximum exceedance predicted on the M27 and A31 (up to 80m from the road). By comparison there is more widespread exceedance of the critical level for 24 hour NOx. This suggests that the vegetation may be at more risk from acute short-term exposure than chronic long-term exposure to NOx. This is significant for those plants that can recover from acute short-term exposure to NOx, but are susceptible to the cumulative effects associated with long-term exposure.

8.13 AQC (Air Quality Consultants, 2017) reports that predicted exceedances for NOx in 2026 (of both the critical level of 30 µg/m^3 (Do-Something scenario total concentration) and the screening criterion of 1% (2026 Do-Something scenario minus 2026 Do-Minimum scenario) are mainly along the A337 (up to 5m from the road) and A35 (up to 2m from the road). The results of the sensitivity test show exceedance at 15m from the A337 in Pikeshill.

8.14 Exceedances in 2036 (when considering areas where total concentrations for the 2036 'Do-Something' scenario exceed the critical level and the differences between the 2036 Do something and 2036 Do-minimum scenarios exceed the 1% screening criterion) also occur along the A337 and A35, with more exceedance points identified compared to 2026. There are additional exceedances predicted around the junction between the A31 and M27 (up to 20m from the road). In the sensitivity test, exceedances of the critical level and screening criterion are reported to mostly occur between 1 and 4m from the roadside of the A35, with the exception of one location in Lyndhurst where an exceedance is predicted at 20m. Along the A337 exceedances are predicted at 20m in several locations.

8.15 For the 2036 sensitivity test scenario the actual change resulting from the local plans is predicted to be 0.32 – 9.04 µg/m^3 which equates to a percentage change (relative to the critical level) of 1.06% - 30.14%. Where the critical level is exceeded when considering the total 'Do Something' concentrations, at most points exceedance is also noted in the absence of the Local Plans.

8.16 The 2026 'In-combination' assessment (when considering areas where total concentrations for the 2026 'Do-Something' scenario exceed the critical level and the differences between the 2026 Do something and 2015-adapted scenarios exceed the 1% screening criterion[10]) for NOx predicts exceedances of the annual mean concentration of 30 µg/m^3 along the A35 at distances of between 1m and 4m from the roadside. On the A337 exceedances are predicted at between 1m and 4m from the road edge, and along the A31 exceedances extend to 20m in places. Adjacent to the M27 exceedances of 30 µg/m^3 are predicted at 40m from the roadside.

8.17 AQC reports that the results from the 2036 'In-Combination' sensitivity test (when considering areas where total concentrations for the 2036 'Do-Something' scenario exceed the critical level and the differences between the 2036 Do something and 2015-adapted scenarios exceed the 1% screening criterion[9]) are similar to those described above, with the exception that exceedances are also identified adjacent to the junction between the M27 and A31, which occur at 80m from the roadside. Exceedances also occur 7m from the roadside along the B3078 and along the A31 exceedances extend to 40m.

8.18 The A35 and A337 have trees of varying age and size along both sides of the road in many places and the presence of this vegetation is expected to affect pollutant dispersal away from the road. Consequently the exceedances identified for these roads are considered to be a precautionary over-estimate as some interception of pollutants by the trees is likely (and hence the exceedance distance will be reduced). A similar conclusion is reached for the M27 / A31 junction and elsewhere along the A31, which are also buffered by trees along both sides of the road.

8.19 The B3078 cuts through areas of heathland, which encroach close to the road. Within 2m of the road the grass verge is only considered to be 'supporting' habitat for the SAC, but dry heath is present beyond this. It is therefore possible that exceedance of the annual mean concentration of 30 µg/m^3 for NOx could occur within areas of dry heath under the 2036 'Do-Something' sensitivity test scenario (but not under the 2036 'Do-Something 'official' scenario, the difference between the two scenarios indicating that exceedance is uncertain depending upon how engine technology advances over the life of the Local Plans); however, in the majority of cases exceedance is predicted in the absence of the Local Plans.

8.20 APIS reports that the long-term (annual mean) concentration of NOx is most relevant for its impacts on vegetation, as the effects are additive over long periods of time. Furthermore, they conclude that in the UK the short-term NOx concentration mean is not especially ecologically useful as a threshold (in part because of recent reductions in SO_2, which cause the effects of NOx to be observed at lower concentrations).

8.21 There is no published evidence for any directly toxic effect of NOx on animals. This assessment has therefore focussed on the effects of NOx on vegetation, i.e. the habitats that a particular species relies upon. It follows that this assessment considers indirect effects on animals where species are dependent on particular habitats for their survival. For example, the New Forest SPA is noted for woodlark, which favours lowland heath with trees used for a singing post. Consequently by assessing the impacts of airborne pollutants on heathland and woodland, the indirect effects of pollution are considered for woodlark. The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not identify pollution as an issue within the SPA site.

Nitrogen Deposition

8.22 For nitrogen deposition the 2036 sensitivity test scenario predicts that the actual change resulting from the local plans will be 0.10 – 0.858 kg N/ha/yr, which equates to a percentage change (relative to the lower level of the critical load range for each habitat) of 1.00% - 8.58%). Where the critical load is exceeded when considering 'Do Something' impacts, only a small proportion of points are above the higher critical load value (e.g. dry heath 10-20 kg N/ha/yr).

8.23 Predicted exceedance of the screening criterion for nitrogen deposition (under the 2036 'In-Combination' with sensitivity test[9]) is typically up to 16m from the road; however, the spatial extent of exceedance extends to 160m for the B3078 near Godshill and 38m for the A337 north of Lyndhurst. In many locations the presence of trees alongside roads is likely to reduce the spatial extent over which exceedance occurs due to the relatively large foliage area.

8.24 AQC (Air Quality Consultants, 2017) reports that for nutrient nitrogen deposition in 2026, exceedances of the screening criterion (taking the difference between the 2026 Do Something and 2026 Do Minimum scenarios) and the total critical load (2026 Do Something scenario) are observed at two locations along the A337 (1m from the roadside and up to 4m from the roadside for the sensitivity test). In 2036, exceedances of the screening criterion (taking the difference between the 2036 Do Something and 2036 Do Minimum scenarios) and the total critical load (2036 Do Something scenario) are observed along the entire length of the A35, out to 2m from the roadside. East of Lyndhurst, the exceedances extend to 3m from the roadside.

8.25 As previously noted for NOx, the presence of trees alongside these roads leads to the conclusion that effects are likely to be limited to this vegetation, particularly as exceedance distances are typically less than 4m.

8.26 South of Lyndhurst, along the A337, exceedances of the critical load and screening criterion are predicted at 1m from the roadside, but north of Lyndhurst, exceedances are predicted up to 15m. However, these exceedances do not take into account the presence of trees along both sides of the A337, which are likely to intercept a proportion of the nutrient nitrogen deposition. Exceedances of the critical load and screening criterion are also observed out to 7m from the road near to Junction 1 of the M27, which is another section of road where the results of the modelling need to be treated as precautionary due to the presence of trees alongside the road.

8.27 In the sensitivity test, additional exceedances of the critical load and screening criterion are identified out to 4m on North Lane, although this is in a section where there are trees alongside the road and so this figure is considered to be precautionary. North of Lyndhurst, exceedances are identified out to 20m from the roadside, whilst south of Lyndhurst, exceedances are predicted out to 11m.

8.28 Near to Junction 1 of the M27, exceedances extend to 20m from the roadside. As previously noted, these roads have trees alongside the carriageway and this vegetation is likely to intercept some pollutants.

8.29 The 2026 'In-combination' assessment[10] for nutrient nitrogen deposition indicates that exceedances of the critical load (Do-Something scenario) and screening criterion (difference between the 2026 Do Something and 2015-adapted scenarios) are observed along the entire length of the A35, A337, A31 and A338. Exceedances on the A35, west of Lyndhurst, extend to 40m: east of Lyndhurst, exceedances occur up to 20m. Trees are present alongside the A35 for a significant part of its length, although the width of the tree belt varies considerably (and consequently its ability to intercept pollutants is also likely to vary). Although the width of the adjacent tree belt is variable, it is likely that where trees are present they will intercept some nutrient nitrogen deposition.

8.30 Exceedances of the critical load and screening criterion are also predicted on the A337 north of Lyndhurst out to 160m from the roadside, and to the south of Lyndhurst exceedances are predicted out to 20m. These are considered to be over-estimates as the locally dense woodland cover alongside the road is expected to limit the spatial extent of nutrient nitrogen deposition.

8.31 On the A31, exceedances of the critical load and screening criterion are identified out to 80m from the roadside, with the exception of near to Junction 1 of the M27, where exceedance of the critical load and screening criterion extends up to 1,280 m. AQC (Air Quality Consultants, 2017), reports that these are likely to be the cumulative effects of the nearby road network. Exceedances are identified out to 80m from the roadside of the M27 (although this does not account for the screening effect of trees alongside the road). Exceedances of the screening criterion and critical load are observed out to 15m from the roadside along the B3078.

8.32 AQC advises that for the sensitivity test, the locations of exceedances of the critical load and screening criterion are the same as those identified for the 'official' results; however, exceedances extend further from the road edge. Under this scenario exceedances are also predicted along the B3055 (10 and 15 kgN/ha/yr only), out to 5m from the roadside (although this is only in those sections where woodland encroaches close to the road).

8.33 The results of the 2036 'In-Combination' scenario[10] predict exceedances of the screening criterion and critical load that are similar to those identified for the 'official' results, but with the following exceptions. Exceedances are predicted on:

- the B3054 out to 2m from the roadside (there is a wide grass verge alongside the road and this is considered to be 'supporting' habitat for the SAC);
- the B3054 close to the junction with the A326, out to 20m (there is a narrow verge alongside the road with a narrow strip of dry heath beyond);

8.34 The results for the sensitivity test show widespread exceedances of the screening criterion and critical load, particularly in locations where two roads run parallel to one another, such as the A31 and A35. Exceedances are predicted at distances up to 2,500m (but this level of exceedance is only noted under this scenario).

8.35 For nitrogen deposition under the 2036 'In-Combination' with sensitivity test scenario[9], only a small proportion of exceedance points are above the higher critical load value for each habitat (e.g. dry heath 10-20 kg N/ha/yr). Nitrogen deposition levels that are above the higher critical load value for each habitat are noted at the M27 junction with the A31, at single points on the B3078 and B3080 and at two points on the A31.

Ammonia

8.36 Exceedance of the screening criterion and critical level for ammonia is predicted up to 1,280m from the road at many locations, sometimes extending as far as 2,560m (2036 'In-Combination' with sensitivity test scenario[9] with a precautionary critical level of 1µg/m^3, i.e. critical level for bryophytes and lichens). Whilst direct ammonia uptake contributes to the overall nitrogen balance in a plant, its alkalinity may have toxic effects by interfering with plant biochemistry. Ammonia may also react to create ammonium ions (NH_4^+), which contributes to nutrient nitrogen and acid deposition.

8.37 AQC (Air Quality Consultants, 2017) reports that for ammonia in 2026 there are exceedances of the screening criterion (difference between the 2026 Do Something and 2026 Do Minimum scenarios) and critical level (total 2026 Do Something scenario) along the A337, A35 and A36. Exceedances along the A337 occur along the entire modelled road length, up to 4m from the road, i.e. extending no further than the trees that are present alongside the road. The sensitivity test indicates that exceedances occur at similar locations, but at more regular intervals along the A35 and at 1m, i.e. extending no further than the trees that are present alongside the road.

8.38 For ammonia in 2026 the actual change resulting from the local plans will be 0.01 – 0.72 µg/m^3 which equates to a percentage change (relative to the lower critical level for lichens and bryophytes) of 1.00% - 72.10%. However, the baseline ranges from 0.85 – 4.08 µg/m^3 with most points being below 3.00 µg/m^3 (i.e. the critical level for higher plants). For 2036 actual change resulting from the local plans will be 0.01 – 0.27 µg/m^3 which equates to a percentage change (relative to the lower critical level for lichens and bryophytes) of 1.00% - 27.10%. The baseline ranges from 0.77 – 4.19 µg/m^3 with most points being below 3.00 µg/m^3 (in both scenarios the highest values are along the M27).

8.39 Exceedances of the critical load (total 2036 Do Something scenario) and screening criterion (difference between 2036 Do Something and Do Minimum) are similar to those described for 2026, although they extend across the entire modelled length of the A35 and M27. The exceedances do not extend further than the trees that are present alongside the road. AQC identifies a cluster of exceedances that are predicted on roads around Junction 1 of the M27, and these are attributed to the combined emissions from a number of busy roads. These exceedances occur out to 5m along the B3079 and to 20m on the A31 (east of the junction) and motorway slip roads. All of these roads have trees alongside the carriageway.

8.40 Whilst exceedances of the screening criterion and critical level for ammonia occur on the B3055, these only extend to 1m on the western side and to 4m on the eastern side. Trees are present in places alongside the road: where they are absent there is a verge that varies locally in width and may have a reduced buffering effect for habitats set back from the road.

8.41 On the A337, north of Lyndhurst, exceedances are predicted at 40m from the roadside, whereas, to the south, exceedances are predicted out to 9m to 15m. In Setley, along the A337 exceedances of the screening criterion and critical load are predicted at 40m.

8.42 The results for2036 indicate that exceedances occur along the A31 out to 3m, i.e. extending no further than the trees that are present alongside the road: an exceedance extending out to 9m is noted near Junction 1 of the M27. The screening criterion and total ammonia critical level are exceeded along Rolleston Road at 1m (i.e. the verge adjacent to the road), as well as along the A326 out to 15m (there is a strip of grassland that runs alongside the road).

