

Report

Medway Local Plan HRA

## **Air Quality Modelling for Ecology Assessment**

For Medway Council

30 October 2025

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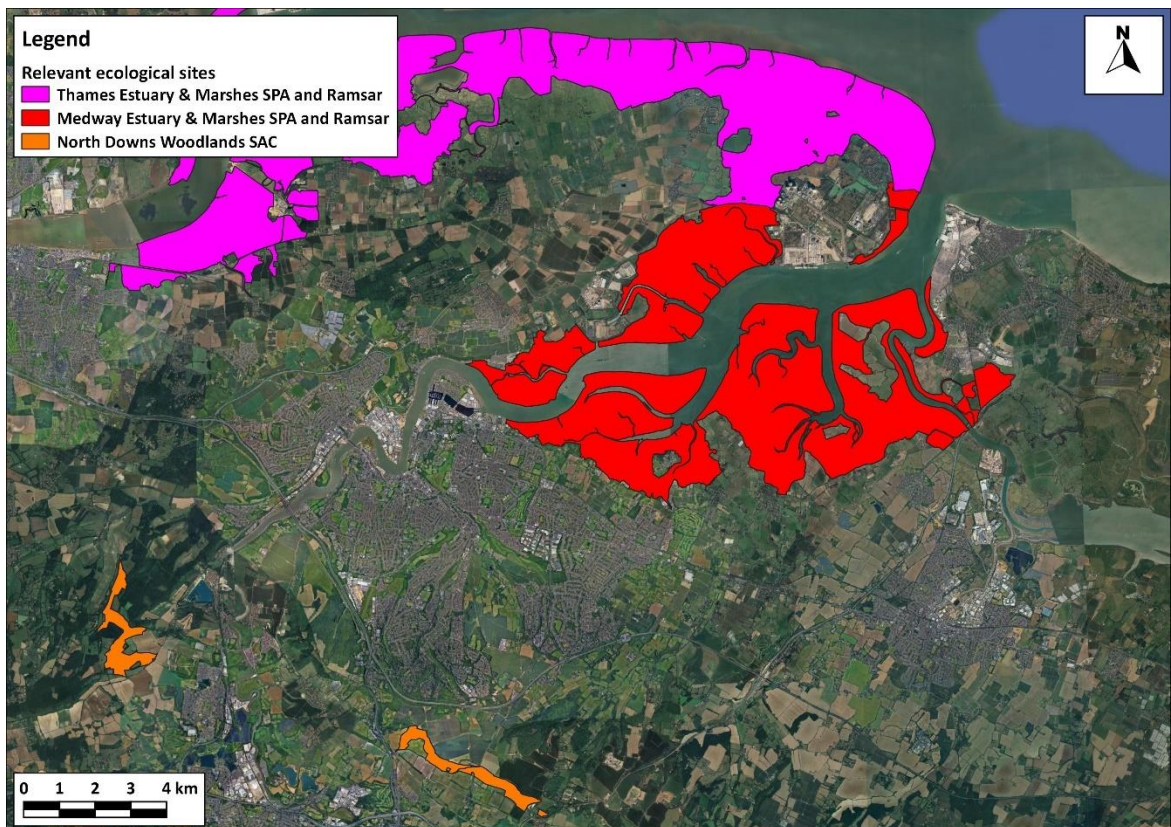
# 1 Introduction

1.1 This report has been prepared by Air Quality Consultants Ltd | Part of Logika Group (AQC). It describes the air quality modelling methodology and results to inform the Habitats Regulations Assessment (HRA) of the Medway Local Plan 2041.

1.2 The Local Plan will lead to changes in traffic flows on roads which pass within 200 m of designated nature conservation sites. Road traffic can emit nitrogen oxides (NOx) and ammonia (NH<sub>3</sub>), and some sensitive vegetation may be affected by elevated concentrations of these pollutants. Furthermore, the deposition of both NOx and NH<sub>3</sub> can alter the nutrient and acidity balance of some ecosystems, causing changes to their composition and health. This assessment has quantified the changes to NOx and NH<sub>3</sub> concentrations that would be caused by the proposed Local Plan, as well as the changes to nitrogen and acid deposition fluxes at the following designated sites:

- North Downs Woodlands Special Area of Conservation (SAC);
- Medway Estuary and Marshes Special Protection Area (SPA) and Ramsar site; and
- Thames Estuary and Marshes SPA and Ramsar site.

1.3 The locations of these sites are shown in Figure 1.



**Figure 1: Designated Sites Included in this Assessment**

Map data ©2025.

1.4 This report describes the scope of the air quality assessment, the modelling methodology, and the modelled results. It compares the results with screening thresholds which can be used to discount the potential for significant effects. However, it does not seek to interpret the results any further than this

or reach a conclusion regarding the overall significance of effects; that assessment, including the policy against which the assessment is made, is provided separately by Lepus Consulting Ltd.

- 1.5 The professional experience of the consultants involved in the air quality assessment is summarised in Appendix A1.

## 2 Assessment Criteria

### Policy Context

- 2.1 Protection of nature conservation sites is provided by an array of different policies. Different policy protection is usually provided to sites designated at European<sup>1</sup>, national<sup>2</sup>, and local levels<sup>3</sup>. Instead of considering each relevant policy individually, this current report applies criteria which are frequently used to screen out the potential for significant effects regardless of the specific policies protecting a site.

### Critical Levels and Critical Loads

- 2.2 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets a limit value for annual mean concentrations of nitrogen oxides and for annual and winter mean concentrations of sulphur dioxide. The same values have been set as domestic objectives within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002). The limit values and objectives only apply a) more than 20 km from an agglomeration (about 250,000 people), and b) more than 5 km from Part A industrial sources, motorways and built-up areas of more than 5,000 people.
- 2.3 Critical levels (CLEs) and critical loads (CLOs) are the ambient concentrations and deposition fluxes below which significant harmful effects to sensitive ecosystems are unlikely to occur. Some of the CLEs are set at the same concentrations as the objectives but do not have the same spatial constraints on where they apply. The CLEs relevant to this assessment are set out in Table 1.
- 2.4 The CLE for annual mean NO<sub>x</sub> concentrations is set at the same concentration irrespective of the habitats features of interest. There are two CLEs for NH<sub>3</sub>, with the lower value (1 µg/m<sup>3</sup>) applying only where lichens or bryophytes are present or form a key part of the ecosystem integrity. This reflects the fact that lichens and bryophytes are not connected directly to soil nutrients and can therefore be particularly susceptible to changes in atmospheric nitrogen. Lepus Consulting has advised that the lower CLE applies in all cases. A short-term (24-hour mean) CLE for NO<sub>x</sub> has also been set, however guidance from the Institute of Air Quality Management (IAQM) (Holman et al, 2020) recommends that: "...only the annual mean NO<sub>x</sub> concentration is used in assessments unless specifically required by a regulator; for instance, as part of an industrial permit application where high, short term peaks in emissions, and consequent ambient concentrations, may occur". Thus the 24-hour mean CLE is not relevant to the current assessment, which is concerned with annual average effects from increased road traffic.
- 2.5 The CLOs are specific to different habitat types. The Air Pollution Information System (APIS) (2025) sets out the CLOs which might apply across the entirety of nationally and internationally-designated sites. This information has been used, alongside discussions with Lepus Consulting, to define which CLOs are relevant to the locations of interest to this study.
- 2.6 The CLOs for nitrogen deposition are published as ranges. This is because other factors influence how sensitive a habitat may be to additional nitrogen; for example how a site is managed can affect its sensitivity to nitrogen deposition. To provide a worst-case assessment, this report has focussed on the

<sup>1</sup> European sites make up the Natura 2000 network and include Special Protection Areas (SPAs), Special Areas of Conservation (SACs), and Ramsar Sites.

<sup>2</sup> Sites of national-level importance are principally designated as Sites of Special Scientific Interest (SSSIs).

<sup>3</sup> Local nature sites are usually taken to include those designated locally as well as national nature reserves and ancient woodland.

lower-bound of each CLo range. However, this should not be taken to suggest that the lower-bound value is indicative of potential effects in the study area.

2.7 Acid deposition is assessed against the “CLmaxN” value published on APIS (2025). This is the level above which additional deposition will cause acidification.

2.8 The CLoS used in this assessment are provided in Table 2.

**Table 1: Vegetation and Ecosystem CLeS <sup>a</sup>**

Pollutant	Time Period	CLe
Nitrogen Oxides (expressed as NO <sub>2</sub> )	Annual Mean <sup>a,b</sup>	30 µg/m <sup>3</sup>
NH <sub>3</sub>	Annual Mean	3 (1 <sup>c</sup> ) µg/m <sup>3</sup>

<sup>a</sup> The CLeS are defined by the World Health Organisation (WHO, 2000).

<sup>b</sup> Away from major sources (see Paragraph 2.2), this CLe is set as an objective (Defra, 2007) and a limit value (The European Parliament and the Council of the European Union, 2008).

<sup>c</sup> The more stringent CLe of 1 µg/m<sup>3</sup> only applies where lichens or bryophytes are present or form a key part of the ecosystem integrity, but has been used throughout to provide a robust assessment.

**Table 2: Vegetation and Ecosystem CLoS**

Site	Nutrient Nitrogen (kgN/ha/yr)	Acid Deposition ‘N <sub>max</sub> ’ (keq/ha/yr)
North Downs Woodlands SAC	10	1.983
Medway Estuary and Marshes SPA and Ramsar	10	Not sensitive
Thames Estuary and Marshes SPA and Ramsar	10	Not sensitive

## Screening Thresholds for Predicted Concentrations and Deposition Fluxes

2.9 The Environment Agency has published criteria which allow impacts from industrial developments requiring environmental permits to be screened out as insignificant (Environment Agency, 2025). Exceeding these criteria does not mean that there is a significant effect, it simply means that further consideration is required of the potential changes to air quality or deposition. With respect to annual average impacts from most industrial sources, no further assessment is required whenever the change caused by the proposed development (termed by the Environment Agency the Process Contribution, or ‘PC’) is less than 1% of the relevant CLe or CLo. Furthermore, there is no need for further assessment if detailed dispersion modelling has shown that the CLe or CLo is not exceeded (i.e. the Predicted Environmental Concentration, or ‘PEC’ is less than 100% of the CLe or CLo).

2.10 Natural England’s guidance on advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations (Natural England, 2018) recommends the use of the Environment Agency criteria described above for changes to traffic caused by all types of plans or projects affecting European sites. It explains:

*“1% of critical load/level are considered by Natural England’s air quality specialists ... to be suitably precautionary, as any emissions below this level are ... considered to be imperceptible”.* It goes on:

*“There can therefore be a high degree of confidence in [the use of these criteria] to screen for risks of an effect”.*

- 2.11 For European sites, Natural England (2018) explains that the 1% criterion should be applied to plans and projects both alone and in-combination. As with the Environment Agency guidance, exceeding 1% of the CLe or CLo does not mean that there will be a significant effect, it is simply a trigger for when further assessment is needed.
- 2.12 The CLe and CLo are defined as the *“deposition/concentration ... below which adverse effects on receptors ... do not occur according to present scientific knowledge”* (APIS, 2025). There is therefore no reasonable scientific doubt regarding the absence of a significant effect wherever the CLe and CLo are not exceeded, even where the PC exceeds the 1% criterion.
- 2.13 The CLo were recently subject to a detailed review and revision (Bobbink et al., 2022). Prior to that revision, Natural England (2018) referred to earlier work (NECR210, 2016) that there may be adverse effects below the (previously published) CLo. Natural England has not revised its guidance following the CLo revision and therefore requires an Appropriate Assessment wherever the PC is >1% of the CLe or CLo even when the total concentration or deposition is below the CLe or CLo. The potential for adverse effects may still be discounted on the basis that the total concentration or deposition is less than the current CLe or CLo, but procedurally, this should happen at the Appropriate Assessment rather than screening stage of HRA. This modelling report simply considers whether adverse effects can be ruled out solely on the basis of the air quality predictions and has therefore applied the following tests. The potential for a significant effect can, ultimately, be discounted wherever:

- The change (PC), both alone and in-combination, is less than 1% of the relevant CLe or CLo; **OR**
- The total concentration or deposition (PEC) is less than the relevant CLe or CLo,

If the first bullet is met, impacts can be disregarded at screening stage, while if the latter bullet is met, impacts may be disregarded at Appropriate Assessment stage.

### 3 Methodology

3.1 The assessment has been carried out following current best practice, drawing on the professional expertise of the consultants involved (Appendix A1). Care has also been taken to ensure consistency with guidance issued by the IAQM (Holman et al, 2020) and the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2021).

#### Consultation

3.2 The proposed methodology was provided to Natural England in writing on 18/07/25 (email from Lepus Consulting to Natural England). This explained that:

- traffic data will come from the strategic model and road links outside the traffic area of detailed modelling (AODM) will not be included;
- the assessment will consider air quality alongside roads within the AODM where a change in traffic flow greater than 1,000 AADT (either alone or in-combination) is predicted within 200 m of a European site. A map was provided to show that this comprises Medway Estuary and Marshes SPA and Ramsar, Thames Estuary and Marshes SPA and Ramsar, The Swale SPA and Ramsar, and North Downs Woodlands SAC. The Swale SPA and Ramsar and the south east section of the North Downs Woodlands SAC are outside the AODM and therefore excluded;
- Only roads within 200 m of the identified designated sites will be modelled;
- the baseline year for explicitly modelled road traffic emissions will be 2019, reflecting the base year in the traffic model;
- the future assessment year will be 2041, to match that of the strategic traffic model;
- NO<sub>x</sub> emissions from road traffic will be calculated using Defra's Emissions Factors Toolkit (EFT), with the years set to 2019 and 2041;
- NH<sub>3</sub> emissions from road traffic will be calculated using AQC's Calculator for Road Emissions of Ammonia (CREAM), with the years set to 2019 and 2041;
- background NH<sub>3</sub> concentrations and nitrogen deposition will be taken from APIS. The most recent data will be used, which at the time of writing are centred on a 2021 base year. These 2021 background data will be combined with the 2019 emissions from local traffic to create the existing baseline scenario;
- future NH<sub>3</sub> concentrations and nitrogen deposition will be calculated by adjusting the 2021 data using the Business-as-Usual assumptions in JNCCs Nitrogen Futures modelling. This adjustment will be applied for just 9 years, to predict values in 2030. These 2030 background data will be combined with the 2041 emissions from local traffic to create the future scenarios;
- other tools published by Defra for Local Air Quality Management (LAQM) will be used in the assessment. Where these do not allow predictions to be made beyond 2040, the 2040 settings will be used to predict concentrations in 2041;
- deposition will be calculated using deposition velocities taken from AQTAG06;
- the change due to the Local Plan alone will be quantified by comparing the 2041 Reference Case with the 2041 Local Plan scenario;

- the change due to the Local Plan in-combination with other relevant plans will be quantified by comparing a 2041 'No Growth' scenario (2019 traffic data with 2041 emissions) with the 2041 Local Plan scenario;
- tabulated concentrations and deposition fluxes at transects would be provided, as well as isopleth maps of the areas around the roads;
- the potential impacts of industrial development allocations will be considered qualitatively based on the distances of planned developments from the above designated sites; and
- the critical loads to be used in the assessment were suggested, and it was stated that impacts would be assessed against the lower (most precautionary) end of the critical load range.

3.3 Natural England responded to this suggested approach, in its entirety, on 02/09/25 (email from Sean Hanna (Natural England) to Catherine Smith (Medway Council) with the following feedback:

*“We would generally recommend that the assessment considers both the lower and upper range of the critical load to provide a robust assessment and would recommend the critical levels and loads are taken from APIS. In addition to considering the potential impacts to habitats supporting birds associated with the SPAs and Ramsar sites, the Habitats Regulations Assessment should also consider whether there will be any impacts to the aquatic plants and invertebrates associated with the Ramsar site.”*

3.4 These comments have been taken into account in the method set out below, which otherwise follows the approach provided to Natural England on 18/07/25.

### Industrial Development Allocations

3.5 The potential impacts of industrial development allocations on concentrations of NOx, ammonia and ozone, as well as nitrogen deposition and acid deposition (as a result of both nitrogen and sulphur emissions) have been considered qualitatively.

### Defining the Study Area

3.6 Consideration has been given to potential effects on all European, national, and local sites within 200 m of roads on which traffic flows have been predicted by Medway Council to increase as a result of the scheme by more than 1,000 vehicles, or 200 Heavy Duty Vehicles (HDVs), per day as an Annual Average Daily Traffic (AADT) flow. These criteria are defined in guidance from National Highways (2024) and Natural England (2018). These criteria have been applied in-combination with other relevant projects. The designated sites have been identified from information published by Defra, JNCC, Natural England, the Welsh Government, and Scottish Natural Heritage. Some sites within these distances have been excluded from the assessment as explained in Table 3. The sites identified and the roads included in the assessment are shown in Figure 2.

**Table 3: Designated Sites Excluded from the Assessment**

Site	Reason for Exclusion
The Swale SPA and Ramsar	Located outside the traffic AODM
Peters Pit SAC	Advice from Lepus Consulting – not sensitive to changes in air quality
Queendown Warren SAC	No road links located within 200 m

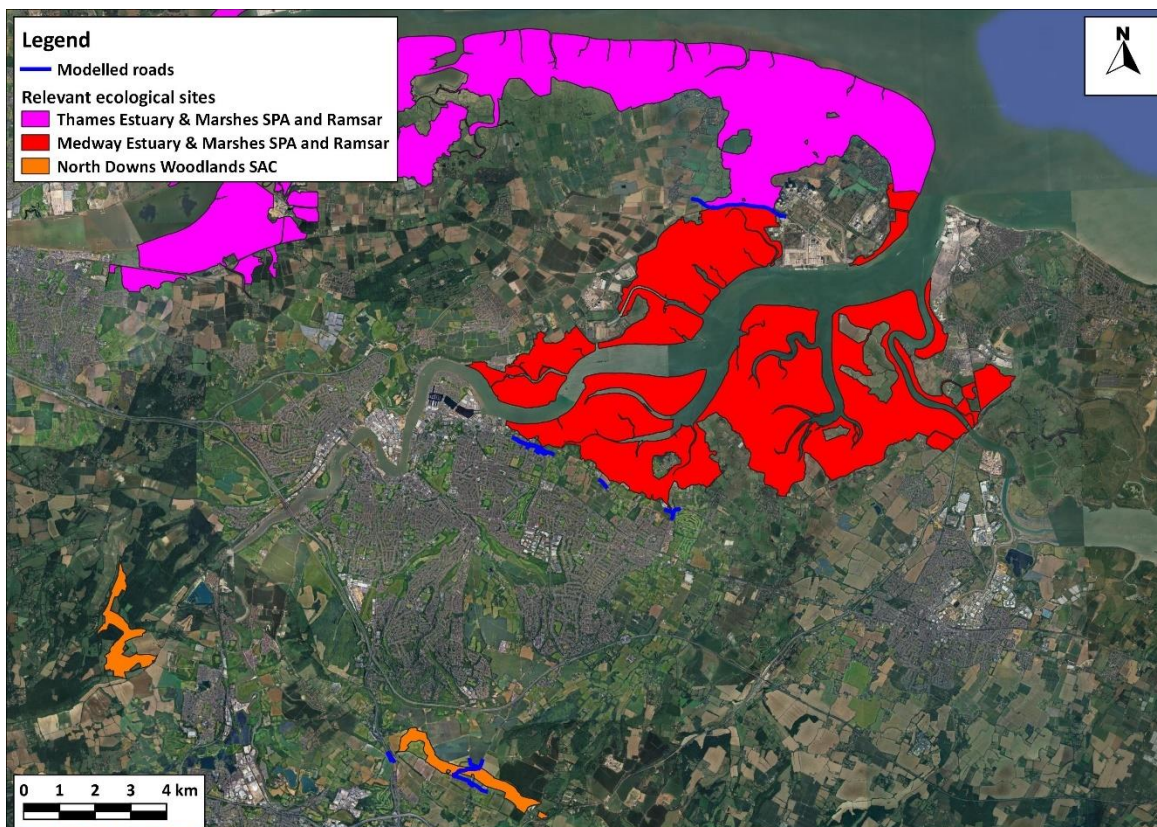


Figure 2: Study Area

Map data ©2025.

## Assessment Scenarios

### Base Year

- 3.7 Total concentrations and deposition have been assumed to be the sum of the influence of local traffic and the 'background' (which represents the influence of all other emissions sources, ranging from local to international and is taken from published data). Traffic volumes, emissions per vehicle, and background conditions, all change year to year.
- 3.8 Medway Council's strategic traffic model has been run for the years 2019 and 2041; these are the only years for which traffic data are available for use in this study. Background data on NH<sub>3</sub> concentrations and nitrogen deposition are available from APIS (2025), with the most recent dataset available representing the three-year period centred on 2021.
- 3.9 2021 was a year in which traffic flows were significantly depressed by the COVID-19 pandemic. Therefore, even if the traffic model had been run for 2021, it would not be appropriate to use these data as the basis of predicting conditions in 2041. Nitrogen deposition and ammonia background concentrations in 2021 were also affected by the pandemic (as were those in 2020 which forms part of the 3-year mean from APIS), but road transport is relatively unimportant to the overall backgrounds. Natural England typically requests that the most recent APIS data should form the starting point for an assessment even when this is 2021.
- 3.10 The approach used here has been to construct the 'existing baseline' scenario by combining the 2019 traffic data with the 2021 APIS data. No adjustments have been made to account for the

difference in years. If the COVID-19 pandemic had not happened, traffic flows in 2021 are likely to have been slightly higher than those in 2019, but in practice they are likely to have been lower. However, these differences are relatively small in the context of projecting traffic flows in 2041. Therefore, in the context that the assessment year is 2041, combining 2019 and 2021 data to construct the existing baseline does not introduce significant uncertainty.

- 3.11 For brevity, the existing baseline air quality scenario has been termed '2019 Base', but it represents a combination of 2019 and 2021 data. This does not have a significant effect on the conclusions of the assessment.

### Traffic Data

- 3.12 The data available from Medway Council's strategic traffic model cover:

- 2019 Base;
- 2041 Reference Case, this includes the committed schemes within Medway (not constrained to Trip End Model Presentation Program (TEMPro) alongside those within neighbouring authorities (constrained to TEMPro);
- 2041 Local Plan Scenario, this includes the LP developments within Medway and the committed growth outside of Medway (noting that the LP allocations from neighbouring authorities is not included, but consented growth is, showing the impact of the LP within Medway).

- 3.13 It is necessary to use these data to consider:

- The effect of the Plan in isolation. This has been taken as the difference in traffic between the 2041 Local Plan Scenario and the 2041 Reference Case;
- The effect of the Plan in-combination. This has been taken as the difference in traffic between the 2041 Local Plan Scenario and the 2019 Base.

- 3.14 Emissions from road transport are predicted to reduce over time, so that an average vehicle in 2041 emits less than an average vehicle in 2019. A direct comparison of traffic emissions in 2019 with those in 2041 with the Plan would therefore show an improvement, irrespective of any increases in traffic volumes. To show the effect of Plan-generated traffic without the confounding influence of concurrent reductions in emissions per vehicle, an artificial scenario has been constructed which assumes no change in traffic between 2019 and 2041 (i.e. using 2041 emissions and 2019 traffic volumes).

### Scenario Definition

- 3.15 NO<sub>x</sub> and NH<sub>3</sub> concentrations, and nitrogen and acid deposition fluxes, have been predicted for the following scenarios:

- A) existing baseline. This scenario is termed '2019 Base';
- B) a future scenario without any increase in traffic from 2019 (including future-year emissions factors and future-year background concentrations and fluxes but base-year traffic within the dispersion model). This scenario is termed '2041 Zero Growth';
- C) 2041 without the Local Plan but with the forecast background increase in traffic between from 2019 (also including future-year emissions factors and background concentrations and fluxes). This scenario is termed '2041 Base'; and

D) 2041 with both the proposed Local Plan and background traffic growth (also including future-year emissions factors and background concentrations and fluxes). This scenario is termed '2041 With Plan'.

3.16 The three 2041 scenarios have been compared to derive the impacts of the proposed Local Plan alone and in-combination with other projects and plans:

- the difference between scenarios C and D represents the change (i.e. the PC) caused by the proposed Local Plan alone; and
- the difference between scenarios B and D represents the PC caused by the Local Plan in-combination.

## Monitoring

3.17 Information on existing nitrogen dioxide concentrations has been obtained by collating the results of monitoring carried out by the local authority. This has focused on roadside monitoring which is carried out to assess impacts on human health. The measurements have been used here to verify the air quality model as described in Appendix A2.

## Modelling Methodology

### Background Concentrations and Fluxes

3.18 Background concentrations of NO<sub>x</sub> and NH<sub>3</sub>, and nitrogen and acid nitrogen deposition fluxes, have been taken from APIS (2025). The concentrations and deposition fluxes represent 1 km x 1 km averages. As noted above, APIS currently presents 3-year mean values centred on the calendar year of 2021.

3.19 Concentrations of NH<sub>3</sub> and deposition fluxes have been adjusted to represent the future using the rate of change predicted for this area using the Business-as-Usual assumptions of the Joint Nature Conservation Committees (JNCC's) Nitrogen Futures project (JNCC, 2020)<sup>4</sup>. Nitrogen Futures only predicted changes to 2030, so the rate of change predicted by JNCC between 2021 and 2030 has been used to predict concentrations and deposition in 2041 (i.e. only 9 years of change have been accounted for). Given the UK's national and international commitments to reduce emissions, as well as evidence from monitoring across the UK showing significant recent improvements in background concentrations of both NO<sub>x</sub> and NH<sub>3</sub>, this approach is most likely to over-predict in 2041 and therefore provide a conservative assessment.

3.20 Concentrations of NO<sub>x</sub> in 2041 have been predicted by multiplying the 2021 concentration taken from APIS by the relative change to concentrations (between 2021 and 2040) for each location predicted in Defra's latest (2021-based) national NO<sub>x</sub> maps published for Local Air Quality Management (Defra, 2025).

### Influence of Local Road Traffic

3.21 Concentrations have been predicted using the ADMS-Roads dispersion model, with emissions of NO<sub>x</sub> derived using Defra's Emissions Factors Toolkit (EFT) (v13.1) (Defra, 2025), and emissions of NH<sub>3</sub> derived using AQC's Calculator for Road Emissions of Ammonia (CREAM) (v2A) (AQC, 2025). Traffic flows have been derived from Medway Council's strategic traffic model. The model results for NO<sub>x</sub> and nitrogen

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<sup>4</sup> A linear rate of change has been assumed between 2017 and the 2030 Business as Usual scenario, with the APIS 2021 data scaled based on the location-specific predicted changes. Acid nitrogen deposition has been calculated from the predicted nitrogen deposition.

dioxide have been verified against local measurements. Details of the model inputs and the model verification are provided in Appendix A2. Deposition fluxes have been calculated from the predicted concentrations of nitrogen dioxide and NH<sub>3</sub>. Details of the method for calculating deposition are provided in Appendix A2.

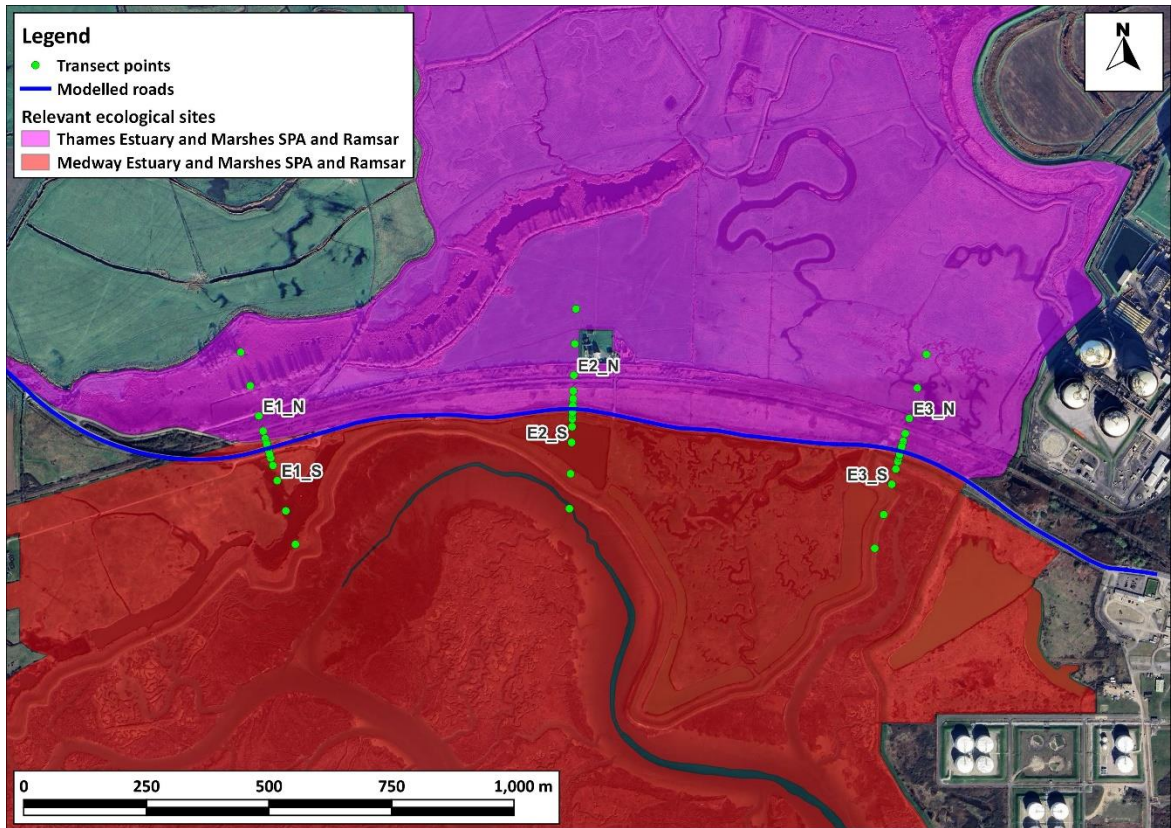
## Receptors

- 3.22 Impacts have been predicted at receptors arranged along transects running perpendicular to affected roads. The transects begin at the closest part of the designated site to the road<sup>5</sup>. Where the designated site is located within 2 m of the road, receptors have been placed at the following distances from the road: 2 m, 3 m, 5 m, 9 m, 17 m, 33 m, 65 m, 129 m and 200 m <sup>6</sup>. Where the designated site is set back more than 2 m from the road, the same spacing is used beginning at the point closest to the road. These roadside transects are shown in Figure 3 to Figure 7. Additional receptors have been placed at various points in and around each SAC, using source-oriented grids at the same distances as the transects, and underlying Cartesian grids with spacing of 50 m. These additional receptors have been used to generate isopleths.
- 3.23 All receptors have been modelled at a height of 1.5 m to ensure consistency with the national background deposition modelling carried out on behalf of Defra and used within this assessment.