8.43 Exceedances of the screening criterion and critical level are also observed out to 160m from the roadside on the A337. As previously noted for other pollutants, this is considered to be an over-estimate due to the presence of trees alongside the road.

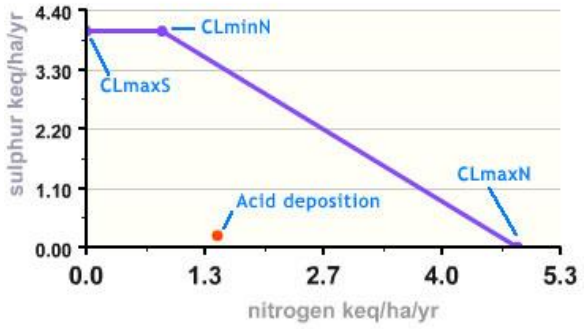
8.44 The results of the 'In-Combination' scenario[10] for both assessment years, and both the 'official' and sensitivity tests, show that exceedances of the ammonia screening criterion and critical level are predicted to occur along most (2026) and all (2036) modelled roads. In 2026, exceedances occasionally extend out to 2,560m from the roadside. AQC report that exceedances generally extend out to 320m, and mainly occur along the A31, A337 and A35 (which have trees along much of their length, which may intercept airborne ammonia). In 2036, exceedances extend out to 2,560m for many roads.

8.45 The 2015-adapted baseline using both the 2026 and 2036 emission factors mostly falls below 3.00 µg/m^3 (i.e. the critical level for higher plants). In both scenarios the highest levels are at points along the M27 and the section of the A337 to the north of Lyndhurst (which is likely to be influenced by proximity to the M27).

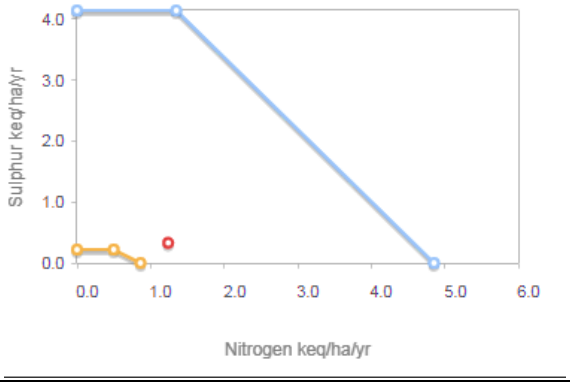
Acid Deposition

8.46 APIS advocates the use of the Critical Load Function, which is a three-node line on a graph representing the acidity critical load (Graph 1). Combinations of deposition above this line would exceed the critical load, while all areas below or on the line represent an 'envelope of protection' where critical loads are not exceeded.

8.47 APIS reports that baseline SO_2 concentrations for the New Forest fall within the range 0.22 – 0.68 keq/ha/yr, with SO_2 levels following a downward trend since 2004 due to improvements for industrial emissions. The maximum acid deposition nitrogen value for the 2036 'In-Combination' scenario is 2.78 keq/ha/yr. This level of acid deposition, when considered alongside the baseline SO_2 concentrations, falls within the 'envelope of protection' for dry heath and wet heath (see Graph 2): the 'envelope of protection' is even greater for broadleaf woodland habitats (source: http://www.apis.ac.uk). In all other modelled scenarios the nitrogen value falls below this level and therefore falls within the 'envelope of protection'.



Graph 1: Critical Load Function



Graph 2: Critical Load Function for dry heath

8.48 The main effects of acid deposition are on acid sensitive bryophyte species, resulting in changes in species composition and frequency. There is no evidence that such effects are being experienced in the New Forest SAC despite an existing baseline where traffic levels are already high.

8.49 Low soil pH can affect soil chemistry, potentially resulting in root damage. The dominant soils in the New Forest are generally acidic in nature and consequently may be less resistant to the effects of acidification, although some vegetation types, such as those associated with heathland, may be tolerant of acid conditions (http://www.landis.org.uk/soilscapes/, accessed 25 November 2017).

8.50 The results of the modelling for 2036 show that acid deposition exceedances are limited to the A35 (up to 2m from the road) and the A337 (up to 4m from the road). The results of the sensitivity test for 2036 are similar to the 'official' results. Both the A35 and the A337 are tree-lined roads where the trees adjacent to the road are likely to intercept the acid deposition.

8.51 The results of the 2026 'In-Combination' scenario[10] (when comparing the difference between the 2026 Do Something and 2015-adapted scenarios, and also the total Do-Something concentrations) show exceedance on a number of roads as follows:

- M27 (up to 160m from the road)
- A31 (up to 320m from the road)
- A337 (up to 80m from the road)
- A326 (up to 11m from the road)
- A35 (up to 9m from the road to the north-east of Lyndhurst; up to 20m from the road to the south-west of Lyndhurst)
- B3055, B3078 and B3080 (up to 20m from the road)

8.52 Similar results are obtained for the 2036 'In-Combination' scenario[10]. The 2036 'In-Combination' with the sensitivity test[9] shows exceedances of the critical load and screening criterion at the same general locations but up 640m from the A31 near Junction 1 of the M27, up to 320m from the A337, and up to 320m from the A35 (on the eastern side of Lyndhurst). Exceedances are also shown on North Lane (up to 14m), the B3054 and B3055 (up to 20m) and the A326 (up to 20m).

8.53 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not identify pollution as an issue within the SAC site. The results of the air quality modelling indicate that exceedances against the screening criteria and critical level and critical load thresholds for different pollutants are predicted in locations where the main habitats within the impact area are heathland, broadleaved woodland, purple moor grass and rush pasture and fens.

Areas of SAC Habitats Affected

8.54 In the following sections the spatial impact of pollutants is considered. The area of each habitat type that may be affected by increased pollutant levels has been calculated for four modelling scenarios:

- 2026 sensitivity test scenario
- 2036 sensitivity test scenario
- 2026 'In-Combination' with sensitivity test scenario[11]
- 2036 'In-Combination' with sensitivity test scenario[11]

8.55 For each scenario the area of habitat that may be affected has been estimated using QGIS, and expressed as a percentage of the total area of habitat within the SAC (source: Natura 2000 Standard Data Form).

[11] The 'in-combination' impacts have been determined by comparing each 'Do-Something' scenario against the predictions made in these years using the 2015 traffic flows and the relevant future year emission factors. The sensitivity test considers the underperformance of certain diesel vehicles.

Nitrogen deposition

Table 13. nitrogen deposition 2026 sensitivity test

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A35 west			0.003		0.002		
A337 north			0.006				
Total			0.009		0.002		
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0	0	0.0003	0	2.63E-05	0	0

8.56 Table 13 shows that for the 2026 sensitivity test scenario exceedance of the screening criterion is predicted to affect very small areas of woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests) and dry heath (SAC habitat European dry heaths).

8.57 The results for the 2026 'In-Combination' sensitivity test[11] (Table 14) show that larger areas of habitat will be affected by other plans and projects: the area of purple moor grass (SAC habitat Molinia meadows) that may be affected is 1.84%, the area of woodland (combined[12]) is 4.36% and the area of fens and flushes (SAC habitat alkaline fens) is 2.01% of the total area of those habitats within the SAC.

Table 14. N Dep 2026 'in combination' sensitivity test[11]

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	1.807	16.378	15.909	10.772	49.518	10.079	0.452
A35 east	2.284	3.609	3.851		0.001	0.004	
A35 west	1.761	12.642	8.396	0.918	4.969	2.129	0.203
A337 north	4.905	38.542	8.335		5.410	0.570	0.769
A337 south	1.004	10.601	2.674		0.160		
B3055	0.060	0.046	0.0009		0.808	0.0002	
B3058	0.001						
B3078	3.205	5.152	2.914	0.052	7.593		
B3080	0.032	0.575	0.197		4.501		
M27							
Total	15.06	87.55	42.28	11.74	72.96	12.78	1.42
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	1.841	2.938	1.419	2.010	0.961	0.625	0.487

[12] The broadleaved woodland and mixed deciduous woodland areas have been combined and compared with the total area of SAC woodland habitats as the habitat mapping does not allow direct comparison.

Table 15. nitrogen deposition 2036 sensitivity test

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	0.034	0.178	0.128				
A35	0.0005	0.088	1.575	0.002	0.323	0.129	
A337 north	1.627	5.573	6.421		0.261	0.106	0.056
A337 south	0.102	0.192	1.522				
Total	1.764	6.031	9.646	0.002	0.584	0.234	0.056
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.216	0.202	0.324	0.0003	0.008	0.011	0.019

8.58 The areas presented in Table 15 show that by 2036 the potential effects of the Local Plans on nitrogen deposition will still have a very small effect on SAC habitats in terms of the area affected. The greatest effects are seen for purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests). The area of purple moor grass that may be affected is 0.216% and the area of woodland (combined) is 0.526% of the total area of those habitats within the SAC. The areas that have been calculated for the A31, A35 and A337 do not take into account the presence of trees alongside these roads, which is likely to intercept some nutrient nitrogen. Consequently these areas are likely to be over-estimates.

Table 16. N Dep 2036 'in combination' sensitivity test[11]

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	3.556	33.917	10.941	33.755	104.742	15.550	1.950
A35 east	14.223	31.964	9.411		1.099	7.181	0.084
A35 west	12.052	24.593	30.059	1.604	7.429	9.596	0.320
A326	0.005		0.001		5.647		
A337 north	4.132	39.790	9.506		5.195	0.878	0.692
A337 south	6.558	99.933	11.384		0.613		
B3054	0.376	0.047	0.031	0.038	6.565	0.301	
B3055	0.056	0.226	0.147		3.732	0.273	
B3056	0.003	0.140		0.331		0.017	0.153
B3058	0.190	0.064	1.271				
B3078	3.738	5.481	2.885	0.503	10.605		0.011
B3079	0.127	2.440	0.003				
M27							
Total	45.016	238.595	75.639	36.2308	145.627	33.796	3.21

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	5.503	8.007	2.538	6.201	1.917	1.653	1.099

8.59 The areas presented in Table 16 show that the potential 'in combination' effects of the Local Plans on nitrogen deposition (2036 'in combination' scenario[11]) will have a more extensive effect on SAC habitats. The greatest effects are seen for purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests). The 'in combination' effect on fens and flushes (SAC habitat alkaline fens) is predicted to affect an area that equates to 6.2% of the total habitat area in the SAC; however, the Local Plans impacts when considered in isolation, are predicted to affect 0.0003%, which is a very small effect (Table 14 shows that the area affected by 2026 is predicted to be 2.00% of the total area of the habitat within the SAC).

8.60 The area of purple moor grass that may be affected is 5.50% (1.84% by 2026) and the area of woodland (combined) is 10.54% (4.35% by 2026) of the total habitat area within the SAC. As previously noted, the presence of trees alongside the A31, A35 and A337 is likely to intercept some nutrient nitrogen, and consequently these areas are likely to be over-estimates. For example, it is noted that 104.742 ha of dry heath may be affected by nitrogen deposition adjacent to the A31; however, trees are present alongside a significant part of this road and so this figure is considered to be over-estimated.

Annual Mean NOx

Table 17. AM NOx 2026 sensitivity test

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31		0.038					
A35 west			0.018				
A337 north	0.025		0.368				
Total	0.025	0.038	0.386	0	0	0	0
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.003	0.001	0.013	0	0	0	0

8.61 Table 17 shows that for the 2026 sensitivity test scenario exceedance of the screening criterion for annual mean NOx is predicted to affect very small areas of purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests).

8.62 The results for the 2026 'In-Combination' sensitivity test[11] (Table 18) show that larger areas of habitat will be affected by other plans and projects: the area of purple moor grass (SAC habitat Molinia meadows) that may be affected is 0.07%, the area of woodland (combined) is 0.55% and the area of fens and flushes (SAC habitat alkaline fens) is 0.11% of the total area of those habitats within the SAC (fens and flushes will not be affected under the 2026 sensitivity test 'Do Something' impacts scenario).

Table 18. AM NOx 2026 'in combination' sensitivity test[11]

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	0.530	7.995	6.090	0.621	15.756	0.925	
A35 east	0.003	0.475	0.390		0.0004	0.001	
A35 west	0.001	0.151	1.211	0.002	0.503	0.159	0.001
A337 north	0.006	0.0.027	0.057				
A337 south			0.067				
B3078		0.0003	0.018				
M27							
Total	0.54	8.6213	7.833	0.623	16.2594	1.085	0.001
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.066	0.289	0.263	0.107	0.214	0.053	0.0003

Table 19. AM NOx 2036 sensitivity test

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	0.297	6.654	4.129	0.477	18.485	0.530	
A35 east	0.015	0.263	0.556		0.0002	0.002	
A35 west	0.004	0.097	1.214	0.002	0.449	0.159	0.001
A337 north	0.023	0.004	1.065		0.001		
A337 south	2.178	3.407	2.646		0.109	0.058	
B3078	0.495	0.814	0.983		1.542		
M27			0.128		0.420		
Total	3.01	11.24	10.72	0.48	21.01	0.75	0.001
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.368	0.377	0.360	0.082	0.277	0.037	0.0002

8.63 The areas presented in Table 19 show that the potential effects of the Local Plans on annual mean NOx (2036 sensitivity test) will have a minor effect on SAC habitats. The greatest effects are seen for purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests). The area of purple moor grass that may be affected is 0.368% and the area of woodland (combined) is 0.737% of the total habitat area. The areas that have been calculated for the A31, A35, A337 and M27 do not take into account the presence of trees alongside the road, which is likely to intercept some nutrient nitrogen. Consequently these areas are likely to be over-estimates.