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<sup>5</sup> Following guidance from the IAQM (Holman et al, 2020), impacts have not been predicted within 2 m of roads.

<sup>6</sup> These distances are used because they broadly reflect the expected rate at which concentrations of NO<sub>x</sub> and ammonia reduce with distance from roads. This provides an efficient way to more precisely show the predicted changes.



**Figure 3: Receptor Transect Locations – Thames Estuary and Marshes and Medway Estuary and Marshes**

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Figure 4: Receptor Transect Locations - Medway Estuary and Marshes

Imagery ©2025 Airbus, Maxar Technologies.



Figure 5: Receptor Transect Locations - Medway Estuary and Marshes

Imagery ©2025 Airbus, Maxar Technologies.

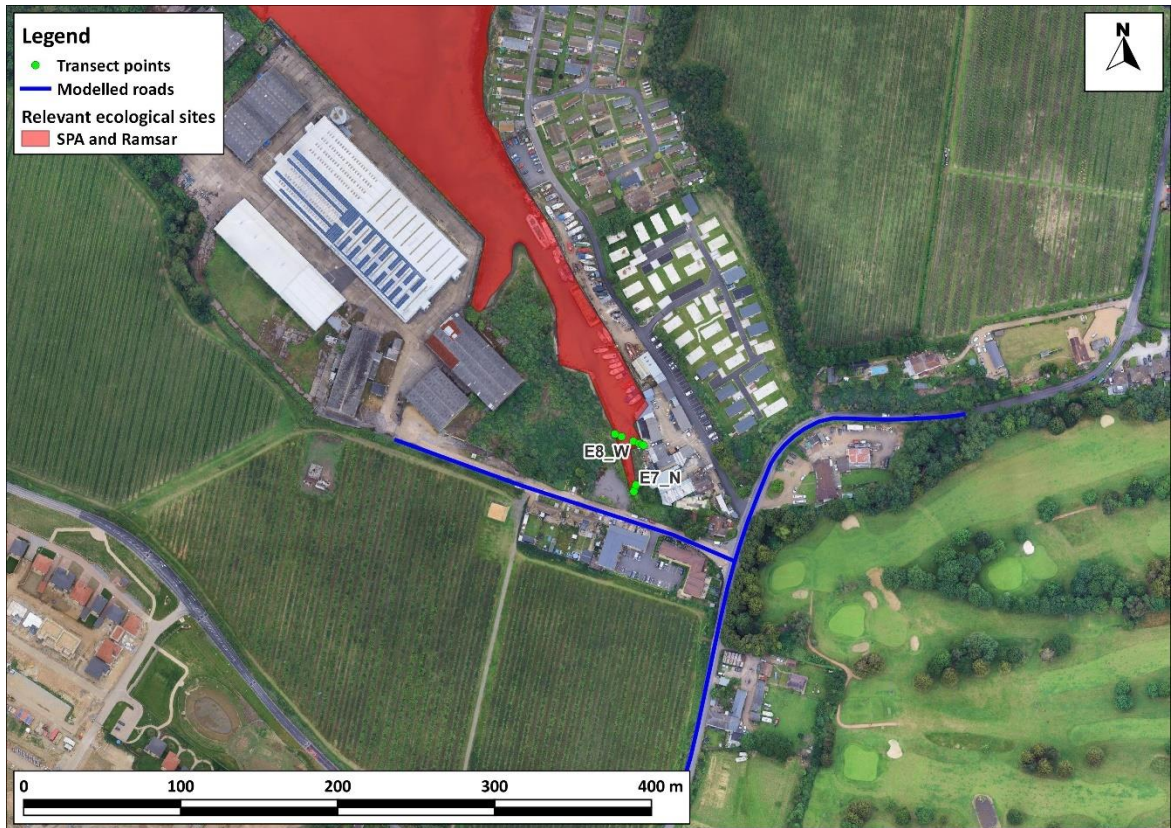


Figure 6: Receptor Transect Locations - Medway Estuary and Marshes

Imagery ©2025 Airbus, Maxar Technologies.

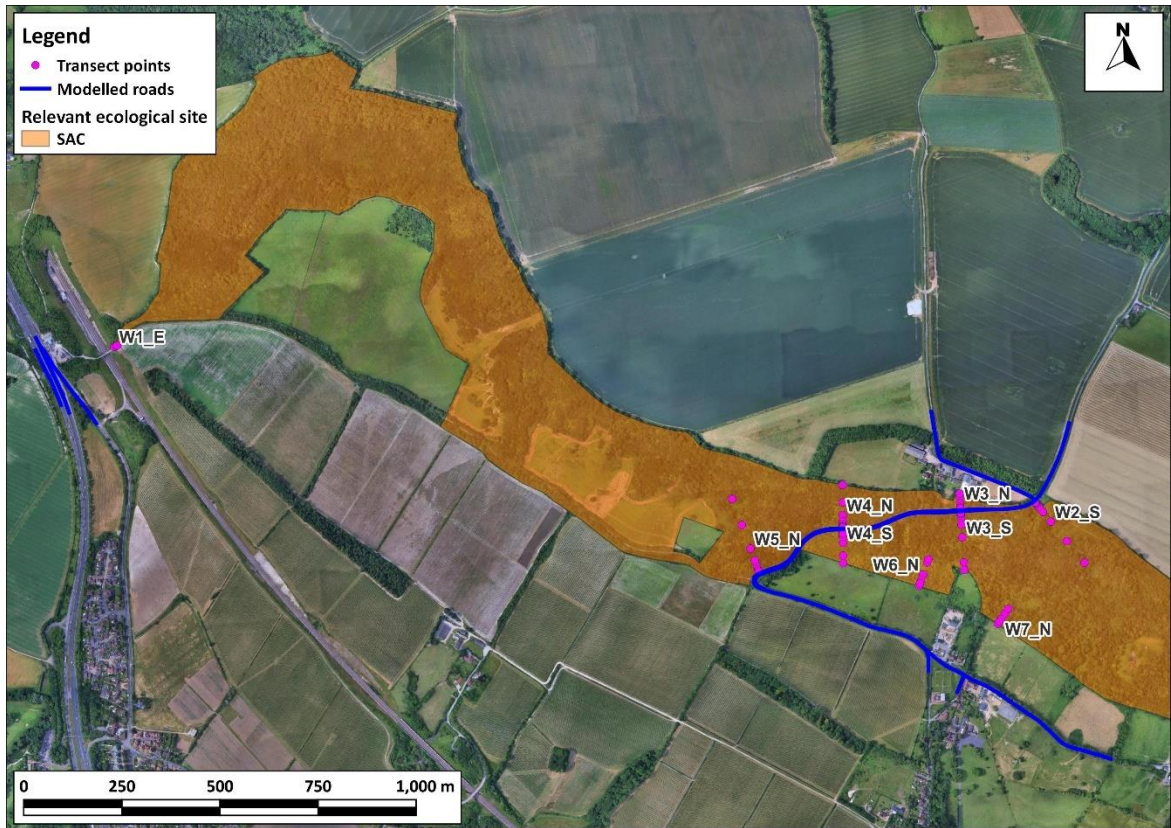


Figure 7: Receptor Transect Locations – North Downs Woodlands

Imagery ©2025 Airbus, Maxar Technologies.

### Uncertainty

- 3.24 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.
- 3.25 An important stage in the process of modelling road traffic emissions of is model verification, which involves comparing the model output with measured concentrations (see Appendix A2). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of base year (2021) concentrations. LAQM.TG22 (Defra, 2022) provides guidance on the evaluation of model performance. Based on the analysis shown in Table A2-5 in Appendix A2, the model performance is considered to be good. There are no suitable roadside NH<sub>3</sub> monitoring sites in the area which can be used to verify the modelled NH<sub>3</sub> concentrations. Development of the CREAM model, which has been used in this assessment, included verifying the emissions model, combined with the ADMS-Roads dispersion model, against measurements from the densest roadside NH<sub>3</sub> monitoring network in Europe (AQC, 2025). The modelling has thus been verified as far as is possible.
- 3.26 Predicting pollutant concentrations in a future year will always be subject to greater uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions.

3.27 Forecasts of future-year concentrations are usually based on measurements made during a recent year. They then take account of projected changes over time to factors such as the composition of the vehicle fleet and the uptake of other new technologies, as well as population increases etc. In early 2020, activity in the UK was disrupted by the COVID-19 pandemic. As a result, concentrations of traffic-related air pollutants fell appreciably (Defra Air Quality Expert Group, 2020). At the same time, concentrations of NH<sub>3</sub> seemed to increase, which is likely relate to disruption of agricultural and land management activities across Europe. A reduction in NO<sub>x</sub> and concurrent increase in NH<sub>3</sub> may have disrupted the formation of ammonium nitrate, which is another important component of nitrogen deposition. The baseline traffic scenario used in this assessment is 2019, which was not affected by the pandemic. However, the background values taken from APIS represent 3-year averages which may include some of the effects of the pandemic. This is not likely to significantly affect the results of this assessment.

## Assumptions

3.28 It is necessary to make a number of assumptions when carrying out an air quality assessment. In order to account for some of the uncertainty in the approach, as described above, assumptions made have generally sought to reflect a realistic worst-case scenario. Key assumptions made in carrying out this assessment include:

- that the Shoeburyness Landwick meteorological monitoring station appropriately represents conditions in the Medway Estuary and Marshes, and Thames Estuary and Marshes, SPA and Ramsar sites (this is discussed further in Appendix A2); and
- that the East Malling meteorological monitoring station appropriately represents conditions in the North Downs Woodlands SAC (this is discussed further in Appendix A2).

## 4 Results

### Impacts of Industrial Development Allocations

- 4.1 Of the sites allocated for employment uses in the Submission Local Plan, only one has been confirmed to include industrial use. The site known as MedwayOne currently has consent for an energy from waste facility (outline planning permission ref. MC/21/0979). It is located on the site of the former Kingsnorth power station and is immediately adjacent to the Medway Estuary and Marshes SPA and Ramsar sites.
- 4.2 The outline planning application for MedwayOne was also supported by a HRA (Aspect Ecology, 2021), an Environmental Statement (ES) (Barton Willmore, 2021a), and an associated ES addendum (Barton Willmore, 2021b). The air quality chapter of the ES considered impacts on the Medway Estuary and Marshes SPA and Ramsar sites and the Thames Estuary and Marshes SPA and Ramsar sites due to emissions from the proposed energy from waste plant. Although the annual mean NO<sub>x</sub> and ammonia PCs were shown to be greater than 1% of the CLEs of 30 µg/m<sup>3</sup> and 3 µg/m<sup>3</sup> respectively, the PECs were well below the CLEs. For nutrient nitrogen deposition the PCs exceeded 1% of the CLo of 20 kgN/ha/yr while the PECs remained below the CLo and, for acid deposition, the PCs were low in comparison to the CLo and the background concentrations. The impact was thus concluded to be insignificant.
- 4.3 The remaining sites allocated for employment do not currently have a defined end-use. Traffic generated by these allocations is included in the data used in this assessment, therefore the results set out below include these traffic-related impacts. The potential for additional impacts relates to emissions from any on-site combustion plant or other emissions associated with heavy industry. While final uses are not yet determined, it is likely that most of the employment allocations will not be associated with significant emissions from sources other than road transport.
- 4.4 Development of each of the employment sites will require individual planning permission. Where there is the potential for significant emissions to air, the planning application would include an air quality assessment of the intended use. With respect to European sites, this would include considering the air quality impacts alone and in-combination with other relevant projects. Large industrial uses would also be regulated under the Environmental Permitting regime, which will ensure that only processes which will not have unacceptable air quality effects are allowed to operate.
- 4.5 The proposed commercial allocations are therefore able to be developed without giving rise to any impacts other than those described in the subsequent sections. If the precise design of future uses involves potentially significant emissions from sources other than road transport, then there are sufficient safeguards in place to ensure that there are no adverse effects on the integrity of the European sites.

### Dispersion Model Results Along Transects

- 4.6 Table 4 to Table 7 set out the concentrations and deposition fluxes along the transects, as well as the changes relative to the CLEs and CLoS. In some cases, Natural England has requested that the degree of 'retardation' to ongoing reductions in nitrogen deposition should also be calculated. This calculation is provided in Appendix A3.