Table 20. AM NOx 2036 'in combination' sensitivity test[11]

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	0.722	8.428	4.968	0.598	15.871	0.913	
A35 east	0.003	0.047	0.390		0.0004	0.001	
A35 west	0.001	0.151	1.211	0.002	0.503	0.160	0.001
A326							
A337 north	0.002	0.010	0.046				
A337 south			0.067				
M27							
B3078		0.0003	0.018				
Total	0.73	8.64	6.70	0.60	16.37	1.07	0.001
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.089	0.290	0.225	0.103	0.216	0.053	0.0003

8.64 The areas presented in Table 20 show that the potential effects of the Local Plans on annual mean NOx (2036 'in combination' scenario[11]) will have a more extensive effect on SAC habitats. The greatest effects are seen for purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests). The 'in combination' effect on fens and flushes (SAC habitat alkaline fens) is predicted to affect an area that equates to 0.10% of the total habitat area in the SAC; the Local Plans are predicted to affect 0.08%, which is a very small effect.

8.65 The area of purple moor grass that may be affected is 0.089% and the area of woodland (combined) is 0.515% of the total habitat area within the SAC. As previously noted, the presence of trees alongside the A31, A35 and A337 is likely to intercept some nutrient nitrogen, and consequently these areas are likely to be over-estimates.

Ammonia

Table 21. NH_3 2026 sensitivity test

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31		0.429					
A35 west		0.012	0.171	0.0005	0.002	0.0002	
A337 north	0.066	0.0002	0.711			0.006	0.007
A337 south		0.003	0.145				
B3056		0.176			5.789		
B3078	5.622	8.562	3.867	0.535	36.408		0.080
Total	5.69	9.18	4.89	0.54	42.20	0.01	0.09
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.695	0.308	0.164	0.092	0.556	0.0003	0.030

8.66 Table 21 shows that for the 2026 sensitivity test scenario exceedance of the screening criterion for ammonia is predicted to affect small areas of purple moor grass (SAC habitat Molinia meadows), woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests) and dry heath (SAC habitat European dry heaths). The area of purple moor grass (SAC habitat Molinia meadows) that may be affected is 0.70%, the area of woodland (combined) is 0.47% and the area of dry heath (SAC habitat European dry heaths) is 0.56% of the total area of those habitats within the SAC.

8.67 The results for the 2026 'In-Combination' sensitivity test[11] (Table 22) show that larger areas of habitat will be affected by other plans and projects: the area of purple moor grass (SAC habitat Molinia meadows) that may be affected is 2.50%, the area of woodland (combined) is 5.00%, the area of fens and flushes (SAC habitat alkaline fens) is 5.77% and the area of dry heath (SAC habitat European dry heaths) is 2.39% of the total area of those habitats within the SAC. As previously noted, these calculations do not take into account the presence of trees, which may intercept pollutants. For example, the area of dry heath that may be affected may have been over-estimated, particularly along the A31 where trees are present alongside both sides of the road in many places.

Table 22. Ammonia 2026 'in combination' sensitivity test[11]

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	7.707	56.108	17.237	30.362	104.498	13.997	1.390
A35 east	0.630	2.355	10.103		0.122	0.004	
A35 west	0.812	0.912	2.462	2.847	4.689	1.385	0.001
A36					1.101		
A326					0.001		
A337 north	3.954	23.794	7.129		0.291	0.102	0.054
A337 south	0.733	5.194	2.435		0.152		
B3054		0.030			1.900	0.286	
B3055	0.222	0.387	0.016	0.0005	18.872	0.656	
B3058	0.041	0.049	0.017				
B3078	5.622	8.562	3.867	0.535	36.408		0.080
B3079	0.633	6.764	0.002				
B3080	0.107	0.975	0.197		8.346		
M27			0.378		4.951		
Total	20.46	105.13	43.84	33.74	181.33	16.43	1.53
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	2.501	3.528	1.471	5.775	2.387	0.803	0.522

Table 23. NH_3 2036 sensitivity test

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	0.240	2.310	0.639		1.229		
A35 east	1.410	3.405	4.121		0.142	0.004	0.084
A35 west	0.784	3.405	5.977	0.146	2.075	1.482	0.095
A362	0.023	0.0008	0.013		1.960	0.037	
A337 north	1.862	6.509	6.784		0.370	0.109	0.058
A337 south	0.848	6.704	2.514		0.165		
B3054	0.585	0.160	0.044	0.041	8.259	0.201	
B3055	0.108	1.221	1.279		0.409		
B3058	1.187		0.154				
B3079		0.237	0.001				
M27					0.015		
Total	7.05	23.95	21.53	0.19	14.62	1.83	0.24
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	0.861	0.804	0.722	0.032	0.192	0.090	0.081

8.68 The areas presented in Table 23 show that the potential effects of the Local Plans on ammonia will have a minor effect on SAC habitats (with respect to area affected). The greatest effects are seen for purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests). The area of purple moor grass that may be affected is 0.86% and the area of woodland (combined) is 1.52% of the total habitat area. The areas that have been calculated for the A31, A35 and A337 do not take into account the presence of trees alongside the road, which is likely to intercept some nutrient nitrogen. Consequently these areas are likely to be over-estimates.

Table 24. Ammonia 2036 'in combination' sensitivity test[11]

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
A31	7.715	56.398	17.299	30.712	104.778	13.997	1.390
A35 east	0.660	2.153	10.216		0.076	0.004	0.0004
A35 west	0.982	1.847	2.499	4.187	7.436	1.789	0.001
A36					1.101		
A326					0.047		
A337 north	3.978	24.179	7.178		0.370	0.102	0.054
A337 south	0.738	5.205	2.435		0.161		
B3054		0.030			1.900	0.286	
B3055	0.222	0.388	0.016	0.830	25.915	0.656	
B3058	0.041	0.049	0.017				

Road	Purple moor grass	Broadleaved woodland	Mixed deciduous	Fens and flushes	Dry heath	Wet heath	Wet woodland
B3078	8.633	14.170	30.846	13.672	150.501	14.370	0.080
B3079	2.802	40.696	1.353	0.178			0.294
B3080	0.107	0.975	0.197		8.417		
M27			0.378		4.951		
Total	25.88	146.09	72.43	49.58	305.65	31.20	1.82
Total SAC habitat	817.98	2979.79	2979.79	584.28	7595.53	2044.95	292.14
% of SAC habitat	3.164	4.903	2.431	8.485	4.024	1.526	0.623

8.69 The areas presented in Table 24 show that the potential effects of the Local Plans on ammonia (2036 'in combination' scenario[11]) will have a more extensive effect on SAC habitats. The greatest effects are seen for purple moor grass (SAC habitat Molinia meadows) and woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests). The 'in combination' effect on fens and flushes (SAC habitat alkaline fens) is predicted to affect an area that equates to 8.5% of the total habitat area in the SAC; however, the Local Plans are predicted to affect 0.03% when considered alone, which is a very small effect (Table 22 shows that the area affected by 2026 with the 'in combination' scenario is predicted to be 5.77% of the total area of the habitat within the SAC).

8.70 The area of purple moor grass that may be affected is 3.16% (2.50% in 2026) and the area of woodland (combined) is 7.33% (5.00% in 2026) of the total habitat area within the SAC. As previously noted, the presence of trees alongside the A31, A35 and A337 is likely to intercept some nutrient nitrogen, and consequently these areas are likely to be over-estimates.

8.71 Table 25 provides a summary of the predicted effects on the designated habitats of the New Forest SAC (as shown in Tables 13 to 24). The effects are expressed as a percentage of the total area of each habitat within the SAC and where the total area affected is less than 1% of the total habitat area this is recorded as 'no likely significant effect'. This conclusion is reinforced by the judgement that the reported values are a precautionary estimate as, for example, there is likely to interception of pollutants by trees and shrubs alongside certain roads.

Table 25: Summary of predicted effects on the New Forest SAC (areas of habitat affected expressed as a percentage of the SAC habitat area)

Pollutant	2026	2026 In Combination	2036	2036 In Combination
N deposition	No likely significant effect	Molinia 1.84% Woodland 4.36% Fen 2.01%	No likely significant effect	Molinia 5.50% Woodland 10.50% Fen 6.20%
NOx	No likely significant effect	No likely significant effect	No likely significant effect	No likely significant effect
Ammonia	No likely significant effect	Molinia 2.50% Woodland 5.00% Fen 5.77% Dry heath 2.39%	Woodland 1.52%	Molinia 3.16% Woodland 7.33% Fen 8.50%

Dorset Heaths SAC and Dorset Heathlands SPA and Ramsar site

8.72 Data published by APIS show that there is already exceedance across the site for nitrogen deposition for all interest features. Nitrogen deposition values for key habitats indicate that current loadings fall mostly within or above the empirical critical load range for each habitat type. Current loadings for *Molinia* meadows and calcareous fens are mostly below the empirical critical load for these habitats.

8.73 The Dorset Heath SAC is a very large and extensive site comprising 37 component SSSIs: for the purposes of this study only 11 SSSIs are considered to be relevant due to their location. Condition assessment information for the 11 component SSSIs (which coincide with the SAC boundary) is of varying age, ranging from 2009 to 2015. Consequently some SSSI units lack recent data and it is therefore possible that deterioration has occurred in recent years but has not yet been reported.

8.74 Within these SSSIs many areas are currently considered to be in unfavourable condition (either recovering, no change or declining). The reason for the current condition is linked to urban effects such as arson, vandalism, unauthorised access, nutrient enrichment, soil erosion and high levels of recreational disturbance. There are also local issues associated with scrub management and grazing requirements.

8.75 It is therefore possible that appropriate site management (and control of undesirable activities) is the most important factor in terms of returning the site to favourable condition. Any changes in the health of vegetation that arises as a result of airborne pollutants may be insignificant when compared to the effects of arson, nutrient enrichment or unauthorised access for example.

8.76 Examination of the exceedance data shows that, whilst exceedance of the screening criterion for 24-hour NOx is predicted to extend up to 2,560m from the carriageway at some locations, there are few exceedances of the annual mean NOx screening criterion (2036 'In-Combination' scenario with sensitivity test[9]). This suggests that the vegetation may be more at risk from acute short-term exposure than chronic long-term exposure to NOx.

8.77 AQC (Air Quality Consultants, 2017) report that there are predicted exceedances for NOx in the 2026 'In-Combination' sensitivity test scenario (of both the critical level of 30 µg/m^3 in the 2026 Do Something sensitivity test and the screening criterion of 1% when considering the difference between the 2026 Do Something and 2015-adapted sensitivity test scenarios) that extend 3m from the edge of the A338. An exceedance to 80m is identified adjacent to the junction between the A31 and A338. Alongside the A338 there is a verge that extends at least 3m, i.e. the area where most exceedance is predicted. Consequently most of the predicted exceedance is only likely to affect verge habitat. In all cases the baseline NOx exceeds the critical level of 30 µg/m^3 without the Local Plans. A similar result is noted for the 2036 'In-Combination' sensitivity test scenario[9] but with additional exceedance points.

8.78 As previously noted, there is no published evidence for any directly toxic effect of NOx on animals. This assessment has therefore focussed on the effects of NOx on the habitats that support key species such as Southern damselfly and great crested newt, as well as SPA birds. The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not identify pollution as an issue within the SPA site.

8.79 Exceedance of the nitrogen deposition screening criterion and the critical load (under the 2026 and 2036 'In-Combination' sensitivity test scenarios[11]) is predicted at the following locations: at the A35 where it passes Upton Heath SSSI and where the A3049 passes Camford Heath SSSI, exceedance is predicted up to 20m from the carriageway. Exceedance up to 640m from the carriageway is predicted where the A338 passes St Leonards and St Ives Heaths SSSI, and up to 20m where it passes Town Common SSSI. In the absence of the sensitivity test no exceedance is predicted for Upton Heath. Immature trees and shrubs that are present along the edge of the A3049 where it passes Camford Heath SSSI may intercept a proportion of the nutrient nitrogen deposition that originates from passing traffic. Consequently the reported exceedance up to 20m from the road is likely to be an over-estimate. Trees are also present alongside the A338 where it passes Town Common SSSI, although the tree cover is discontinuous.

8.80 Exceedance of the critical level and screening criterion for ammonia is predicted up to 320m from the road at many locations, extending as far as 1,280m on the A31 where it runs alongside St Leonards and St Ives Heaths SSSI (2036 'In-Combination' sensitivity test scenario[9] with a precautionary critical level of 1µg/m^3). Along this section of the A31 woodland (mostly coniferous) encroaches close to the road, and it is likely that this will reduce the area over which exceedance is predicted.

8.81 As previously noted, ammonia may react to create ammonium ions (NH_4+), which contribute to nutrient nitrogen: however, there is very limited nutrient nitrogen deposition exceedance in the vicinity of any of the component SSSIs for the Dorset Heaths SAC. Consequently the effect of ammonia is therefore most likely to occur as a result of dry deposition.

8.82 The main effects of acid deposition are on acid sensitive bryophyte species, resulting in changes in species composition and frequency. There is no evidence that such effects are being experienced in the Dorset Heaths SAC despite an existing baseline where traffic levels are already high.