## NOx

**Table 4: Model Results for Annual Mean NOx**

Transect	Distance from Road Edge (m)	Total NOx Concentration ( $\mu\text{g}/\text{m}^3$ )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
<b>Thames Estuary and Marshes SPA and Ramsar</b>								
E1_N	2	30	20.8	11.0	11.5	11.6	0.18	2.00
	3		20.3	10.9	11.4	11.5	0.17	1.83
	5		19.5	10.8	11.2	11.3	0.14	1.56
	9		18.6	10.7	11.0	11.1	0.11	1.22
	17		17.6	10.6	10.8	10.9	0.08	0.85
	33		16.7	10.5	10.6	10.7	0.05	0.53
	65		16.1	10.4	10.5	10.5	0.03	0.30
	129		15.7	10.4	10.4	10.4	0.02	0.17
	200		15.5	10.4	10.4	10.4	0.01	0.11
E2_N	2	30	20.7	10.9	11.5	11.5	0.18	1.97
	3		20.2	10.9	11.4	11.4	0.17	1.81
	5		19.6	10.8	11.3	11.3	0.15	1.57
	9		18.7	10.7	11.1	11.1	0.12	1.25
	17		17.7	10.6	10.9	10.9	0.08	0.89
	33		16.8	10.5	10.7	10.7	0.05	0.56
	65		16.1	10.4	10.5	10.5	0.03	0.32
	129		15.7	10.4	10.4	10.4	0.02	0.17
	200		15.5	10.4	10.4	10.4	0.01	0.11
E3_N	2	30	20.3	10.9	11.4	11.5	0.17	1.83
	3		19.9	10.9	11.3	11.4	0.16	1.69
	5		19.3	10.8	11.2	11.2	0.14	1.48
	9		18.5	10.7	11.0	11.1	0.11	1.20
	17		17.6	10.6	10.8	10.9	0.08	0.86
	33		16.7	10.5	10.7	10.7	0.05	0.55
	65		16.1	10.4	10.5	10.5	0.03	0.31
	129		15.6	10.4	10.4	10.4	0.01	0.16

Transect	Distance from Road Edge (m)	Total NOx Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	200		15.5	10.4	10.4	10.4	0.01	0.10
<b>Medway Estuary and Marshes SPA and Ramsar</b>								
E1_S	2	30	20.2	10.9	11.4	11.4	0.17	1.81
	3		19.8	10.9	11.3	11.3	0.15	1.66
	5		19.2	10.8	11.2	11.2	0.13	1.43
	9		18.4	10.7	11.0	11.0	0.11	1.14
	17		17.5	10.6	10.8	10.8	0.08	0.82
	33		16.7	10.5	10.7	10.7	0.05	0.53
	65		16.0	10.4	10.5	10.5	0.03	0.30
	129		15.6	10.4	10.4	10.4	0.01	0.15
	200		15.5	10.4	10.4	10.4	0.01	0.09
E2_S	2	30	20.0	10.9	11.4	11.4	0.16	1.74
	3		19.6	10.8	11.3	11.3	0.15	1.60
	5		19.1	10.8	11.1	11.2	0.13	1.39
	9		18.3	10.7	11.0	11.0	0.10	1.11
	17		17.4	10.6	10.8	10.8	0.07	0.79
	33		16.6	10.5	10.6	10.6	0.05	0.50
	65		16.0	10.4	10.5	10.5	0.03	0.29
	129		15.6	10.4	10.4	10.4	0.01	0.16
	200		15.5	10.4	10.4	10.4	0.01	0.10
E3_S	2	30	19.7	10.8	11.3	11.3	0.15	1.61
	3		19.3	10.8	11.2	11.2	0.14	1.48
	5		18.8	10.7	11.1	11.1	0.12	1.30
	9		18.1	10.7	11.0	11.0	0.10	1.05
	17		17.3	10.6	10.8	10.8	0.07	0.76
	33		16.6	10.5	10.6	10.6	0.05	0.49
	65		16.0	10.4	10.5	10.5	0.03	0.28
	129		15.6	10.4	10.4	10.4	0.01	0.15
	200		15.5	10.4	10.4	10.4	0.01	0.10

Transect	Distance from Road Edge (m)	Total NOx Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
E4_N	104	30	23.2	12.4	12.4	12.5	0.24	0.48
	105		23.2	12.4	12.4	12.5	0.24	0.48
	107		23.1	12.3	12.4	12.5	0.24	0.47
	111		23.0	12.3	12.4	12.5	0.23	0.45
	119		22.8	12.3	12.4	12.4	0.21	0.42
	135		22.4	12.3	12.3	12.4	0.18	0.36
	167		21.8	12.2	12.2	12.3	0.14	0.28
	200		21.4	12.1	12.2	12.2	0.11	0.22
E5_N	57	30	26.6	12.7	12.9	13.0	0.41	0.84
	58		26.5	12.7	12.9	13.0	0.40	0.83
	60		26.3	12.7	12.8	12.9	0.39	0.80
	64		25.9	12.7	12.8	12.9	0.36	0.75
	72		25.2	12.6	12.7	12.8	0.32	0.67
	88		24.2	12.5	12.5	12.6	0.26	0.54
	120		22.9	12.3	12.4	12.4	0.17	0.37
	184		21.6	12.2	12.2	12.2	0.10	0.21
	200		21.4	12.1	12.2	12.2	0.09	0.19
E6_E	181	30	16.3	10.0	10.0	10.0	0.01	0.03
	182		16.3	10.0	10.0	10.0	0.01	0.03
	184		16.3	10.0	10.0	10.0	0.01	0.03
	188		16.3	10.0	10.0	10.0	0.01	0.02
	196		16.3	10.0	10.0	10.0	0.01	0.02
	200		16.2	10.0	10.0	10.0	0.01	0.02
E7_N	16	30	20.3	10.4	10.5	10.5	0.02	0.19
	17		20.1	10.4	10.4	10.4	0.02	0.19
	19		19.8	10.4	10.4	10.4	0.02	0.18
	20		19.7	10.3	10.4	10.4	0.02	0.17
E8_W	76	30	17.9	10.2	10.2	10.2	0.01	0.10
	77		17.9	10.2	10.2	10.2	0.01	0.10

Transect	Distance from Road Edge (m)	Total NOx Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	79		17.9	10.2	10.2	10.2	0.01	0.10
	83		17.9	10.2	10.2	10.2	0.01	0.09
	91		17.8	10.2	10.2	10.2	0.01	0.09
	96		17.8	10.2	10.2	10.2	0.01	0.09
<b>North Downs Woodlands SAC</b>								
W1_E	166	30	22.9	10.7	10.8	10.8	0.03	0.53
	167		22.9	10.7	10.8	10.8	0.03	0.52
	169		22.8	10.7	10.8	10.8	0.03	0.51
	173		22.6	10.7	10.8	10.8	0.03	0.49
	175		22.5	10.7	10.8	10.8	0.03	0.49
W2_S	2	30	30.6	11.5	11.8	11.9	0.35	1.32
	3		29.1	11.3	11.6	11.7	0.31	1.15
	5		27.0	11.1	11.3	11.4	0.25	0.93
	9		24.6	10.9	11.0	11.1	0.18	0.68
	17		22.4	10.7	10.8	10.8	0.12	0.44
	33		20.6	10.5	10.5	10.6	0.07	0.26
	65		19.5	10.4	10.4	10.4	0.04	0.15
	129		18.8	10.3	10.3	10.3	0.02	0.08
	200		18.5	10.3	10.3	10.3	0.02	0.05
W3_N	2	30	34.8	12.2	12.4	12.6	0.50	1.17
	3		33.3	12.0	12.2	12.4	0.46	1.09
	5		31.2	11.8	12.0	12.1	0.39	0.98
	9		28.6	11.5	11.6	11.7	0.31	0.82
	17		25.9	11.1	11.3	11.3	0.23	0.63
	33		23.4	10.8	10.9	11.0	0.16	0.46
	41		22.7	10.8	10.8	10.9	0.14	0.42
W3_S	2	30	28.3	11.4	11.6	11.7	0.28	0.99
	3		27.3	11.3	11.5	11.6	0.26	0.87
	5		25.9	11.1	11.3	11.3	0.22	0.73

Transect	Distance from Road Edge (m)	Total NOx Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	9		24.2	10.9	11.0	11.1	0.17	0.56
	17		22.5	10.7	10.8	10.8	0.13	0.40
	33		21.0	10.6	10.6	10.6	0.09	0.27
	65		20.0	10.4	10.5	10.5	0.06	0.19
	129		19.4	10.4	10.4	10.4	0.04	0.14
	148		19.4	10.4	10.4	10.4	0.04	0.14
W4_N	2	30	35.9	12.3	12.6	12.7	0.52	1.26
	3		34.3	12.2	12.4	12.5	0.47	1.17
	5		32.1	11.9	12.1	12.2	0.41	1.04
	9		29.3	11.6	11.7	11.8	0.32	0.86
	17		26.4	11.2	11.3	11.4	0.24	0.65
	33		23.7	10.9	11.0	11.0	0.16	0.45
	65		21.5	10.6	10.7	10.7	0.10	0.29
	110		20.3	10.5	10.5	10.5	0.06	0.19
W4_S	2	30	29.5	11.6	11.8	11.9	0.31	1.05
	3		28.4	11.4	11.6	11.7	0.28	0.93
	5		27.0	11.3	11.4	11.5	0.24	0.79
	9		25.2	11.0	11.2	11.2	0.20	0.62
	17		23.3	10.8	10.9	11.0	0.15	0.46
	33		21.9	10.7	10.7	10.8	0.11	0.34
	65		21.0	10.5	10.6	10.6	0.08	0.27
	84		20.9	10.5	10.6	10.6	0.08	0.27
W5_N	2	30	36.9	12.5	12.6	12.7	0.26	0.73
	3		35.1	12.3	12.4	12.5	0.24	0.68
	5		32.4	11.9	12.1	12.1	0.20	0.61
	9		28.8	11.5	11.6	11.7	0.16	0.49
	17		25.1	11.1	11.1	11.2	0.11	0.36
	33		22.0	10.7	10.7	10.8	0.07	0.23
	65		20.0	10.5	10.5	10.5	0.04	0.14

Transect	Distance from Road Edge (m)	Total NOx Concentration (µg/m³)				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	129		19.0	10.3	10.3	10.4	0.02	0.08
	200		18.6	10.3	10.3	10.3	0.02	0.05
W6_N	128	30	20.1	10.4	10.5	10.5	0.06	0.21
	129		20.1	10.4	10.5	10.5	0.06	0.21
	131		20.1	10.4	10.5	10.5	0.06	0.21
	135		20.0	10.4	10.5	10.5	0.06	0.20
	143		20.0	10.4	10.5	10.5	0.06	0.20
	159		19.9	10.4	10.5	10.5	0.05	0.19
	191		19.8	10.4	10.5	10.5	0.05	0.17
	200		19.8	10.4	10.5	10.5	0.05	0.17
W7_N	154	30	19.1	10.3	10.4	10.4	0.03	0.10
	155		19.1	10.3	10.4	10.4	0.03	0.10
	157		19.1	10.3	10.4	10.4	0.03	0.10
	161		19.1	10.3	10.4	10.4	0.03	0.10
	169		19.1	10.3	10.4	10.4	0.03	0.10
	185		19.0	10.3	10.3	10.4	0.03	0.09
	200		19.0	10.3	10.3	10.4	0.03	0.09

### Ammonia

Table 5: Model Results for Annual Mean NH<sub>3</sub>

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m³)				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
<b>Thames Estuary and Marshes SPA and Ramsar</b>								
E1_N	2	1	1.10	1.11	1.27	1.28	1.67	17.3
	3		1.08	1.10	1.24	1.25	1.50	15.7
	5		1.05	1.08	1.19	1.21	1.27	13.2
	9		1.02	1.05	1.14	1.15	0.97	10.1
	17		0.98	1.02	1.08	1.09	0.65	6.8

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m <sup>3</sup> )				Change as % of Cle		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	33		0.95	1.00	1.03	1.04	0.39	4.1
	65		0.93	0.98	1.00	1.00	0.22	2.2
	129		0.91	0.97	0.98	0.98	0.11	1.2
	200		0.91	0.97	0.98	0.98	0.08	0.8
E2_N	2	1	1.10	1.11	1.27	1.28	1.65	17.2
	3		1.08	1.10	1.24	1.25	1.51	15.7
	5		1.06	1.08	1.20	1.21	1.29	13.4
	9		1.02	1.05	1.15	1.16	1.00	10.4
	17		0.98	1.02	1.09	1.10	0.69	7.2
	33		0.95	1.00	1.04	1.04	0.42	4.3
	65		0.93	0.98	1.00	1.00	0.22	2.3
	129		0.91	0.97	0.98	0.98	0.11	1.2
	200		0.91	0.97	0.97	0.98	0.07	0.7
E3_N	2	1	1.09	1.10	1.24	1.26	1.53	16.0
	3		1.07	1.09	1.22	1.23	1.41	14.6
	5		1.05	1.07	1.18	1.20	1.22	12.6
	9		1.02	1.05	1.14	1.15	0.96	10.0
	17		0.98	1.02	1.08	1.09	0.67	7.0
	33		0.95	1.00	1.04	1.04	0.41	4.2
	65		0.93	0.98	1.00	1.00	0.22	2.3
	129		0.91	0.97	0.98	0.98	0.11	1.1
	200		0.91	0.97	0.97	0.97	0.07	0.7
<b>Medway Estuary and Marshes SPA and Ramsar</b>								
E1_S	2	1	1.08	1.10	1.24	1.25	1.49	15.5
	3		1.07	1.08	1.21	1.22	1.36	14.1
	5		1.04	1.06	1.17	1.18	1.15	11.9
	9		1.01	1.04	1.13	1.13	0.89	9.3
	17		0.98	1.02	1.08	1.08	0.62	6.4
	33		0.95	1.00	1.03	1.03	0.38	3.9

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	65		0.92	0.98	1.00	1.00	0.20	2.0
	129		0.91	0.97	0.98	0.98	0.09	1.0
	200		0.91	0.97	0.97	0.97	0.05	0.6
E2_S	2	1	1.08	1.09	1.23	1.24	1.44	15.0
	3		1.06	1.08	1.20	1.22	1.31	13.6
	5		1.04	1.06	1.17	1.18	1.12	11.6
	9		1.01	1.04	1.12	1.13	0.87	9.0
	17		0.97	1.02	1.07	1.08	0.60	6.2
	33		0.94	0.99	1.03	1.03	0.36	3.7
	65		0.92	0.98	1.00	1.00	0.20	2.0
	129		0.91	0.97	0.98	0.98	0.10	1.0
	200		0.91	0.97	0.97	0.97	0.06	0.6
E3_S	2	1	1.06	1.08	1.20	1.22	1.32	13.7
	3		1.05	1.07	1.18	1.19	1.20	12.5
	5		1.03	1.05	1.15	1.16	1.03	10.8
	9		1.00	1.03	1.11	1.12	0.81	8.5
	17		0.97	1.01	1.07	1.07	0.57	5.9
	33		0.94	0.99	1.03	1.03	0.35	3.6
	65		0.92	0.98	1.00	1.00	0.19	1.9
	129		0.91	0.97	0.98	0.98	0.09	1.0
	200		0.91	0.97	0.97	0.97	0.06	0.6
E4_N	104	1	1.12	1.16	1.17	1.19	2.04	3.4
	105		1.12	1.16	1.17	1.19	2.02	3.4
	107		1.12	1.16	1.17	1.19	1.98	3.3
	111		1.11	1.15	1.17	1.18	1.90	3.2
	119		1.10	1.15	1.16	1.18	1.76	3.0
	135		1.09	1.14	1.15	1.16	1.52	2.6
	167		1.07	1.12	1.13	1.14	1.17	2.0
	200		1.05	1.12	1.12	1.13	0.92	1.6