8.83 APIS reports that baseline SO_2 concentrations for the Dorset Heaths fall within the range 1.2 – 0.17 keq/ha/yr, with SO_2 levels following a downward trend since 2004 due to improvements in industrial emissions. Applying the Critical Load Function the nitrogen value for the 2036 'In-Combination' scenario would need to be greater than c.4.00 keq/ha/yr for acid deposition to fall outside the 'envelope of protection (the maximum level predicted for the New Forest was 2.78 keq/ha/yr). Acid deposition is likely to fall within the 'envelope of protection' for all habitats located alongside the key roads where exceedance is predicted (source: http://www.apis.ac.uk).

8.84 Whilst low soil pH can affect soil chemistry, potentially resulting in root damage, the dominant soils in the Dorset Heaths are generally acidic in nature and consequently may be less resistant to the effects of acidification, although some vegetation types such as those associated with heathland, may be tolerant of acid conditions (http://www.landis.org.uk/soilscapes/, accessed 25 November 2017).

8.85 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not identify pollution as an issue within the SAC site. The results of air quality modelling indicate that exceedances against the screening criteria and critical level and critical load thresholds for different pollutants are predicted in locations where the main habitats within the impact area are heathland and broadleaved woodland.

Solent Maritime SAC

8.86 Data published by APIS show that there is currently limited exceedance for some habitats for nitrogen deposition. Nitrogen deposition values for shifting dunes and shingle vegetation indicate that current loadings fall within the empirical critical load range for each habitat type: however, for all other receptors current loadings fall below the empirical critical load range for each habitat type.

8.87 Although marine systems are generally nitrogen limited, nitrogen inputs from atmospheric sources are likely to be insignificant compared to those from other sources. It therefore follows that impacts on vegetation in marine systems is also likely to be insignificant in situations where other nitrogen sources are dominant.

8.88 Exceedance of the NOx screening criterion and critical level in 2036 occurs on the A35 near Redbridge at 640m from the roadside. Saltmarsh is present at this location, which is where exceedance is predicted for nitrogen deposition and NOx. APIS suggests that nitrogen deposition [from the atmosphere] is probably of low importance for this habitat, particularly as tidal flushing is likely to remove a proportion of any nitrogen derived from atmospheric sources. Where exceedance has been predicted for certain pollutants, the area of habitat that is likely to be affected is very small. In all cases impacts have been predicted for sections of road that run next to key habitats for less than 600m.

8.89 For ammonia an exceedance of the screening criterion and critical level in 2026 and 2036 is observed where the A36 crosses the River Blackwater estuary at Totton. The exceedance extends to 15m from the road. The 'In-Combination' assessment[10] results in exceedance to 320m for the 2036 scenario only. If the sensitivity test is applied the exceedance extends to 2,560m for 2036. It is considered that at this location tidal flushing is likely to significantly reduce the effects of acid deposition. Nutrient nitrogen deposition (eutrophication effects) is likely to be of greater relevance (http://www.apis.ac.uk/, accessed 12 November 2017).

8.90 The Natura 2000 Standard Data Form (which is based on the Natura 2000 Database submitted to the European Commission on 22/12/2015) does not identify pollution as an issue within the SAC site. The results of air quality modelling indicate that exceedances of the screening criteria and critical level and critical load thresholds are predicted in locations where the main habitats within the impact area are saltmarsh, mudflat and floodplain grazing marsh.

Solent and Southampton Water SPA and Ramsar site

8.91 As previously noted, there is no published evidence for any directly toxic effect of NOx on animals. This assessment has therefore focussed on the effects of NOx on saltmarsh and mudflats, which are habitats that support SPA / Ramsar species such as black-tailed godwit. Consequently by assessing the impacts of airborne pollutants on these habitats, the indirect effects of pollution are considered for all SPA / Ramsar bird species.

9 Conclusions and Recommendations

Baseline Assessment

9.1 The assessment carried out by AQC (Air Quality Consultants, 2017) has included an assessment of current baseline conditions. This indicates that background NOx (as derived from Defra's background maps) is below the critical level of 30 ug/m^3, but that there is currently some exceedance of the critical level for ammonia (1 ug/m^3) and the critical load for nitrogen deposition (8-20 kgN/ha/yr). The baseline model results (Air Quality Consultants, 2017) do show exceedance of the critical level of 30 ug/m^3 for NOx.

9.2 Data published by APIS show that there is already exceedance for some pollutants for some interest features of both the New Forest SAC and the Dorset Heaths SAC. For these sites and interest features, any predicted exceedance arising from implementation of the two Local Plans may need to be considered against a baseline that already appears to be subject to air quality impacts.

9.3 The modelling work carried out by AQC (Air Quality Consultants, 2017) indicates that implementation of the New Forest District Council Local Plan and the New Forest National Park Authority Local Plan will result in exceedance of the screening criteria and critical levels and loads for some pollutants. In many locations the spatial extent of exceedance is limited to a narrow strip alongside a particular road (for example nutrient nitrogen deposition); however, more wide-ranging effects are predicted for some pollutants, in particular ammonia.

9.4 Whilst nutrient nitrogen deposition can have direct impacts on vegetation, the most likely mechanism by which effects can be observed is through changes in the nutrient balance. This can lead to, for example, changes in species dominance and can result in increased risk of attack by insect pests. The SSSI condition assessments do not identify any such effects, although an assessment of plant health is probably not included in the monitoring.

9.5 APIS (http://www.apis.ac.uk/, accessed 12 November 2017) notes that '*the rough surfaces of woodlands leads to increased rates of NH_3 deposition especially at the woodland edge. Ammonia exposure significantly increases foliar nitrogen concentrations predisposing trees to biotic and abiotic stress*'. Ammonia can have direct toxic effects but can also have indirect effects, such as reducing the ability of stomata to close under drought conditions, leading to plant water stress.

9.6 The soils in the New Forest are typically acidic in nature and consequently may have limited capacity to buffer the effects of acid deposition, although plants tolerant of acid soils are likely to be more resistant to the direct effects of acidification. Some habitats such as heathland are relatively acid tolerant: for broadleaved woodlands, adverse effects may include low levels of phosphate and base cation availability, particularly on acid mineral soils.

9.7 Predicted exceedance has been assessed using the worst-case modelling scenario, 2036 'In-Combination' with sensitivity test (which refers to the spatial extent over which the difference between the adapted-2015 and 2036 Do-something scenarios exceeds the screening criterion and the total concentration/flux in the Do-something scenario exceeds the critical level or critical load. This has been used as the 'worst case' as it considers all changes that are expected to occur between 2015 and 2036, and includes the sensitivity test. This is considered to be precautionary and is likely to over-estimate the air quality impacts. It is also the case that interception of airborne pollutants is likely, particularly where trees are present alongside roads.

9.8 Examination of the condition assessments that have been completed by Natural England for the component SSSIs within the European sites, together with examination of the Natura 2000 Data Forms for each European site, has found that pollution is not reported as impacting on any of the sites. The main issues that are identified relate to other factors, such as site management, inappropriate drainage, lack of scrub management, invasive species, arson and unauthorised access. Whilst pollution has not been highlighted as a concern it is important to note that this may be due to the limitations of the monitoring approach that has been adopted.

9.9 In the following sections the conclusions of the assessment are presented for the various European sites that have been considered in this study.

The New Forest SAC, SPA and Ramsar site

9.10 The assessment has identified a number of locations where an exceedance of the screening criterion is predicted for 24-hour NOx, however, no background 24-hour NOx concentrations are available and so total 24-hour mean concentrations have not been calculated. The worst-case assumption has been made that the 24-hour mean NOx critical level is already exceeded at locations close to the roadside (Air Quality Consultants, 2017).

9.11 Exceedance of the annual mean NOx critical level is much more limited; the extent to which the screening criterion of 1% is exceeded is up to 80m from the road (for the worst-case 2036 'In-Combination' with sensitivity test scenario[9]). This suggests that effects related to chronic long-term exposure are unlikely but that acute short-term effects cannot be ruled out. In most cases exceedance is only predicted within or close to the road, i.e. within a narrow strip extending no more than a few metres from the road.

9.12 Modelling results for 2036 show that for annual mean NOx the absolute change[13] is predicted to range from 0.32 to 9.04 kgN/ha/yr (the percentage change ranges from 1.06% to 30.14%). The 2036 'In-Combination' assessment results show that the absolute change is predicted to range from 0.9 to 35.55 kgN/ha/yr (the percentage change ranges from 2.99% to 118.50%). It is noted that in both scenarios the critical level (30 µg/m3) is exceeded at most modelling points in the absence of the Local Plans, i.e. exceedance of the critical level is likely irrespective of whether the Local Plans are implemented.

9.13 In many locations trees and shrubs are present next to a road and it is expected that this vegetation will intercept some NOx, reducing the area over which effects might be expected to occur (trees are present alongside the A31, M27, A337, A35 and B3079, which are the only roads where exceedance of NOx is predicted). Vegetation monitoring is required to determine whether vegetation is currently showing signs of the effects of exposure to NOx.

9.14 Modelling results for 2036 show that for nitrogen deposition the absolute change is predicted to range from 0.10 to 0.86 kgN/ha/yr (the percentage change ranges from 1.00% to 8.58%). The 2036 'In-Combination' assessment results show that the absolute change is predicted to range from 0.10 to 1.48 kgN/ha/yr (the percentage change ranges from 1.00% to 9.86%). It is noted that in both scenarios there are relatively few locations where 20 kgN/ha/yr is exceeded, i.e. the upper critical load for habitats such as dry heath and broadleaf woodland (the upper critical load is exceeded on the M27, A31, B3078 and B3080 both with and without the Local Plan).

9.15 In those areas where nitrogen deposition exceedance is predicted it is possible that the effects on the habitat features of the European site will be mitigated through existing vegetation, such as trees alongside the roads (as previously noted trees are present alongside the A31, M27, A337, A35 and B3079 as well as the B3055 east of Brockenhurst and the B3078 west of Brook where exceedance is predicted). It is considered unlikely that nutrient nitrogen deposition will have a significant effect on any SAC interest features in these areas (and thus is unlikely to have an adverse effect on the integrity of any SPA / Ramsar interest features).

9.16 Trees are not present where some sections of the B3078, B3080, North Road, B3055 and B3054 pass through areas of dry heath. In these areas it is noted that nitrogen deposition levels (2036 'In-Combination' assessment) at some modelling points along the B3078 and B3080 are close to or just above the 20 kgN/ha/yr upper critical load for dry heath; however, the baseline is elevated in the absence of the Local Plans (the contribution of the Local Plans is less than 3.7% for these roads). At the other exceedance locations the nitrogen deposition levels are towards the 10 kgN/ha/yr lower critical load for dry heath, i.e. at the lower end of the critical load range for dry heath. Consequently nitrogen deposition levels are predicted to be within rather than above the critical load range, i.e. at a level where effects may occur.

[13] Absolute change is the 'Do Something' scenario minus the relevant year Do Minimum scenario. For In Combination, the adapted-2015 scenario, with the relevant future year traffic emission factors has been used as the baseline.

9.17 The impact of ammonia on vegetation is less certain: whilst the data indicate that contribution to nitrogen deposition is not likely to result in exceedance, direct toxic effects may occur. There is no indication that ammonia is currently affecting any of the habitats within the SAC; however, this may be because the monitoring that has been carried out to date has not considered plant health.

9.18 Modelling results for 2026 and 2036 (with and without the sensitivity test) show that ammonia exceedance is predicted but that this is typically within a few metres of a given road. In many locations the presence of trees alongside roads is likely to limit the area over which ammonia deposition exceedance may occur.

9.19 Modelling results for 2036 show that for ammonia the absolute change is predicted to range from 0.01 to 0.27 µg NH_3 m^{-3} (the percentage change ranges from 1.00% to 27.10%). It is noted that at the majority of exceedance points the predicted levels are below 3 µg NH_3 m^{-3}, i.e. the critical level for higher plants (for the purposes of the modelling exercise the 1 µg NH_3 m^{-3}, critical level for lichens and bryophytes has been adopted on a precautionary basis). Exceedance greater than 3 µg NH_3 m^{-3}, is only predicted along the M27. It is therefore concluded that the predicted changes in ammonia levels may impact on bryophytes and lichens, however impacts on higher plants are less likely.

9.20 The 2026 and 2036 'In-Combination' assessments show more widespread exceedance for ammonia, with greatest exceedance noted on the M27 / A31, A36 and B3078 / B3080. The 2036 'In-Combination' assessment results show that for ammonia the absolute change is predicted to range from 0.01 to 1.07 µg NH_3 m^{-3} (the percentage change ranges from 1.00% to 107.00%). Exceedance greater than 3 µg NH_3 m^{-3}, has only been recorded along the M27, A31 and at two locations on the A337 to the north of Lyndhurst (at locations where trees are present adjacent to the road).

9.21 Whilst the M27 / A31 and A36 have trees alongside the carriageway (which are expected to intercept some ammonia), there are areas, such as along the B3078 / B3080, where trees are absent and consequently where open habitats such as dry heath are more vulnerable to ammonia deposition. In these areas exceedance is less than 2 µg NH_3 m^{-3}.

9.22 Vegetation monitoring will help to determine whether vegetation is currently showing signs of the effects of exposure to ammonia. Monitoring at intervals during the life of the Local Plans will show whether future deterioration occurs.

9.23 The 2036 assessment shows that acid deposition exceedance is limited to the A35 (up to 2m from the road) and the A337 (up to 4m from the road). Trees are adjacent to both road and these are likely to intercept the acid deposition. The results of the 2036 'In-Combination' scenario[11] show exceedance on a number of roads. Exceedance is predicted on M27, A31, A337 (north of Brockenhurst), A35 and North Lane and trees are located alongside these sections of road. Exceedance is also predicted along the A326, B3054, B3055, B3078 and B3080, which run through areas of open heathland with no or minimal tree cover adjacent to the roads.

9.24 Application of the Critical Load Function has led to the conclusion that the predicted level of acid deposition falls within the 'envelope of protection' for all potentially affected SAC habitats (source: http://www.apis.ac.uk). It is considered unlikely that acid deposition will have a significant effect on SAC interest features, particularly in locations where trees are expected to intercept the airborne pollutants (and thus is unlikely to have a significant effect on any SPA / Ramsar interest features). It is noted that in all cases exceedance is predicted in the absence of the Local Plans with the contribution attributable to the Local Plans being small.

9.25 The main effects of acid deposition are likely to be on acid sensitive bryophyte species; however, there is no known evidence that such effects are currently being experienced. Acid deposition can also affect soil pH and chemistry: the dominant soils in the New Forest are generally acidic in nature and so their buffering capacity is likely to be limited.

9.26 The area of habitat that may be affected has been estimated using QGIS, and expressed as a percentage of the total area of habitat within the SAC (source: Natura 2000 Standard Data Form). This shows that for the 2036 'Do Something' scenario for nitrogen deposition 0.22% of purple moor grass (SAC habitat Molinia meadows) and 0.53% of woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests) may be affected, which are very small impacts. By comparison the 2036 'in combination' scenario predicts that 5.50% of purple moor grass, 10.54% of woodland (combined), 6.20% of fen and 1.92% of dry heath may be affected (percentage of the total SAC habitat areas).

9.27 For the 2036 scenario for annual mean NOx, 0.37% of purple moor grass (SAC habitat Molinia meadows), 0.74% of woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests) and 0.28% of dry heath (SAC habitat European dry heaths) may be affected, which again are very small impacts. The 2036 'in combination' scenario predicts that 0.09% of purple moor grass, 0.51% of woodland (combined), 0.10% of fen and 0.22% of dry heath may be affected (percentage of the total SAC habitat areas).

9.28 The 2036 scenario for ammonia predicts that 0.86% of purple moor grass (SAC habitat Molinia meadows), 1.52% of woodland habitats (SAC habitats acidophilous oak and beech forests, Asperulo-Fagetum beech forests and alluvial forests) and 0.19% of dry heath (SAC habitat European dry heaths) may be affected, which are very small impacts. By comparison the 2036 'in combination'[10] for ammonia scenario predicts that 3.16% of purple moor grass, 7.33% of woodland (combined), 8.50% of fen and 4.02% of dry heath may be affected (percentage of the total SAC habitat areas)

9.29 There is no published evidence for any directly toxic effect of pollutants on animals and so the assessment has focussed on the effects on the habitats that support key species. It is considered unlikely that any habitats will be affected to such an extent that protected species will also be affected.

9.30 Overall it is considered that implementation of the New Forest District Council Local Plan and the New Forest National Park Authority Local Plan is not likely to have an adverse effect on the integrity of the New Forest SAC, SPA and Ramsar sites when considered in isolation. In combination effects will result in exceedances for ammonia and acid deposition, although exceedance of critical loads / levels is predicted in the absence of the Local Plans.

9.31 Some uncertainty exists with regards to the effects of ammonia on vegetation. Whilst there is currently no indication that ammonia is having an effect on vegetation, this may be due to the limitations of the monitoring methodology that is used. The results of modelling indicate that effects of the two Local Plans in isolation are not likely to be significant with respect to the effects of ammonia on vegetation within the SAC; however, more widespread effects are predicted when the 'In- Combination' scenario is considered, i.e. when other factors not related to the Local Plans are taken into account.

9.32 The advice published by APIS (APIS - http://www.apis.ac.uk/) indicates that site-specific information on the effects of ammonia on vegetation is limited. It is therefore recommended that New Forest District Council and the New Forest National Park Authority undertake periodic vegetation monitoring to determine the current condition of sensitive vegetation and to identify any changes that occur during the life of the two Local Plans (measured at appropriate intervals). The monitoring would need to be complemented by a mitigation strategy that sets out actions that will be implemented if required (see below).

Dorset Heaths SAC and Dorset Heathlands SPA and Ramsar site

9.33 The results of condition assessments that have been completed for relevant SSSIs within the study area (i.e. component SSSIs for the European sites) indicate that many areas are not in favourable condition. The effects of airborne pollution may be relatively small compared to the effects related to other issues that have been identified as contributing to the current condition of these sites.

9.34 Predicted exceedance for nitrogen deposition is very limited in its extent: exceedance is predicted on the A338, A3049 and A35. On the A338 (the section adjacent to the SAC) the baseline levels for nitrogen deposition (in the absence of the Local Plans) range from 15.54 to 16.47 kgN/ha/yr. The baseline levels for nitrogen deposition with the Local Plans range from 15.71 to 17.01 kgN/ha/yr. On the A3049 (adjacent to the SAC) the baseline levels for nitrogen deposition (in the absence of the Local Plans) range from 12.58 to 13.03 kgN/ha/yr. The baseline levels for nitrogen deposition with the Local Plans range from 12.82 to 13.51 kgN/ha/yr. On the A35 (adjacent to the SAC) the baseline levels for nitrogen deposition (in the absence of the Local Plans) range from 12.45 to 12.52 kgN/ha/yr. The baseline levels for nitrogen deposition with the Local Plans range from 12.55 to 12.74 kgN/ha/yr. These values fall within (rather than above) the critical load range of 10-20 kgN/ha/yr for habitats such as dry heath and broadleaf woodland.

9.35 On the A3049 and A35 it is possible that the effects on the habitat features of the European site will be mitigated through existing vegetation, as trees are present alongside the roads. Where the A338 runs past heathland there is a verge with scattered gorse scrub that separates the two: this may intercept some airborne pollutants but it is not known to what extent this might take place. Nevertheless, any impact on heathland habitat is unlikely to be significant given that the total area of European dry heath within the SAC is 3260.14 ha.

9.36 As noted with the New Forest, the impact of ammonia on vegetation is less certain: whilst the data indicate that contribution to nitrogen deposition is not likely to result in exceedance, direct toxic effects may occur. Modelling results for 2026 and 2036 show that no exceedance is predicted for the Dorset Heaths for ammonia. The 2036 'In-Combination' assessment[10] shows widespread exceedance for ammonia: however, all of the exceedance points adjacent to the Dorset Heaths are below 3 $\mu g\ NH_3\ m^{-3}$, i.e. the critical level for higher plants.

9.37 Exceedance of the critical level and screening criterion is predicted for ammonia on the A338, A31, A3040, A3049 and A35. As noted above, trees alongside the A3049 and A35 may partially mitigate the effects of ammonia on the habitat features of the European site, and this is also the case for the A3040 (the A3040 runs alongside a 150m section of the SAC and the A3049 runs alongside a 450m section). Impacts on the A338 are less certain, although, as noted above, some airborne pollutants may be intercepted by existing vegetation (and the results of the modelling indicate that the effects are localised).

9.38 As previously noted, there is no published evidence for any directly toxic effect of NOx on animals. This assessment has therefore focussed on the effects of NOx on the habitats that support key species.

9.39 Overall it is considered that implementation of the New Forest District Council Local Plan and the New Forest National Park Authority Local Plan is not likely to have an adverse effect on the integrity of the Dorset Heaths SAC or the Dorset Heathlands SPA and Ramsar site. This conclusion applies both to the effects of the NFDC and NFNPA plans alone and to their effects in combination with other plans and projects. Although the resultant increase in traffic will result in localised exceedances of the screening criteria and critical levels or loads, this is likely to be mitigated in part by existing vegetation alongside roads. Where impacts do occur it is expected that they will be limited in their extent and area.

Solent Maritime SAC

9.40 The modelling work indicates that there are few locations where exceedance of the screening criteria for any pollutant is predicted. In these areas impacts are considered unlikely as nitrogen inputs from atmospheric sources are unlikely to be significant compared to those from other sources (APIS - http://www.apis.ac.uk/). Tidal flushing is also likely to remove a proportion of any nitrogen derived from atmospheric sources.

9.41 Taking into account the relative contributions of nitrogen to marine systems, the effects of tidal washing and the small area of habitats that may potentially be affected, it is concluded that the implementation of the New Forest District Council Local Plan and the New Forest National Park Authority Local Plan is not likely to have an adverse effect on the integrity of the Solent Maritime SAC. The modelling scenarios employed mean that this conclusion is also reached when considering the effects of the Local Plan in combination with other plans and projects.

Solent and Southampton Water SPA and Ramsar site

9.42 As previously noted, there is no published evidence for any directly toxic effect of NOx on animals. This assessment has therefore focussed on the effects of NOx on the habitats that support key species. Taking into account the relative contributions of nitrogen to marine systems, the effects of tidal washing and the small area of habitats that may potentially be affected, it is concluded that the implementation of the New Forest District Council Local Plan and the New Forest National Park Authority Local Plan is not likely to have an adverse effect on the integrity of the Solent and Southampton Water SPA and Ramsar site. The modelling scenarios employed mean that this conclusion is also reached when considering the effects of the Local Plan in combination with other plans and projects.

Mitigating Pollution Impacts

9.43 Ricardo AEA (2016) identifies a number of habitat management measures that can be used to mitigate the impacts of airborne pollutants. In summary, the proposed measures include:

- Shelterbelts: Wooded shelterbelts can capture particulates but the role of trees 'in preventing the spread of gaseous pollutants is less clear, although there is some evidence to suggest that they act as a physical barrier to NO_2 transport, changing dispersal patterns rather than taking up the pollutant'. The use of shelterbelts will need to take into account the conservation objectives for the European site and cannot be at the expense of those habitats that are interest features within the designated sites.
- Habitat creation / enhancement: Impacts on habitats close to roads may potentially be offset by creating new habitats or managing existing habitats elsewhere. A key consideration is the nutrient loading within the offsetting site as this can limit the success of attempts to recreate low nutrient status habitats. It is also important to draw a clear distinction between mitigation and compensation, which needs to be considered under the Conservation of Habitats and Species Regulations 2010 (as amended).
- Habitat management: It is possible that adoption of certain management practices could result in the removal of nitrogen from a site, thereby reducing the effect of nutrient nitrogen deposition. It is, for example, evident from the SSSI condition assessment for the New Forest that land management is an important factor in determining present condition.

9.44 In addition, Ricardo AEA (2016) identifies traffic-related measures that are designed to reduce pollutant levels in sensitive locations. It is noted that 'traffic emissions generated at any given site are essentially determined by three factors:

- The amount and type of vehicles flowing past a site;
- The way vehicles are driven (e.g. their speed) and the level of congestion;
- The emissions performance of vehicles, which is dependent on age and technology.

9.45 Proposed traffic-related mitigation measures therefore relate to these three factors. It is anticipated that consideration of these factors will require further modelling work to determine how different scenarios affect pollutant loadings.

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11 Figure

Figure 1: Map showing designated sites

Figure 2: Map showing road locations

Figure 3a: Map showing exceedance locations for annual mean NOx (2036 ‘Do Something’)

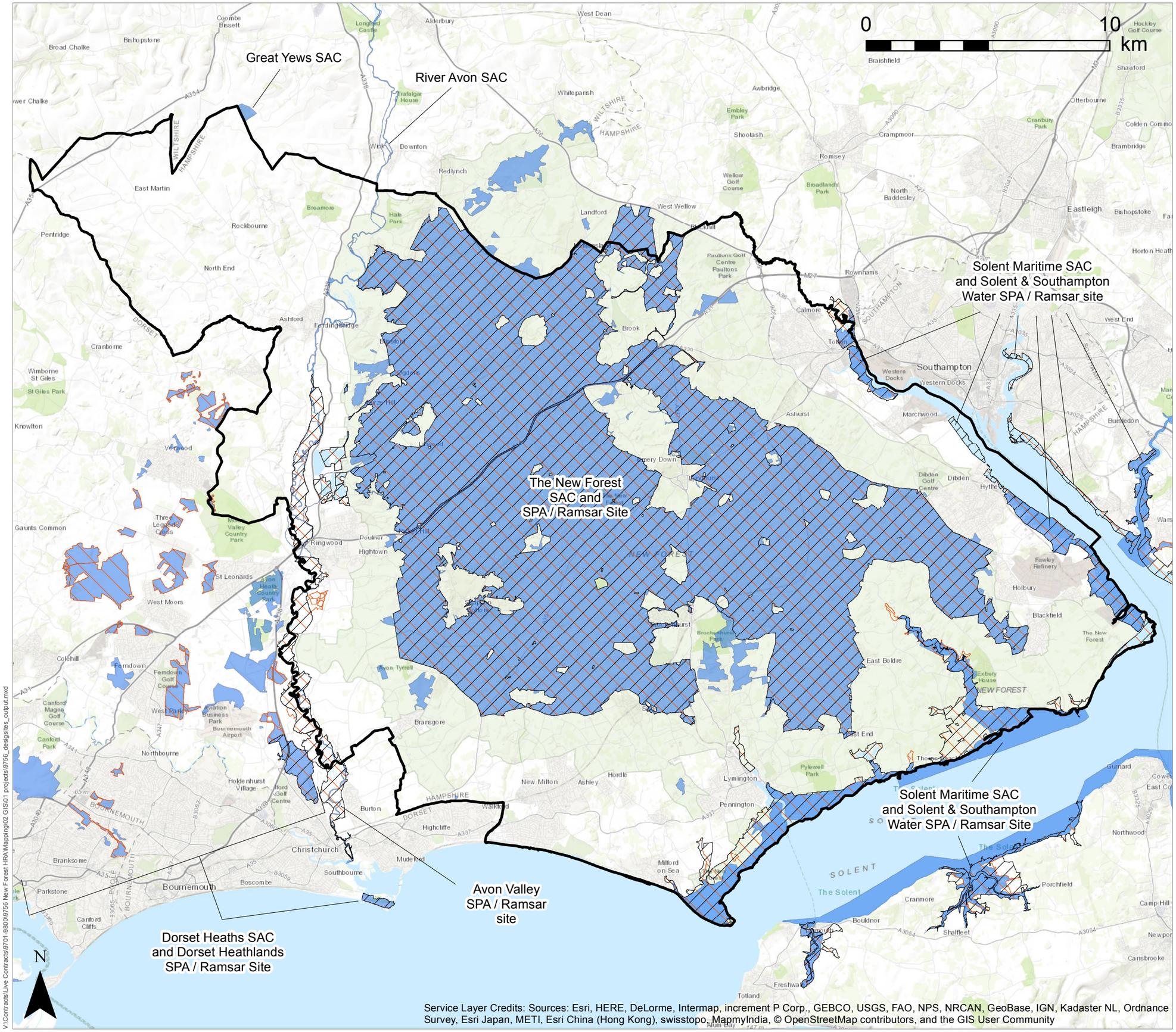
Figure 3b: Map showing exceedance locations for nitrogen deposition (2036 ‘Do Something’)