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m <sup>3</sup> )				Change as % of Cle		
		Cle	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
E5_N	57	1	1.25	1.24	1.27	1.31	3.70	6.4
	58		1.25	1.24	1.27	1.30	3.64	6.3
	60		1.24	1.23	1.26	1.30	3.52	6.1
	64		1.23	1.22	1.25	1.28	3.30	5.7
	72		1.20	1.21	1.23	1.26	2.91	5.0
	88		1.16	1.18	1.20	1.22	2.32	4.0
	120		1.11	1.15	1.16	1.18	1.59	2.8
	184		1.06	1.12	1.13	1.14	0.89	1.6
	200		1.06	1.12	1.12	1.13	0.79	1.4
E6_E	181	1	1.01	1.09	1.10	1.10	0.06	0.2
	182		1.01	1.09	1.10	1.10	0.06	0.2
	184		1.01	1.09	1.10	1.10	0.06	0.2
	188		1.01	1.09	1.09	1.10	0.06	0.2
	196		1.01	1.09	1.09	1.09	0.06	0.2
	200		1.01	1.09	1.09	1.09	0.06	0.2
E7_N	16	1	1.13	1.18	1.18	1.19	0.24	1.2
	17		1.13	1.17	1.18	1.18	0.23	1.1
	19		1.12	1.17	1.17	1.18	0.21	1.0
	20		1.11	1.16	1.17	1.17	0.20	1.0
E8_W	76	1	1.06	1.13	1.13	1.13	0.10	0.6
	77		1.06	1.13	1.13	1.13	0.10	0.6
	79		1.06	1.12	1.13	1.13	0.10	0.6
	83		1.06	1.12	1.13	1.13	0.10	0.5
	91		1.05	1.12	1.13	1.13	0.10	0.5
	96		1.05	1.12	1.13	1.13	0.10	0.5
<b>North Downs Woodlands SAC</b>								
W1_E	166	1	1.08	1.14	1.17	1.17	0.13	2.4
	167		1.08	1.14	1.16	1.17	0.13	2.4
	169		1.08	1.14	1.16	1.16	0.13	2.3

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	173		1.08	1.14	1.16	1.16	0.12	2.2
	175		1.08	1.14	1.16	1.16	0.12	2.2
W2_S	2	1	1.60	1.49	1.61	1.66	4.51	17.0
	3		1.51	1.43	1.53	1.57	3.83	14.4
	5		1.40	1.34	1.43	1.45	2.94	11.1
	9		1.27	1.25	1.31	1.33	1.97	7.4
	17		1.16	1.18	1.21	1.22	1.13	4.2
	33		1.08	1.12	1.14	1.14	0.56	2.1
	65		1.04	1.09	1.10	1.10	0.25	0.9
	129		1.02	1.08	1.08	1.08	0.11	0.4
	200		1.01	1.08	1.08	1.08	0.07	0.2
W3_N	2	1	1.75	1.61	1.73	1.79	5.70	18.3
	3		1.67	1.55	1.66	1.71	5.04	16.5
	5		1.56	1.46	1.56	1.60	4.12	13.9
	9		1.42	1.36	1.44	1.47	3.06	10.6
	17		1.27	1.26	1.31	1.33	2.01	7.1
	33		1.16	1.18	1.21	1.23	1.20	4.4
	41		1.13	1.16	1.19	1.20	1.01	3.7
W3_S	2	1	1.46	1.39	1.49	1.52	3.01	13.1
	3		1.40	1.35	1.43	1.46	2.66	11.3
	5		1.32	1.29	1.36	1.38	2.17	9.0
	9		1.23	1.23	1.28	1.30	1.60	6.4
	17		1.15	1.17	1.20	1.21	1.04	4.1
	33		1.09	1.13	1.15	1.15	0.61	2.3
	65		1.05	1.10	1.11	1.11	0.34	1.3
	129		1.03	1.09	1.10	1.10	0.22	0.8
	148		1.03	1.09	1.09	1.10	0.21	0.8
W4_N	2	1	1.80	1.64	1.77	1.83	5.90	19.5
	3		1.71	1.57	1.70	1.75	5.22	17.6

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	5		1.59	1.48	1.59	1.63	4.27	14.7
	9		1.44	1.38	1.46	1.49	3.16	11.1
	17		1.29	1.27	1.32	1.35	2.06	7.4
	33		1.17	1.19	1.22	1.23	1.18	4.3
	65		1.09	1.13	1.14	1.15	0.60	2.2
	110		1.05	1.10	1.11	1.11	0.33	1.2
W4_S	2	1	1.50	1.42	1.53	1.56	3.32	14.0
	3		1.44	1.38	1.47	1.50	2.94	12.2
	5		1.36	1.32	1.39	1.42	2.41	9.8
	9		1.26	1.25	1.31	1.32	1.79	7.1
	17		1.17	1.19	1.22	1.24	1.19	4.6
	33		1.11	1.14	1.16	1.17	0.75	2.8
	65		1.07	1.12	1.13	1.14	0.51	1.9
	84		1.07	1.12	1.13	1.14	0.49	1.8
W5_N	2	1	1.84	1.65	1.78	1.84	6.39	19.5
	3		1.74	1.58	1.70	1.75	5.61	17.4
	5		1.60	1.48	1.58	1.62	4.47	14.2
	9		1.42	1.36	1.43	1.46	3.10	10.1
	17		1.25	1.24	1.28	1.30	1.79	6.0
	33		1.12	1.15	1.17	1.18	0.85	2.9
	65		1.05	1.10	1.11	1.12	0.35	1.2
	129		1.02	1.08	1.09	1.09	0.13	0.5
	200		1.01	1.08	1.08	1.08	0.07	0.2
W6_N	128	1	1.05	1.10	1.11	1.11	0.33	1.2
	129		1.05	1.10	1.11	1.11	0.33	1.2
	131		1.05	1.10	1.11	1.11	0.33	1.2
	135		1.04	1.10	1.11	1.11	0.32	1.2
	143		1.04	1.10	1.11	1.11	0.31	1.1
	159		1.04	1.10	1.10	1.11	0.29	1.1

Transect	Distance from Road Edge (m)	Total NH <sub>3</sub> Concentration (µg/m <sup>3</sup> )				Change as % of CLe		
		CLe	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	191		1.04	1.10	1.10	1.11	0.27	1.0
	200		1.04	1.10	1.10	1.11	0.27	1.0
W7_N	154	1	1.02	1.09	1.09	1.09	0.18	0.6
	155		1.02	1.09	1.09	1.09	0.18	0.6
	157		1.02	1.08	1.09	1.09	0.18	0.6
	161		1.02	1.08	1.09	1.09	0.17	0.6
	169		1.02	1.08	1.09	1.09	0.16	0.6
	185		1.02	1.08	1.09	1.09	0.15	0.5
	200		1.02	1.08	1.09	1.09	0.14	0.5

### Nitrogen Deposition

Table 6: Model Results for Nitrogen Deposition

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
<b>Thames Estuary and Marshes SPA and Ramsar</b>								
E1_N	2	10	12.9	11.9	12.7	12.8	0.89	9.42
	3		12.8	11.8	12.6	12.7	0.81	8.52
	5		12.6	11.7	12.3	12.4	0.69	7.18
	9		12.3	11.5	12.0	12.1	0.52	5.49
	17		12.1	11.4	11.7	11.8	0.35	3.70
	33		11.8	11.3	11.5	11.5	0.22	2.22
	65		11.7	11.2	11.3	11.3	0.11	1.22
	129		11.6	11.1	11.2	11.2	0.06	0.64
	200		11.6	11.1	11.1	11.1	0.04	0.42
E2_N	2	10	12.9	11.9	12.7	12.8	0.89	9.35
	3		12.8	11.8	12.6	12.7	0.83	8.53
	5		12.6	11.7	12.4	12.4	0.71	7.29
	9		12.4	11.6	12.1	12.1	0.55	5.67

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	17		12.1	11.4	11.8	11.8	0.37	3.91
	33		11.9	11.3	11.5	11.5	0.23	2.37
	65		11.7	11.2	11.3	11.3	0.12	1.26
	129		11.6	11.1	11.2	11.2	0.06	0.64
	200		11.6	11.1	11.1	11.1	0.04	0.40
E3_N	2	10	12.8	11.8	12.6	12.7	0.83	8.67
	3		12.7	11.8	12.5	12.6	0.76	7.96
	5		12.6	11.7	12.3	12.4	0.66	6.88
	9		12.3	11.5	12.0	12.1	0.51	5.43
	17		12.1	11.4	11.7	11.8	0.38	3.80
	33		11.9	11.3	11.5	11.5	0.23	2.31
	65		11.7	11.2	11.3	11.3	0.11	1.23
	129		11.6	11.1	11.2	11.2	0.06	0.62
	200		11.6	11.1	11.1	11.1	0.04	0.37
<b>Medway Estuary and Marshes SPA and Ramsar</b>								
E1_S	2	10	12.8	11.8	12.6	12.7	0.81	8.45
	3		12.7	11.7	12.4	12.5	0.73	7.67
	5		12.5	11.6	12.2	12.3	0.63	6.50
	9		12.3	11.5	12.0	12.0	0.49	5.06
	17		12.0	11.4	11.7	11.7	0.34	3.51
	33		11.8	11.3	11.5	11.5	0.21	2.15
	65		11.7	11.2	11.3	11.3	0.12	1.12
	129		11.6	11.1	11.2	11.2	0.05	0.52
	200		11.6	11.1	11.1	11.1	0.03	0.32
E2_S	2	10	12.7	11.8	12.5	12.6	0.79	8.16
	3		12.6	11.7	12.4	12.5	0.71	7.41
	5		12.5	11.6	12.2	12.3	0.61	6.31
	9		12.3	11.5	11.9	12.0	0.48	4.91
	17		12.0	11.4	11.7	11.7	0.32	3.37

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	33		11.8	11.2	11.4	11.5	0.20	2.04
	65		11.7	11.2	11.3	11.3	0.12	1.12
	129		11.6	11.1	11.2	11.2	0.07	0.57
	200		11.6	11.1	11.1	11.1	0.03	0.34
E3_S	2	10	12.6	11.7	12.4	12.5	0.73	7.45
	3		12.5	11.7	12.3	12.3	0.65	6.82
	5		12.4	11.6	12.1	12.2	0.55	5.85
	9		12.2	11.5	11.9	11.9	0.44	4.61
	17		12.0	11.4	11.6	11.7	0.31	3.24
	33		11.8	11.2	11.4	11.4	0.19	1.99
	65		11.7	11.2	11.3	11.3	0.10	1.07
	129		11.6	11.1	11.2	11.2	0.05	0.53
	200		11.6	11.1	11.1	11.1	0.03	0.34
E4_N	104	10	13.6	12.7	12.7	12.9	1.12	1.89
	105		13.6	12.7	12.7	12.8	1.09	1.87
	107		13.5	12.7	12.7	12.8	1.09	1.84
	111		13.5	12.6	12.7	12.8	1.03	1.77
	119		13.4	12.6	12.7	12.8	0.95	1.63
	135		13.3	12.6	12.6	12.7	0.82	1.40
	167		13.2	12.5	12.5	12.6	0.63	1.08
	200		13.1	12.4	12.5	12.5	0.49	0.85
E5_N	57	10	14.5	13.1	13.3	13.5	2.01	3.49
	58		14.4	13.1	13.3	13.5	1.98	3.44
	60		14.4	13.1	13.2	13.4	1.91	3.33
	64		14.3	13.0	13.2	13.3	1.78	3.12
	72		14.1	12.9	13.1	13.2	1.58	2.76
	88		13.8	12.8	12.9	13.0	1.25	2.20
	120		13.5	12.6	12.7	12.8	0.87	1.53
	184		13.2	12.5	12.5	12.5	0.48	0.85

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	200		13.1	12.4	12.5	12.5	0.44	0.76
E6_E	181	10	12.4	12.0	12.0	12.0	0.05	0.11
	182		12.4	12.0	12.0	12.0	0.05	0.11
	184		12.4	12.0	12.0	12.0	0.03	0.09
	188		12.4	12.0	12.0	12.0	0.03	0.09
	196		12.4	12.0	12.0	12.0	0.03	0.08
	200		12.4	12.0	12.0	12.0	0.03	0.08
E7_N	16	10	13.3	12.5	12.5	12.5	0.14	0.65
	17		13.2	12.4	12.5	12.5	0.12	0.63
	19		13.2	12.4	12.4	12.5	0.13	0.59
	20		13.1	12.4	12.4	12.4	0.12	0.56
E8_W	76	10	12.7	12.2	12.2	12.2	0.05	0.31
	77		12.7	12.2	12.2	12.2	0.05	0.31
	79		12.7	12.2	12.2	12.2	0.05	0.30
	83		12.7	12.2	12.2	12.2	0.05	0.30
	91		12.7	12.2	12.2	12.2	0.05	0.30
	96		12.7	12.2	12.2	12.2	0.07	0.29
<b>North Downs Woodlands SAC</b>								
W1_E	166	10	26.5	24.4	24.6	24.6	0.10	2.1
	167		26.5	24.4	24.6	24.6	0.13	2.1
	169		26.5	24.4	24.6	24.6	0.10	2.0
	173		26.4	24.3	24.5	24.5	0.10	1.9
	175		26.4	24.3	24.5	24.5	0.12	1.9
W2_S	2	10	31.6	27.2	28.2	28.6	3.66	13.8
	3		30.7	26.7	27.6	27.9	3.13	11.7
	5		29.5	26.0	26.7	26.9	2.37	9.0
	9		28.2	25.3	25.7	25.9	1.62	6.1
	17		27.0	24.7	24.9	25.0	0.93	3.5
	33		26.2	24.2	24.3	24.4	0.49	1.7