Figure 3c: Map showing exceedance locations for ammonia (2036 ‘Do Something’)

Figure 3d: Map showing exceedance locations for annual mean NOx (2036 ‘in combination’)

Figure 3e: Map showing exceedance locations for nitrogen deposition (2036 ‘in combination’)

Figure 3f: Map showing exceedance locations for ammonia (2036 ‘in combination’)



LEGEND

- New Forest District boundary
- Special Area for Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar site

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PROJECT TITLE
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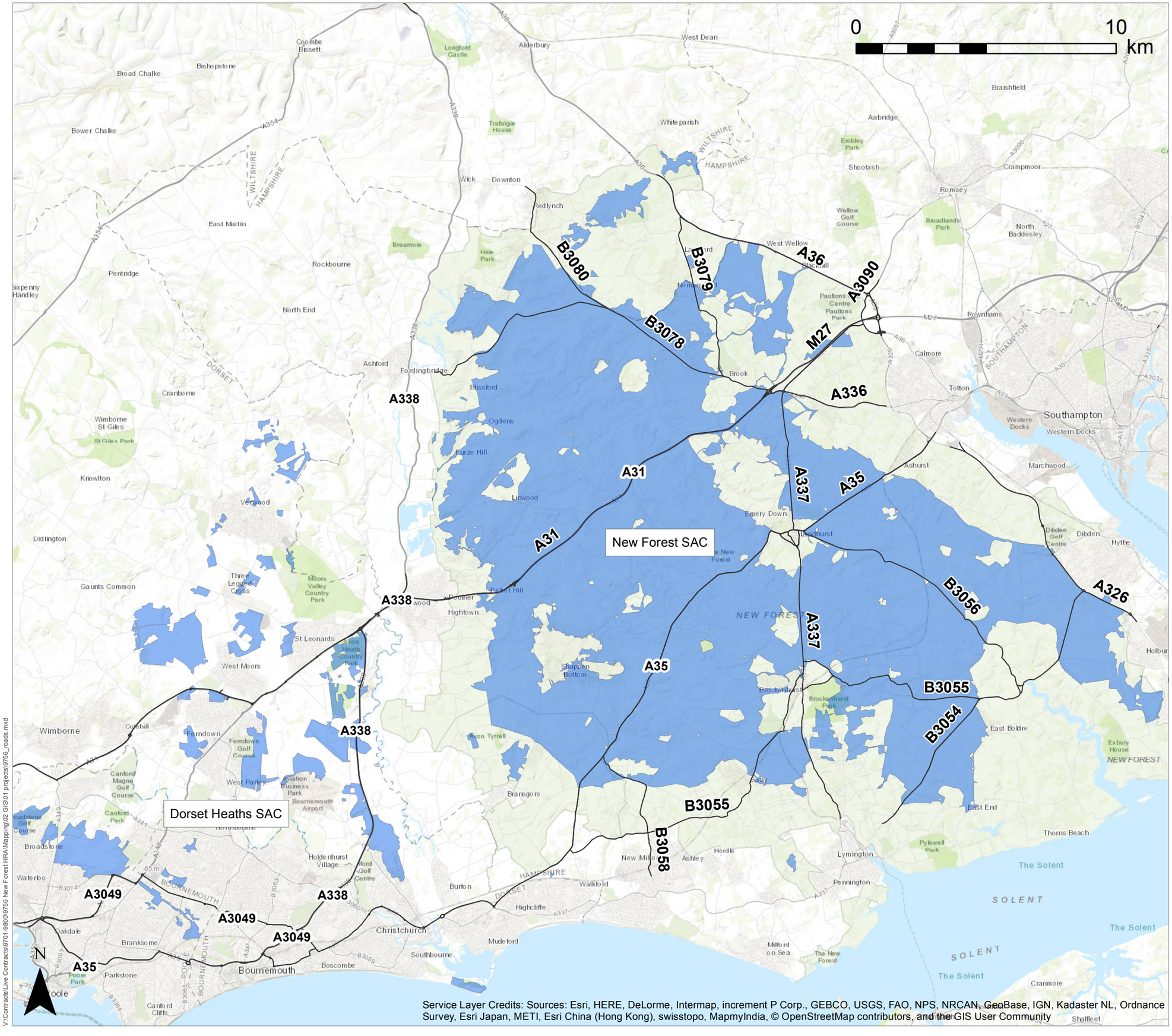
Figure 1: Designated sites

DATE: 29.11.2017 CHECKED: SB SCALE: 1:150,000
DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

Special Area for Conservation (SAC)

Roads where exceedance was predicted

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Figure 2: Road locations

DATE: 22.01.2018 CHECKED: SB SCALE: 1:140,000
DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data

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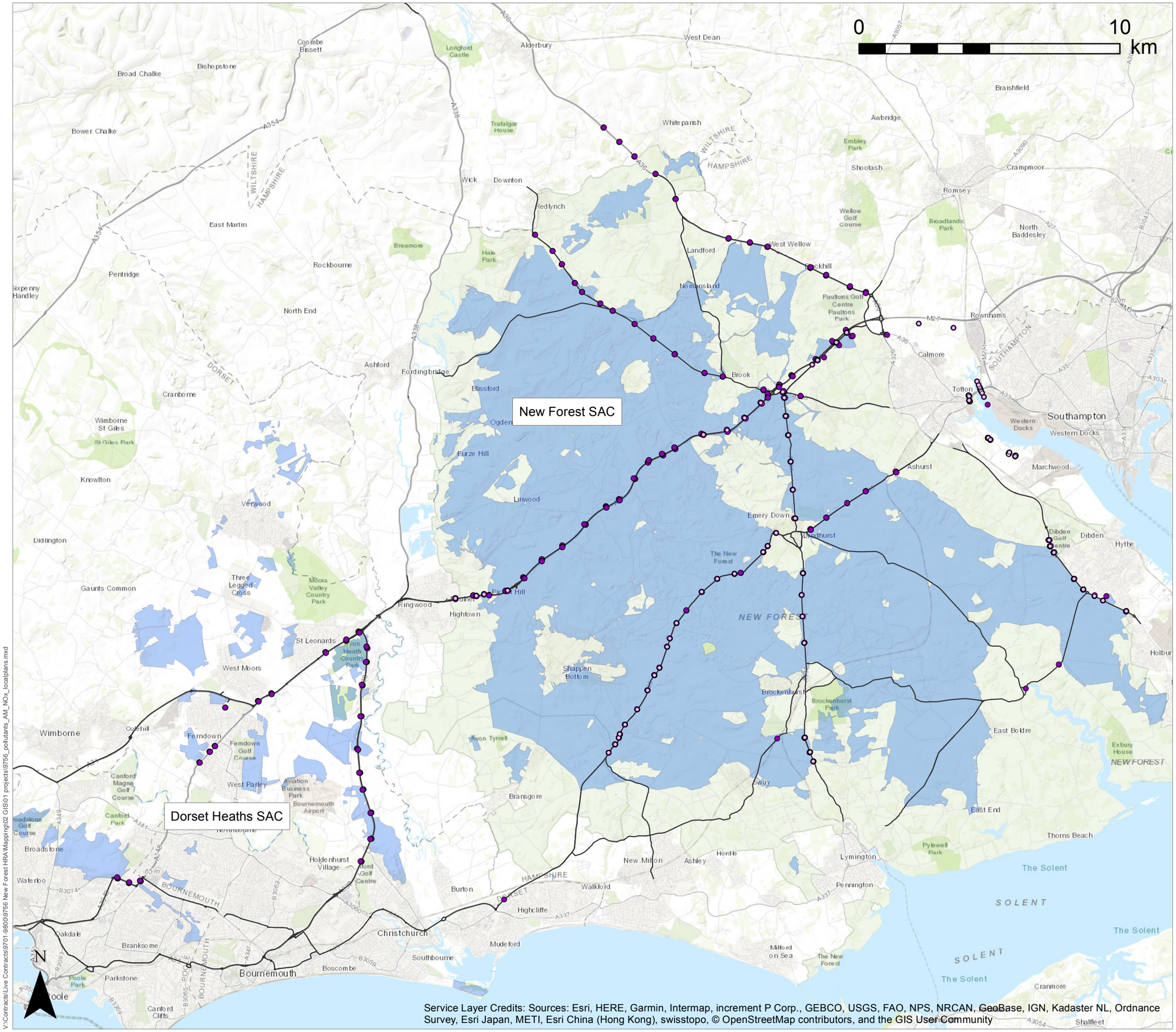

LEGEND

- Special Area for Conservation
- Roads where exceedance was predicted
- Points where annual mean NOx exceedance is predicted (2026 'Do Something' scenario)
- Points where annual mean NOx exceedance is predicted (2036 'Do Something' scenario)

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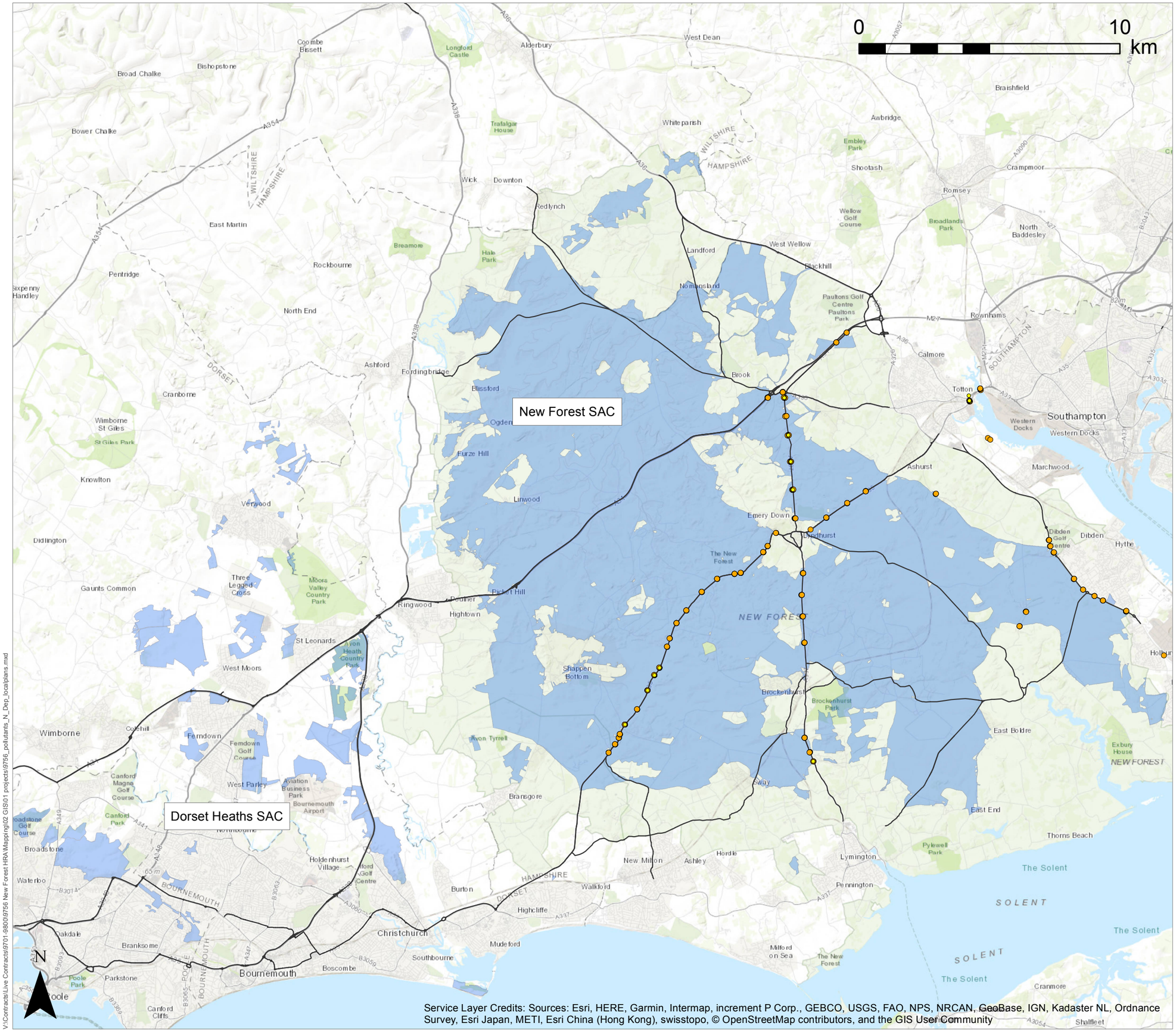
Figure 3a: Exceedance locations for annual mean NOx (2036 'Do Something' scenario)

DATE: 03.04.2018 CHECKED: SB SCALE: 1:140,000

DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

- Special Area for Conservation (SAC)
- Roads where exceedance was predicted
- Points where nitrogen deposition exceedance is predicted (2026 'Do Something' scenario)
- Points where nitrogen deposition exceedance is predicted (2036 'Do Something' scenario)

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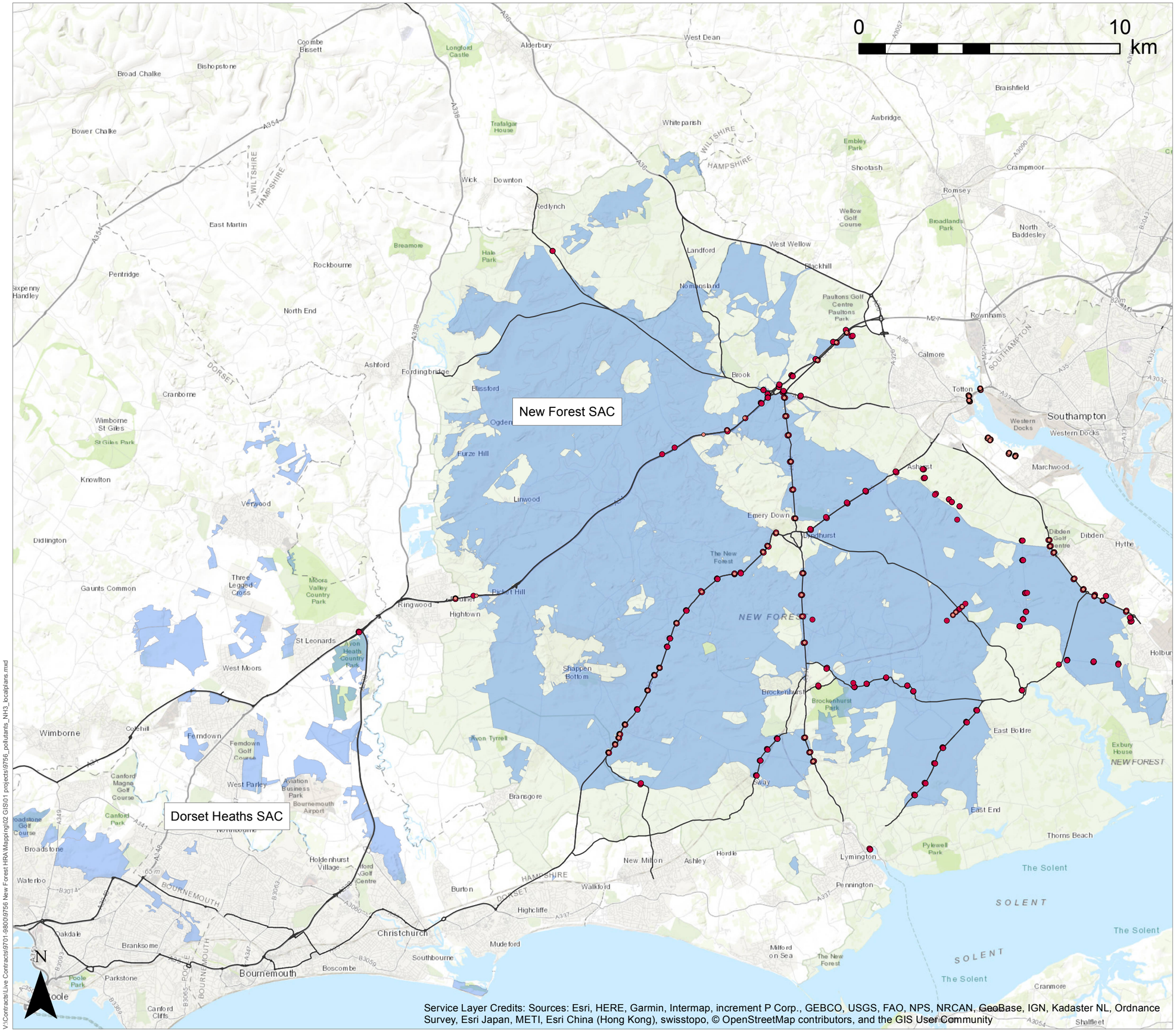
DRAWING TITLE

Figure 3b: Exceedance locations for nitrogen deposition (2036 'Do Something' scenario)

DATE: 03.04.2018 CHECKED: SB SCALE: 1:140,000

DRAWN: COH APPROVED: SB STATUS: FINAL



LEGEND

- Special Area for Conservation (SAC)
- Roads where exceedance was predicted
- Points where ammonia exceedance is predicted (2026 'Do Something' scenario)
- Points where ammonia exceedance is predicted (2036 'Do Something' scenario)

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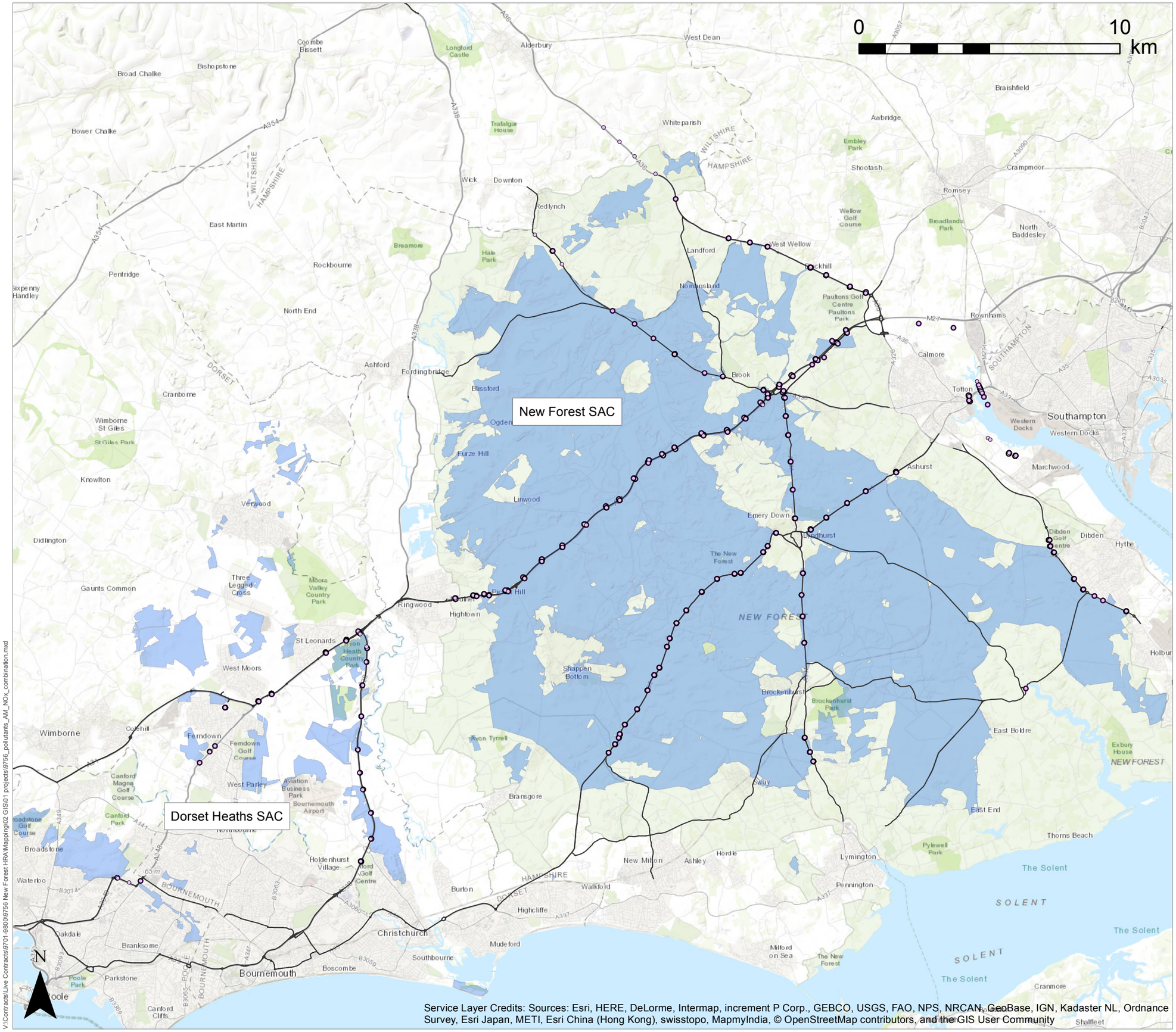
Figure 3c: Exceedance locations for ammonia (2036 'Do Something' scenario)

DATE: 03.04.2018 CHECKED: SB SCALE: 1:140,000

DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

- Special Area for Conservation
- Roads where exceedance was predicted
- Points where annual mean NOx exceedance is predicted (2026 'in combination' scenario)
- Points where annual mean NOx exceedance is predicted (2036 'in combination' scenario)

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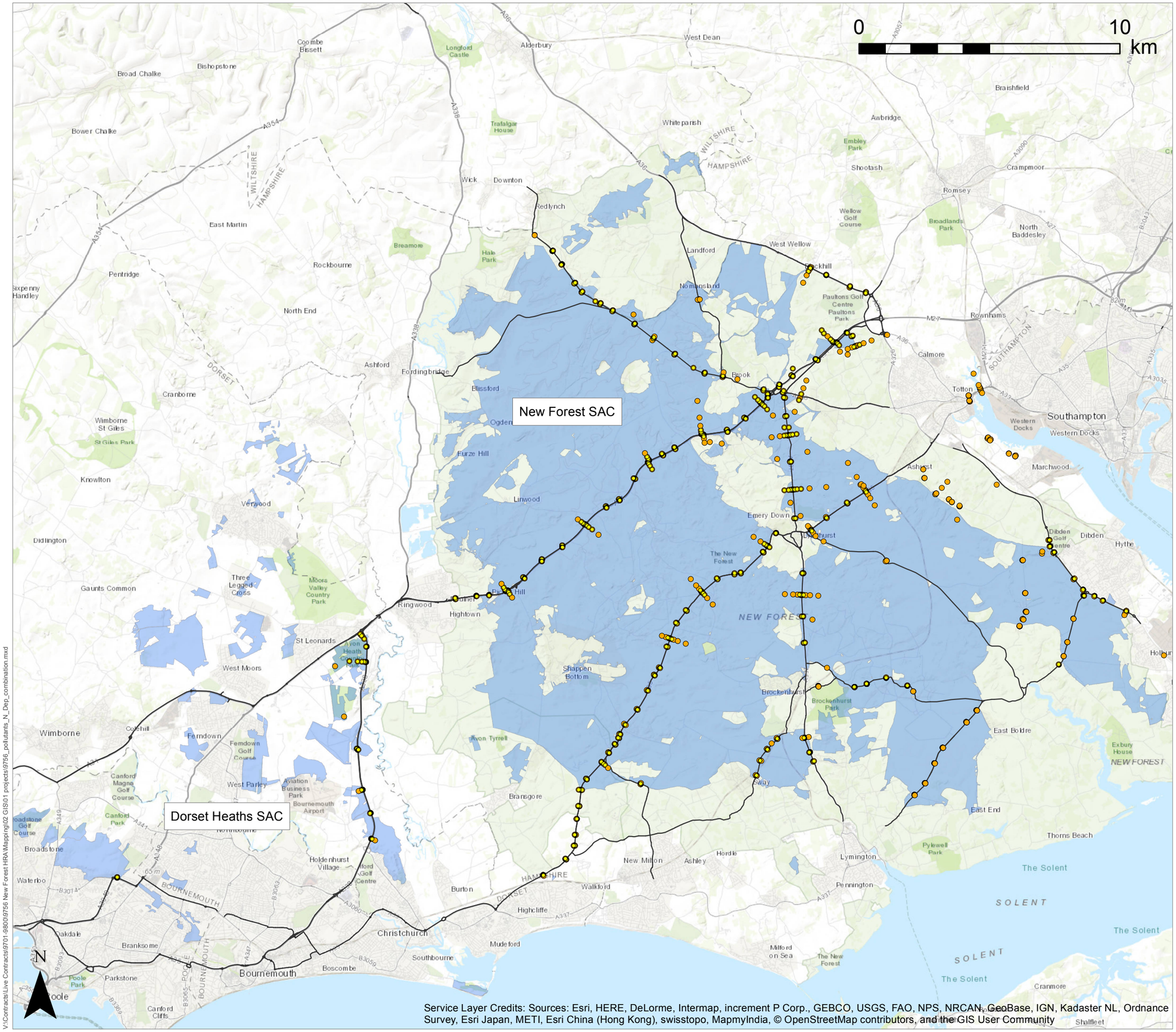
DRAWING TITLE

Figure 3d: Exceedance locations for annual mean NOx (2036 'in combination' scenario)