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	65		25.7	24.0	24.0	24.0	0.22	0.8
	129		25.4	23.8	23.9	23.9	0.11	0.3
	200		25.4	23.8	23.8	23.8	0.05	0.2
W3_N	2	10	33.3	28.2	29.2	29.7	4.64	14.7
	3		32.4	27.7	28.7	29.1	4.12	13.3
	5		31.3	27.0	27.8	28.2	3.35	11.2
	9		29.9	26.2	26.8	27.1	2.53	8.6
	17		28.4	25.4	25.8	26.0	1.65	5.8
	33		27.2	24.7	25.0	25.1	1.02	3.6
	41		26.9	24.6	24.8	24.9	0.84	3.1
W3_S	2	10	30.1	26.4	27.2	27.5	2.46	10.7
	3		29.6	26.1	26.8	27.0	2.18	9.2
	5		28.8	25.6	26.2	26.4	1.78	7.3
	9		27.9	25.1	25.5	25.6	1.30	5.3
	17		27.0	24.6	24.9	25.0	0.87	3.4
	33		26.3	24.3	24.4	24.5	0.50	1.9
	65		25.9	24.0	24.1	24.1	0.30	1.1
	129		25.6	23.9	24.0	24.0	0.17	0.7
	148		25.6	23.9	24.0	24.0	0.19	0.7
W4_N	2	10	33.7	28.5	29.6	30.0	4.80	15.7
	3		32.9	27.9	28.9	29.4	4.27	14.2
	5		31.6	27.2	28.1	28.4	3.50	11.9
	9		30.1	26.3	27.0	27.2	2.60	9.0
	17		28.6	25.5	25.9	26.1	1.72	6.0
	33		27.3	24.8	25.0	25.1	0.98	3.5
	65		26.4	24.3	24.4	24.5	0.53	1.9
	110		25.9	24.0	24.1	24.1	0.29	1.0
W4_S	2	10	30.6	26.7	27.5	27.8	2.73	11.3
	3		30.0	26.3	27.1	27.3	2.40	9.9

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	5		29.2	25.8	26.4	26.6	1.99	8.0
	9		28.2	25.3	25.7	25.9	1.48	5.8
	17		27.3	24.8	25.1	25.2	0.98	3.8
	33		26.6	24.4	24.6	24.6	0.61	2.3
	65		26.2	24.2	24.3	24.4	0.43	1.6
	84		26.1	24.2	24.3	24.3	0.44	1.5
W5_N	2	10	34.2	28.6	29.6	30.1	5.10	15.5
	3		33.2	28.0	29.0	29.4	4.48	13.8
	5		31.7	27.2	28.0	28.3	3.54	11.3
	9		29.9	26.2	26.7	27.0	2.47	8.0
	17		28.1	25.2	25.5	25.7	1.45	4.8
	33		26.7	24.4	24.6	24.7	0.69	2.4
	65		25.9	24.0	24.1	24.1	0.30	1.0
	129		25.5	23.9	23.9	23.9	0.10	0.4
200	25.4	23.8	23.8	23.8	0.05	0.2		
W6_N	128	10	25.9	24.0	24.1	24.1	0.29	1.1
	129		25.9	24.0	24.1	24.1	0.29	1.0
	131		25.9	24.0	24.1	24.1	0.28	1.0
	135		25.8	24.0	24.1	24.1	0.28	1.0
	143		25.8	24.0	24.1	24.1	0.27	1.0
	159		25.8	24.0	24.1	24.1	0.25	0.9
	191		25.8	24.0	24.0	24.1	0.21	0.9
	200		25.8	24.0	24.0	24.1	0.24	0.9
W7_N	154	10	25.5	23.9	23.9	23.9	0.17	0.5
	155		25.5	23.9	23.9	23.9	0.17	0.5
	157		25.5	23.9	23.9	23.9	0.17	0.5
	161		25.5	23.9	23.9	23.9	0.16	0.5
	169		25.5	23.9	23.9	23.9	0.13	0.5
	185		25.5	23.9	23.9	23.9	0.12	0.4

Transect	Distance from Road Edge (m)	Total Nitrogen Deposition (kgN/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	200		25.5	23.9	23.9	23.9	0.14	0.4

### Acid Deposition

Table 7: Model Results for Acid Deposition

Transect	Distance from Road Edge (m)	Total Acid Deposition (keq/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
<b>North Downs Woodlands SAC</b>								
W1_E	166	1.983	1.90	1.74	1.76	1.76	0.04	0.76
	167		1.89	1.74	1.76	1.76	0.05	0.75
	169		1.89	1.74	1.75	1.75	0.04	0.73
	173		1.89	1.74	1.75	1.75	0.03	0.70
	175		1.89	1.74	1.75	1.75	0.04	0.68
W2_S	2	1.983	2.26	1.94	2.02	2.04	1.32	4.98
	3		2.19	1.91	1.97	1.99	1.13	4.23
	5		2.11	1.86	1.91	1.92	0.86	3.24
	9		2.01	1.81	1.84	1.85	0.58	2.18
	17		1.93	1.76	1.78	1.79	0.34	1.26
	33		1.87	1.73	1.74	1.74	0.18	0.63
	65		1.83	1.71	1.72	1.72	0.08	0.28
	129		1.82	1.70	1.70	1.71	0.04	0.12
	200		1.81	1.70	1.70	1.70	0.02	0.08
W3_N	2	1.983	2.38	2.02	2.09	2.12	1.67	5.31
	3		2.32	1.98	2.05	2.08	1.49	4.80
	5		2.23	1.93	1.99	2.01	1.21	4.04
	9		2.13	1.87	1.92	1.93	0.91	3.09
	17		2.03	1.81	1.84	1.85	0.59	2.09
	33		1.94	1.77	1.78	1.79	0.37	1.30
	41		1.92	1.75	1.77	1.78	0.30	1.10

Transect	Distance from Road Edge (m)	Total Acid Deposition (keq/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
W3_S	2	1.983	2.15	1.89	1.94	1.96	0.89	3.84
	3		2.11	1.86	1.91	1.93	0.79	3.32
	5		2.06	1.83	1.87	1.88	0.64	2.63
	9		1.99	1.79	1.82	1.83	0.47	1.89
	17		1.93	1.76	1.78	1.78	0.31	1.21
	33		1.88	1.73	1.74	1.75	0.18	0.70
	65		1.85	1.72	1.72	1.72	0.11	0.40
	129		1.83	1.71	1.71	1.71	0.06	0.25
	148		1.83	1.71	1.71	1.71	0.07	0.24
W4_N	2	1.983	2.41	2.03	2.11	2.15	1.73	5.67
	3		2.35	2.00	2.07	2.10	1.54	5.10
	5		2.26	1.94	2.00	2.03	1.26	4.27
	9		2.15	1.88	1.93	1.95	0.94	3.23
	17		2.04	1.82	1.85	1.86	0.62	2.17
	33		1.95	1.77	1.79	1.79	0.35	1.27
	65		1.88	1.73	1.74	1.75	0.19	0.67
	110		1.85	1.72	1.72	1.72	0.10	0.37
W4_S	2	1.983	2.19	1.91	1.97	1.99	0.98	4.08
	3		2.14	1.88	1.93	1.95	0.87	3.55
	5		2.09	1.85	1.89	1.90	0.72	2.87
	9		2.02	1.81	1.84	1.85	0.53	2.08
	17		1.95	1.77	1.79	1.80	0.35	1.36
	33		1.90	1.74	1.75	1.76	0.22	0.84
	65		1.87	1.73	1.74	1.74	0.15	0.58
	84		1.87	1.73	1.73	1.74	0.16	0.55
W5_N	2	1.983	2.44	2.04	2.12	2.15	1.84	5.58
	3		2.37	2.00	2.07	2.10	1.61	4.98
	5		2.27	1.94	2.00	2.02	1.28	4.06
	9		2.14	1.87	1.91	1.93	0.89	2.90

Transect	Distance from Road Edge (m)	Total Acid Deposition (keq/ha/yr)				Change as % of CLo		
		CLo	A) 2019 Base	B) 2041 Zero Growth	C) 2041 Base	D) 2041 With Plan	Alone (D-C)	In Combination (D-B)
	17		2.01	1.80	1.82	1.83	0.52	1.73
	33		1.91	1.75	1.76	1.76	0.25	0.86
	65		1.85	1.72	1.72	1.72	0.11	0.37
	129		1.82	1.70	1.71	1.71	0.04	0.15
	200		1.81	1.70	1.70	1.70	0.02	0.07
W6_N	128	1.983	1.85	1.72	1.72	1.72	0.10	0.38
	129		1.85	1.72	1.72	1.72	0.10	0.38
	131		1.85	1.72	1.72	1.72	0.10	0.37
	135		1.85	1.72	1.72	1.72	0.10	0.37
	143		1.84	1.72	1.72	1.72	0.10	0.35
	159		1.84	1.71	1.72	1.72	0.09	0.33
	191		1.84	1.71	1.72	1.72	0.08	0.31
	200		1.84	1.71	1.72	1.72	0.09	0.32
W7_N	154	1.983	1.82	1.71	1.71	1.71	0.06	0.20
	155		1.82	1.71	1.71	1.71	0.06	0.20
	157		1.82	1.71	1.71	1.71	0.06	0.19
	161		1.82	1.71	1.71	1.71	0.06	0.19
	169		1.82	1.71	1.71	1.71	0.05	0.17
	185		1.82	1.71	1.71	1.71	0.04	0.16
	200		1.82	1.70	1.71	1.71	0.05	0.16

### Summary

4.7 Table 8 summarises the air quality predictions at the worst-case location within each designated site. As explained in Paragraph 2.13, the potential for significant adverse effects can be ruled out wherever the PC is less than 1% of the CLe/CLo or the PEC is less than the relevant CLe/CLo. The test against the PEC may also need to be described within an Appropriate Assessment, but Table 8 nevertheless summarises which impacts can ultimately be disregarded solely on the basis of the air quality predictions.

**Table 8: Summary of Air Quality Predictions**

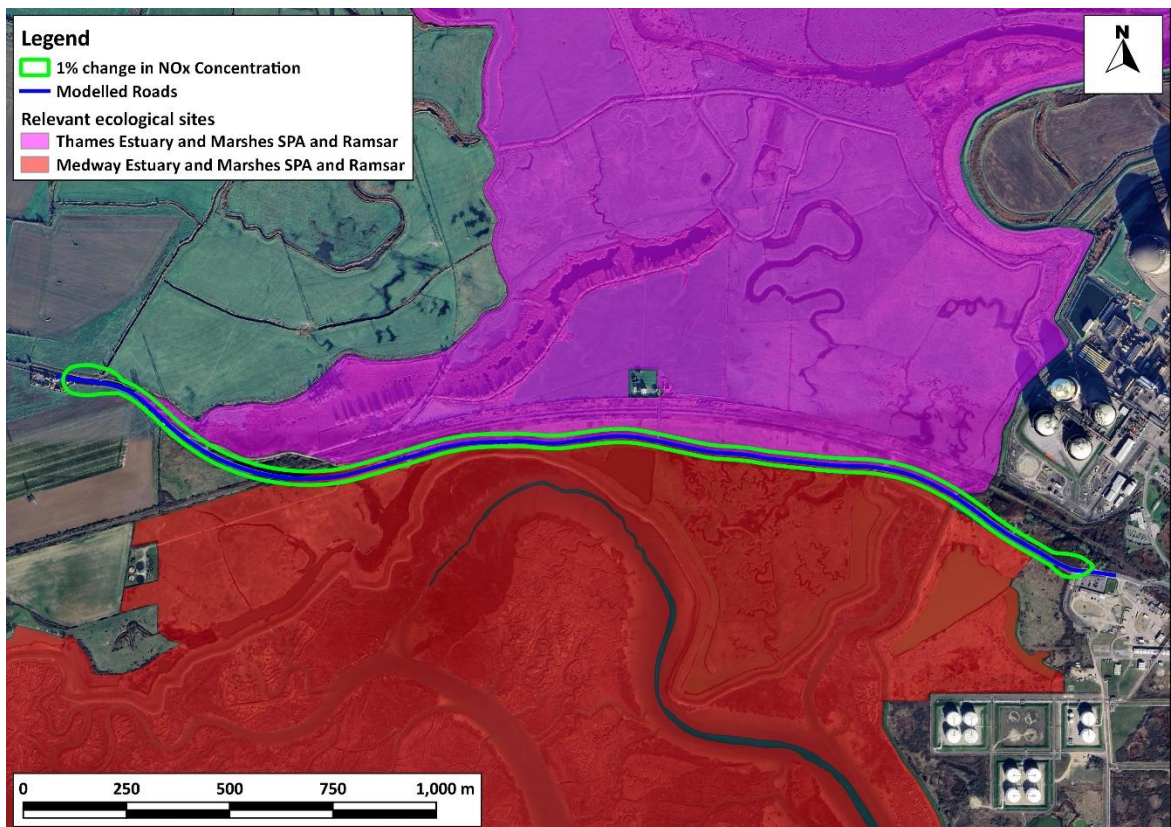
Pollutant	CLe/CLo	PC Alone <1% of CLe/CLo	PC In Combination <1% of CLe/CLo	PEC < CLe/CLo	Screens Out
<b>Thames Estuary and Marshes SPA and Ramsar</b>					
Annual Mean NOx	30	Y	N	Y	Y
Annual Mean NH <sub>3</sub>	1	N	N	N	N
N Dep short vegetation	10	Y	N	N	N
<b>Medway Estuary and Marshes SPA and Ramsar</b>					
NOx	30	Y	N	Y	Y
NH <sub>3</sub>	1	N	N	N	N
N Dep to short vegetation	10	N	N	N	N
<b>North Downs Woodlands SAC</b>					
NOx	30	Y	N	Y	Y
NH <sub>3</sub>	1	N	N	N	N
N Dep to woodland	10	N	N	N	N
Acid Dep to woodland	1.983	N	N	N	N

4.8 On the basis of the observations in Table 8, it is possible to discount impacts in relation to annual mean NOx concentrations. It is not possible to screen out impacts in relation to NH<sub>3</sub>, nitrogen deposition, or acid deposition.

## 5 Isopleths

- 5.1 As the assessment has been unable to classify all of the impacts as insignificant (as shown in Table 8), isopleths have been plotted to show the areas over which the 1% of CLe/CLo screening criterion is exceeded. These are presented in Figure 8 to Figure 26, below. Isopleths are shown wherever the 1% criterion is exceeded within a habitat, even where the potential for a significant effect has already been discounted on the basis that the total does not exceed the CLe or CLo. Isopleths are not shown if the 1% criterion is not exceeded. It should be reiterated that exceeding the 1% criterion does not mean that there will be a significant effect. It simply means that impacts cannot be screened out at this stage. However, the potential for significant effects can be discounted to all areas outside the lines shown in Figure 8 to Figure 26.
- 5.2 It should be noted that these plots are intended to provide only a very high-level summary of the predictions. More detailed contours have also been provided to Lepus Consulting Ltd. to inform the HRA.

### NOx



**Figure 8: Areas Exceeding 1% of CLe in the Thames and Medway Estuary and Marshes SPA and Ramsar Site (In Combination)**

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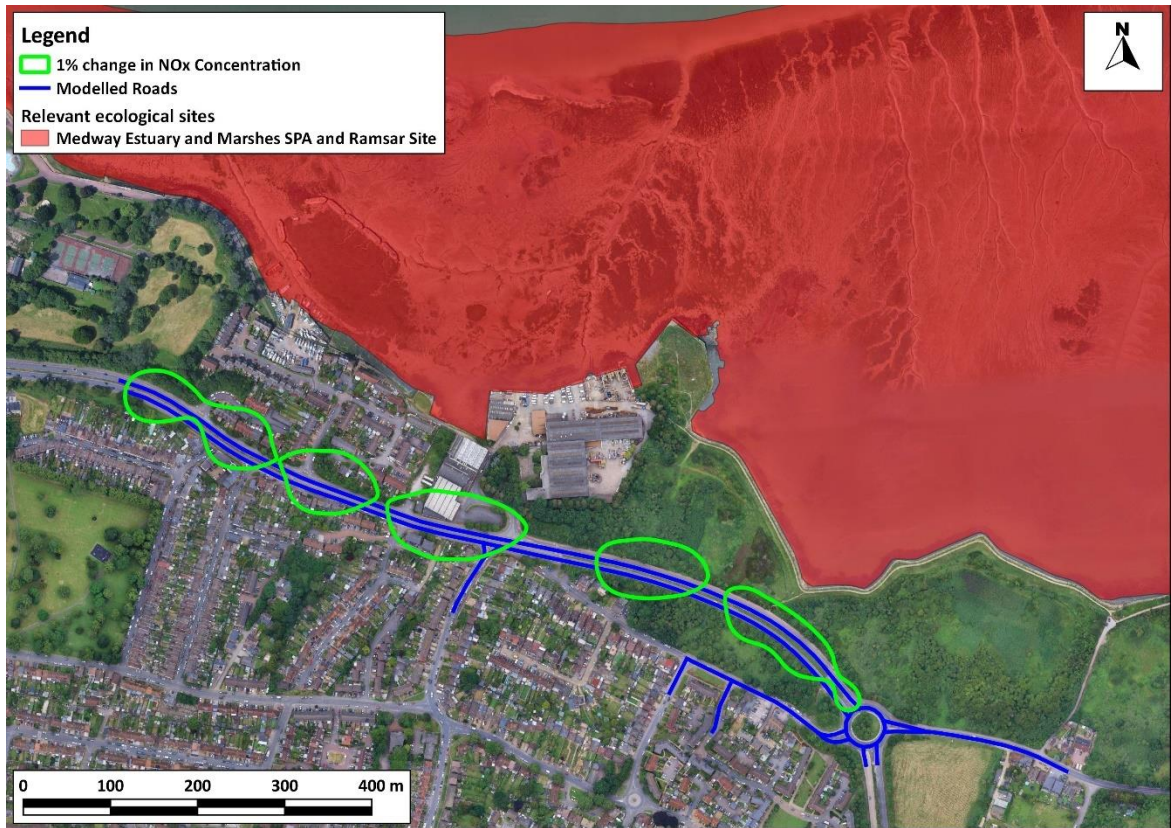


Figure 9: Areas Exceeding 1% of CLEs in the Medway Estuary and Marshes SPA and Ramsar Site

Imagery ©2025 Airbus, Maxar Technologies.

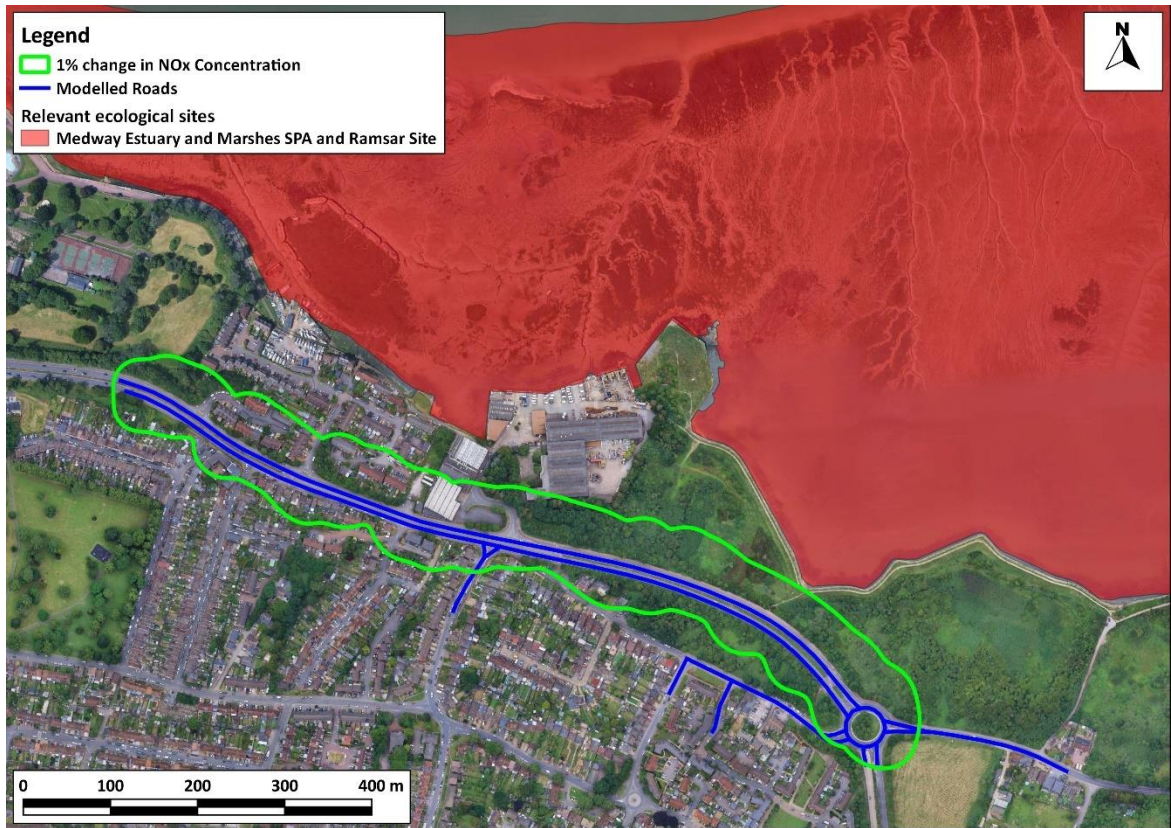


Figure 10: Areas Exceeding 1% of CLEs in the Medway Estuary and Marshes SPA and Ramsar Site (In Combination)

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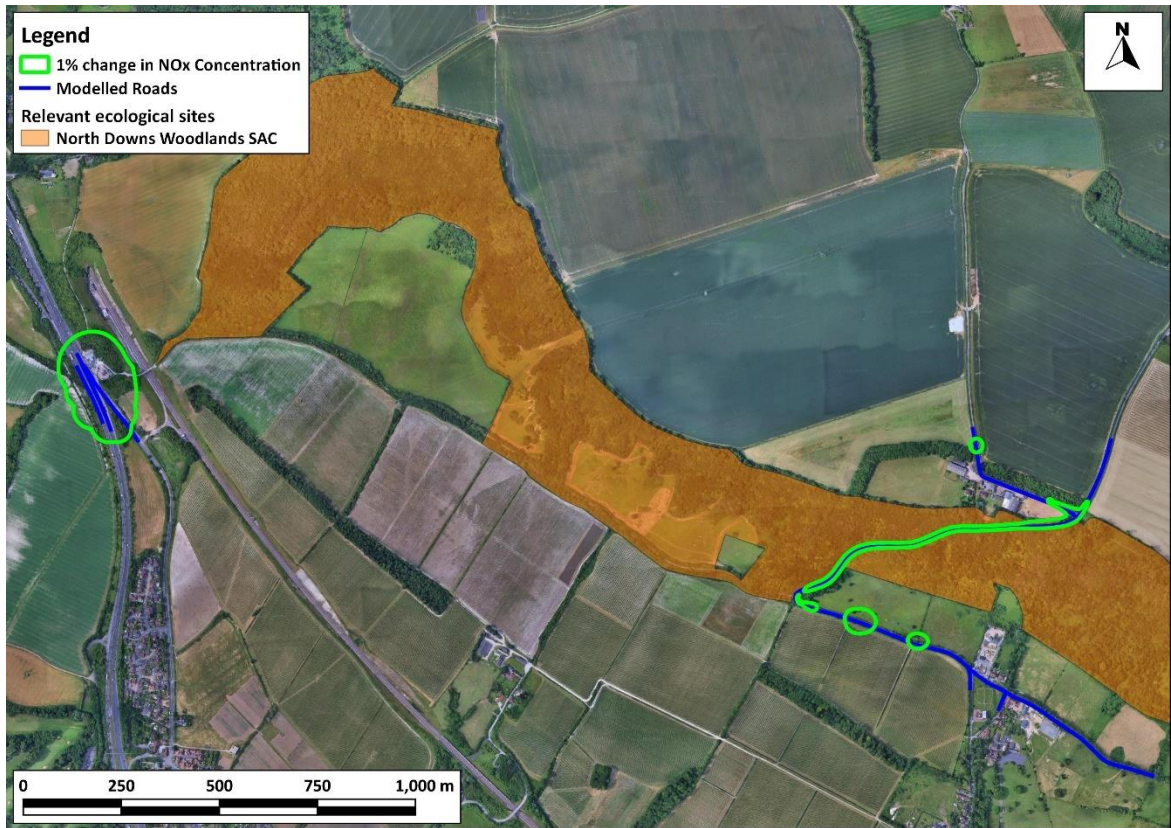
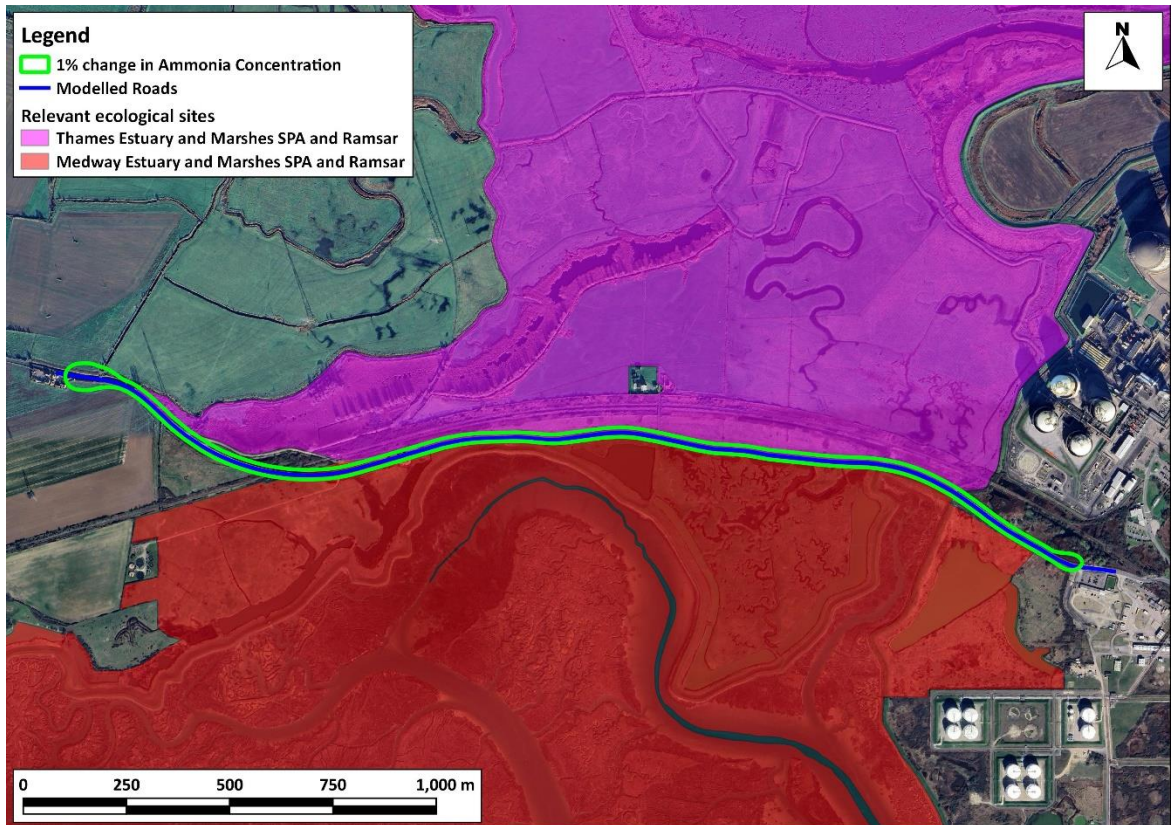


Figure 11: Areas Exceeding 1% of CLEs in North Downs Woodlands SAC (In Combination)

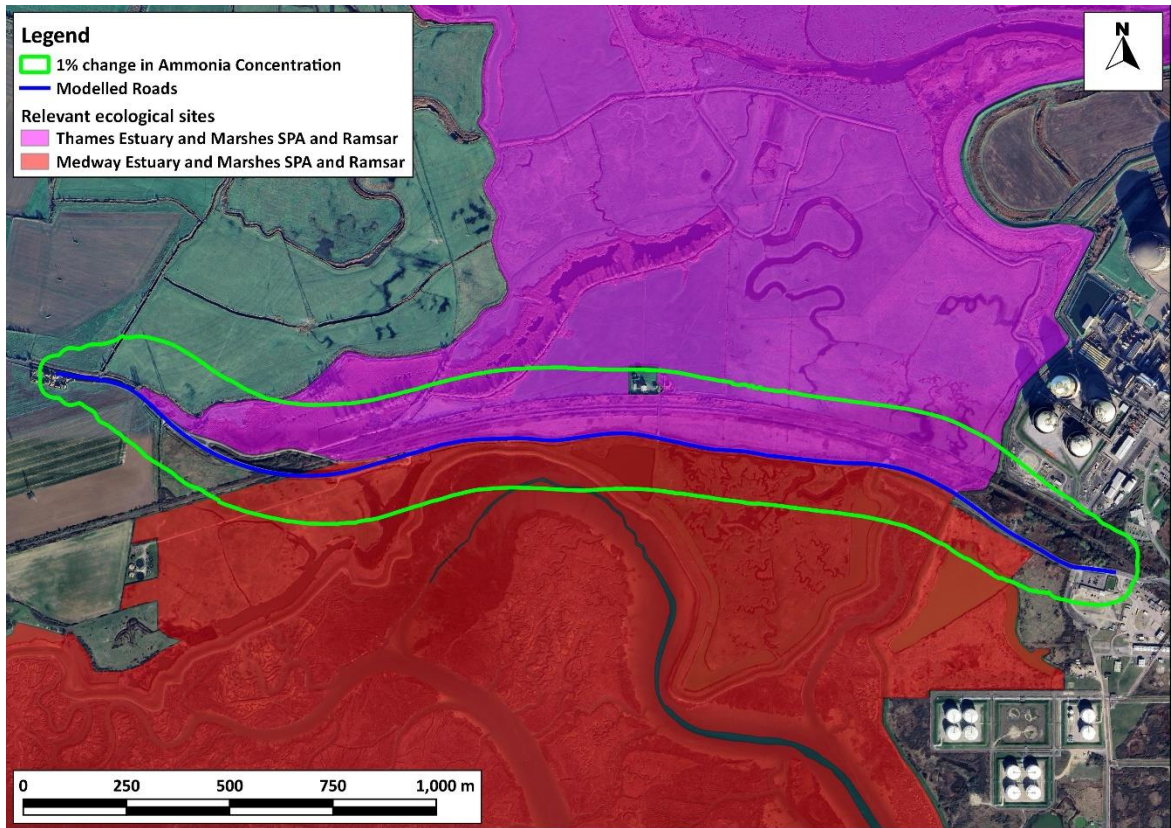
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## Ammonia