DATE: 22.01.2018 CHECKED: SB SCALE: 1:140,000

DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

- Special Area for Conservation (SAC)
- Roads where exceedance was predicted
- Points where nitrogen deposition exceedance is predicted (2026 'in combination' scenario)
- Points where nitrogen deposition exceedance is predicted (2036 'in combination' scenario)

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PROJECT TITLE

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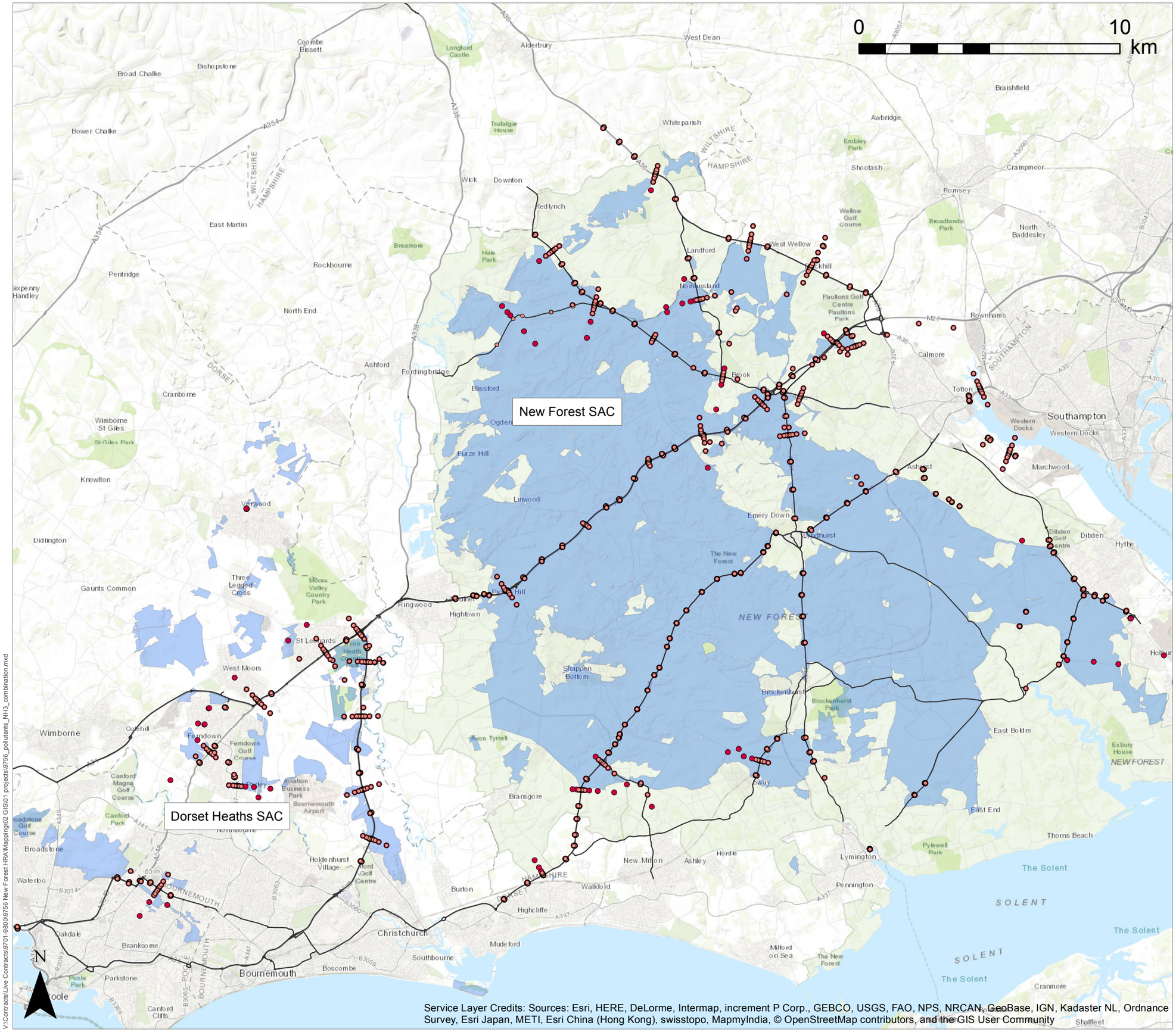
DRAWING TITLE

Figure 3e: Exceedance locations for nitrogen deposition (2036 'in combination' scenario)

DATE: 22.01.2018 CHECKED: SB SCALE: 1:140,000

DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data



LEGEND

- Special Area for Conservation
- Roads where exceedance was predicted
- Points where ammonia exceedance is predicted (2026 'in combination' scenario)
- Points where ammonia exceedance is predicted (2036 'in combination' scenario)

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PROJECT TITLE

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Figure 3f: Exceedance locations for ammonia (2036 'in combination' scenario)

DATE: 22.01.2018 CHECKED: SB SCALE: 1:140,000

DRAWN: COH APPROVED: SB STATUS: FINAL

Sources: BSG Ecology survey data

12 Appendix 1: Critical loads and levels

Table A1: Critical loads and levels for New Forest SAC interest features

Habitat	**Empirical Critical Load kg N/ha/yr**	**Exceedance impacts**	**Critical Level (µg NOx/m^3 annual mean)**	**Critical Level (µg NOx/m^3 24-hour mean)**	**Critical Level (µg NH_3/m^3 annual mean)**
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoeto-Nanojuncetea (H3130)	3-10	Change in the species composition of macrophyte communities, increased algal productivity and a shift in nutrient limitation of phytoplankton from N to P	30	75	Potentially sensitive but no value given
Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (H3110)	5-10	Change in the species composition of macrophyte communities, increased algal productivity and a shift in nutrient limitation of phytoplankton from N to P.	30	75	Potentially sensitive but no value given
Bog woodland (H91D0)	5-10	Increase in vascular plants, altered growth and species composition of bryophytes, increased N in peat and peat water.	30	75	Potentially sensitive but no value given
Transition mires and quaking bogs (H7140)	10-15	Increase sedges and vascular plants, negative effects on bryophytes.	30	75	1
Depressions on peat substrates of the Rhynchosporion (H7150)	10-15	Increase sedges and vascular plants, negative effects on bryophytes.	30	75	1
Alkaline fens (H7230)	15-30	Increase in tall graminoids, decrease in bryophytes.	30	75	1

Habitat	Empirical Critical Load kg N/ha/yr	Exceedance impacts	Critical Level (µg NOx/m^3 annual mean)	Critical Level (µg NOx/m^3 24-hour mean)	Critical Level (µg NH_3/m^3 annual mean)
Old acidophilous oak woods with Quercus robur on sandy plains (H9190)	10-15	Decrease in mycorrhiza, loss of epiphytic lichens and bryophytes, changes in ground vegetation	30	75	Potentially sensitive but no value given
Northern Atlantic wet heaths with Erica tetralix (H4010)	10-20	Transition heather to grass. Ericaceous species susceptible to frost and drought.	30	75	1
European dry heaths (H4030)	10-20	Transition from heather to grass dominance, decline in lichens, changes in plant biochemistry, increased sensitivity to abiotic stress.	30	75	1
Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion) (H9120)	10-20	Changes in ground vegetation and mycorrhiza, nutrient imbalance, changes soil fauna	30	75	Potentially sensitive but no value given
Asperulo-Fagetum beech forests (H9130)	10-20	Changes in ground vegetation and mycorrhiza, nutrient imbalance, changes soil fauna	30	75	Potentially sensitive but no value given
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (H6410)	15-25	Increase in tall graminoids, decreased diversity, decrease of bryophytes.	30	75	Potentially sensitive but no value given

Habitat	Empirical Critical Load kg N/ha/yr	Exceedance impacts	Critical Level (µg NOx/m^3 annual mean)	Critical Level (µg NOx/m^3 24-hour mean)	Critical Level (µg NH_3/m^3 annual mean)
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (H91E0)	Not sensitive	Not sensitive	Not sensitive	Not sensitive	1
Coenagrion mercuriale - Southern damselfly (S1044)	10-20 (European dry heaths)		30 (European dry heaths; Rivers and streams)	75 (European dry heaths; Rivers and streams)	3 (2-4 µg NH_3 m^{-3}) (set for Higher Plants) (European dry heaths; Rivers and streams)
Lucanus cervus - Stag beetle (S1083)	1-20 (Broadleaved, mixed and yew woodland)		30 (Broadleaved, mixed and yew woodland)	75 (Broadleaved, mixed and yew woodland)	3 (2-4 µg NH_3 m^{-3}) (set for Higher Plants) Broadleaved, mixed and yew woodland
Triturus cristatus - Great crested newt (S1166)	Potentially sensitive but no value given		30 (Standing open water and canals)	75 (Standing open water and canals)	3 (2-4 µg NH_3 m^{-3}) (set for Higher Plants)(Standing open water and canals)

Table A2: Critical loads and levels for Dorset Heaths SAC interest features

Habitat	Empirical Critical Load kg N/ha/yr	Exceedance impacts	Critical Level (µg NOx/m^3 annual mean)	Critical Level (µg NOx/m^3 24-hour mean)	Critical Level (µg NH_3/m^3 annual mean)
Depressions on peat substrates of the Rhynchosporion (H7150)	10-15	Increase sedges and vascular plants, negative effects on bryophytes.	30	75	1
Alkaline fens (H7230)	15-30	Increase in tall graminoids, decrease in bryophytes.	30	75	1
Old acidophilous oak woods with Quercus robur on sandy plains (H9190)	10-15	Decrease in mycorrhiza, loss of epiphytic lichens and bryophytes, changes in ground vegetation	30	75	Potentially sensitive but no value given
Northern Atlantic wet heaths with Erica tetralix (H4010)	10-20	Transition heather to grass. Ericaceous species susceptible to frost and drought.	30	75	1
European dry heaths (H4030)	10-20	Transition from heather to grass dominance, decline in lichens, changes in plant biochemistry, increased sensitivity to abiotic stress.	30	75	1
Calcareous fens with Cladium mariscus and species of the Caricion davallianae	15-30	Increase in tall graminoids, decrease in bryophytes.	30	75	Potentially sensitive but no value given
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) (H6410)	15-25	Increase in tall graminoids, decreased diversity, decrease of bryophytes.	30	75	Potentially sensitive but no value given

Habitat	Empirical Critical Load kg N/ha/yr	Exceedance impacts	Critical Level (µg NOx/m^3 annual mean)	Critical Level (µg NOx/m^3 24-hour mean)	Critical Level (µg NH_3/m^3 annual mean)
Coenagrion mercuriale - Southern damselfly (S1044)	10-20 (European dry heaths)		30 (European dry heaths; Rivers and streams)	75 (European dry heaths; Rivers and streams)	3 (2-4 µg NH_3 m^{-3}) (set for Higher Plants) (European dry heaths; Rivers and streams)
Triturus cristatus - Great crested newt (S1166)	Potentially sensitive but no value given		30 (Standing open water and canals)	75 (Standing open water and canals)	3 (2-4 µg NH_3 m^{-3}) (set for Higher Plants)(Standing open water and canals)

Table A3: Critical loads and levels for Solent Maritime SAC interest features

Habitat	**Empirical Critical Load kg N/ha/yr**	**Exceedance impacts**	**Critical Level (µg NOx/m^3 annual mean)**	**Critical Level (µg NOx/m^3 24-hour mean)**	**Critical Level (µg NH_3/m^3 annual mean)**
Estuaries	20-30	Increase late successional species, increase productivity increase in dominance of graminoids.	30	75	Potentially sensitive but no value given
Cord-grass swards (Spartina swards Spartinion maritimae)	20-30	Increase late successional species, increase productivity increase in dominance of graminoids.	30	75	Potentially sensitive but no value given
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	20-30	Increase late successional species, increase productivity increase in dominance of graminoids.	30	75	Potentially sensitive but no value given
Subtidal sandbanks (sandbanks which are slightly covered by seawater all the time)	Not sensitive	n/a	Not sensitive	Not sensitive	Not sensitive
Intertidal mudflats and sandflats (mudflats and sandflats not covered by seawater at low tide)	Potentially sensitive but no value given	n/a	30	75	Potentially sensitive but no value given
Lagoons (coastal lagoons)	20-30	Increase late successional species, increase productivity increase in dominance of graminoids.	30	75	Potentially sensitive but no value given
Annual vegetation of drift lines	Not sensitive	n/a	Not sensitive	Not sensitive	Not sensitive

Habitat	Empirical Critical Load kg N/ha/yr	Exceedance impacts	Critical Level (µg NOx/m^3 annual mean)	Critical Level (µg NOx/m^3 24-hour mean)	Critical Level (µg NH_3/m^3 annual mean)
Coastal shingle vegetation outside the reach of waves (perennial vegetation of stony banks)	8-15	Increase tall grasses, decrease prostrate plants, increased N leaching, soil acidification, loss of typical lichen species.	30	75	Potentially sensitive but no value given
Glasswort and other annuals colonising mud and sand (Salicornia and other annuals colonising mud and sand)	20-30	Increase late successional species, increase productivity increase in dominance of graminoids.	30	75	Potentially sensitive but no value given
Shifting dunes with marram (shifting dunes along the shoreline with Ammophila arenaria 'white dunes')	10-20	Biomass increase, increase N leaching.	30	75	Potentially sensitive but no value given
Desmoulin's Whorl Snail Vertigo moulinsiana	Potentially sensitive but no value given (refer to Rivers and streams)	n/a	30 (European dry heaths; Rivers and streams)	75 (European dry heaths; Rivers and streams)	3 (2-4 µg NH_3 m^{-3}) (set for Higher Plants) (European dry heaths; Rivers and streams)