**Figure 12: Areas Exceeding 1% of CLe in the Thames and Medway Estuary and Marshes SPA and Ramsar Site**

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**Figure 13: Areas Exceeding 1% of CLEs in the Thames and Medway Estuary and Marshes SPA and Ramsar Site (In Combination)**

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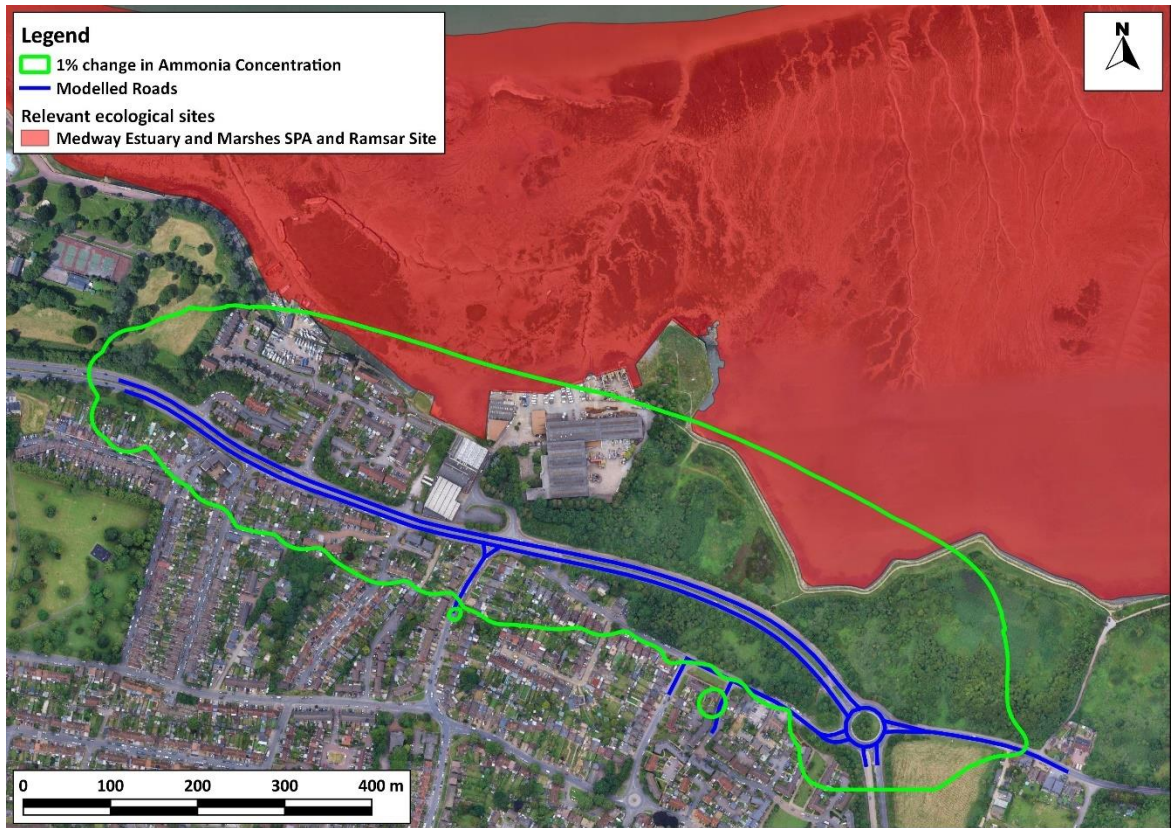


Figure 14: Areas Exceeding 1% of CLEs in the Medway Estuary and Marshes SPA and Ramsar Site

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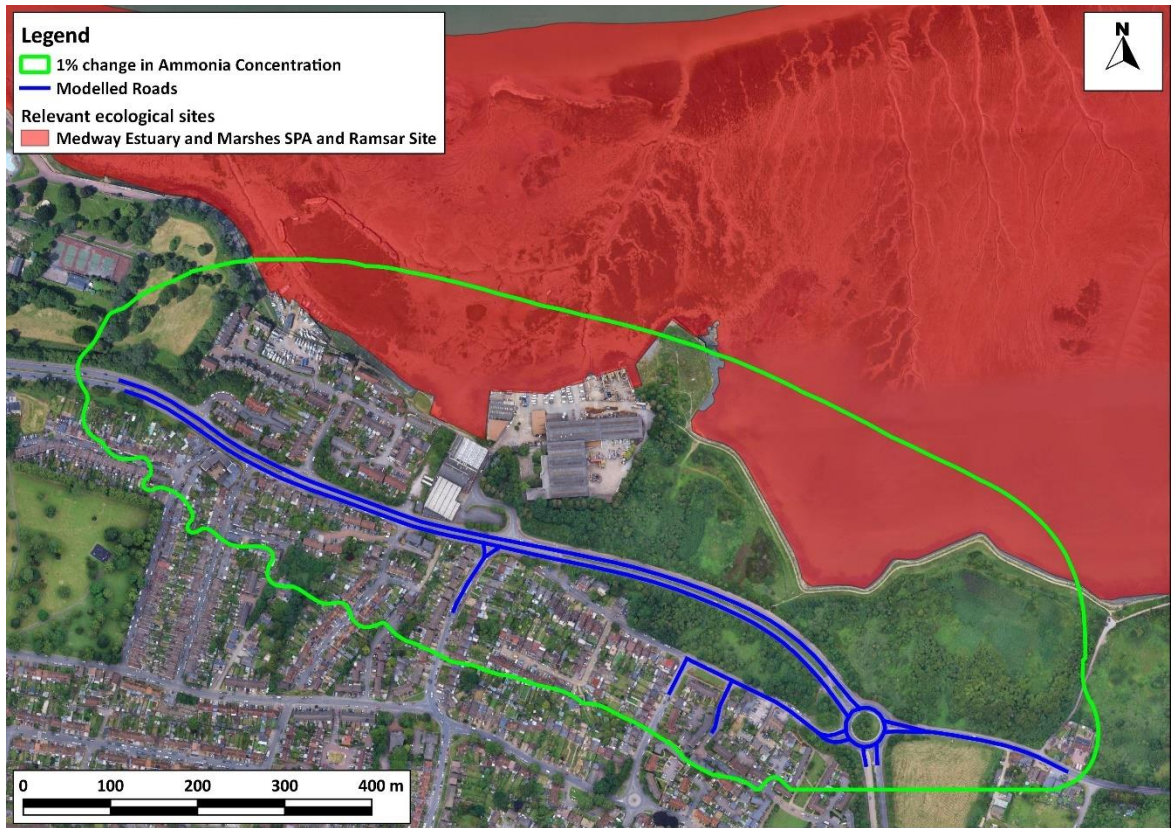


Figure 15: Areas Exceeding 1% of CLEs in the Medway Estuary and Marshes SPA and Ramsar Site (In Combination)

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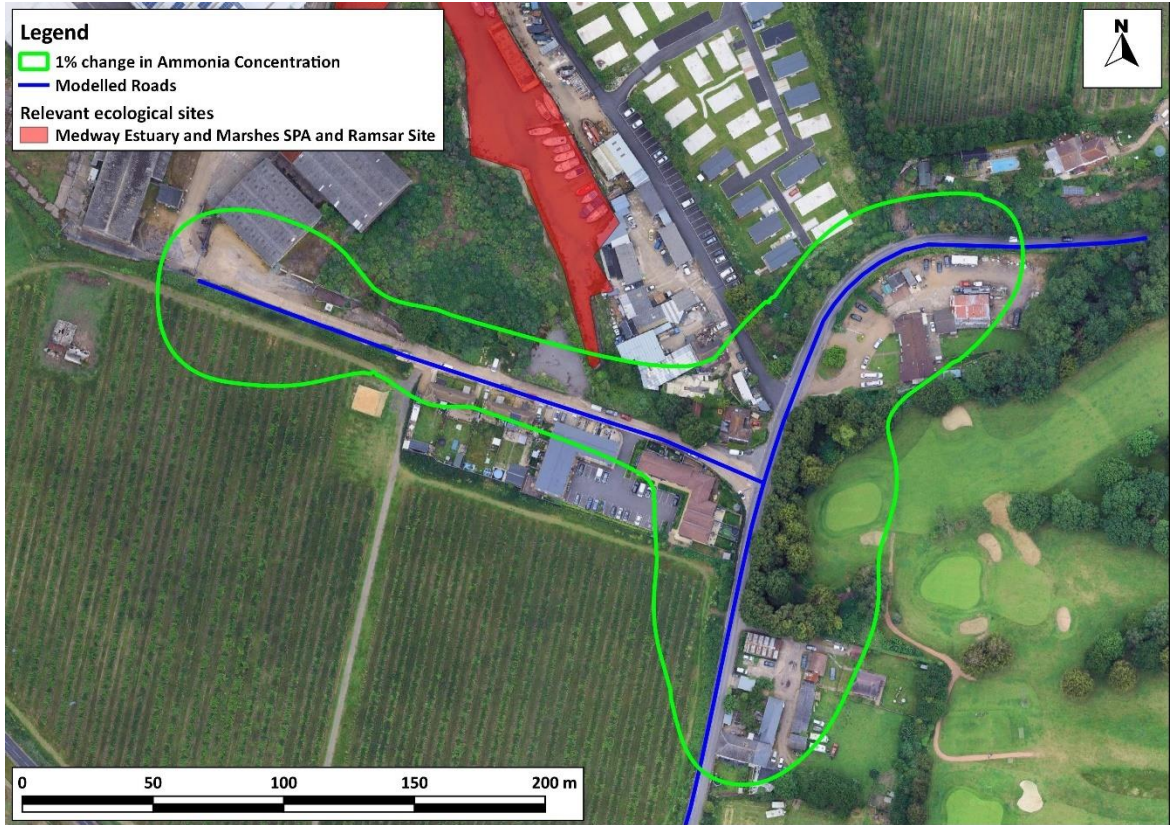


Figure 16: Areas Exceeding 1% of CLEs in the Medway Estuary and Marshes SPA and Ramsar Site (In Combination)

Imagery ©2025 Airbus, Maxar Technologies.

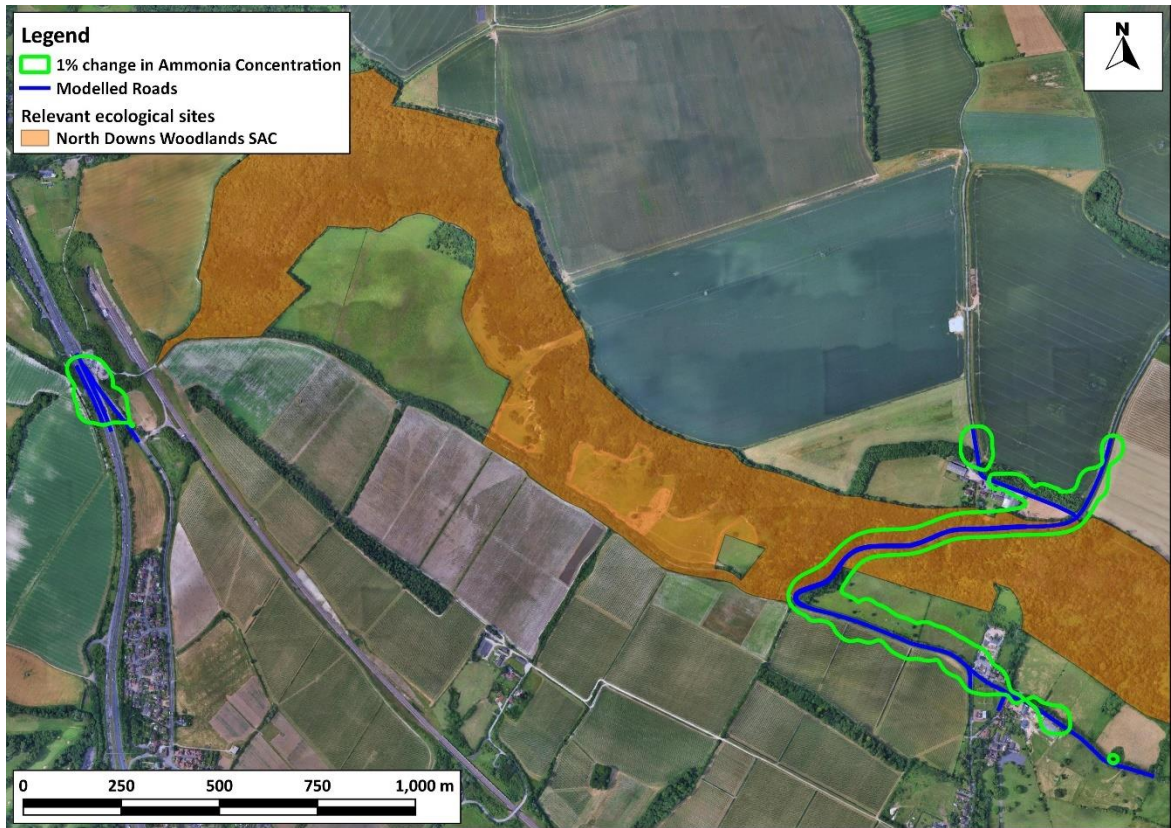


Figure 17: Areas Exceeding 1% of CLEs in North Downs Woodlands SAC

Imagery ©2025 Airbus, Maxar Technologies.

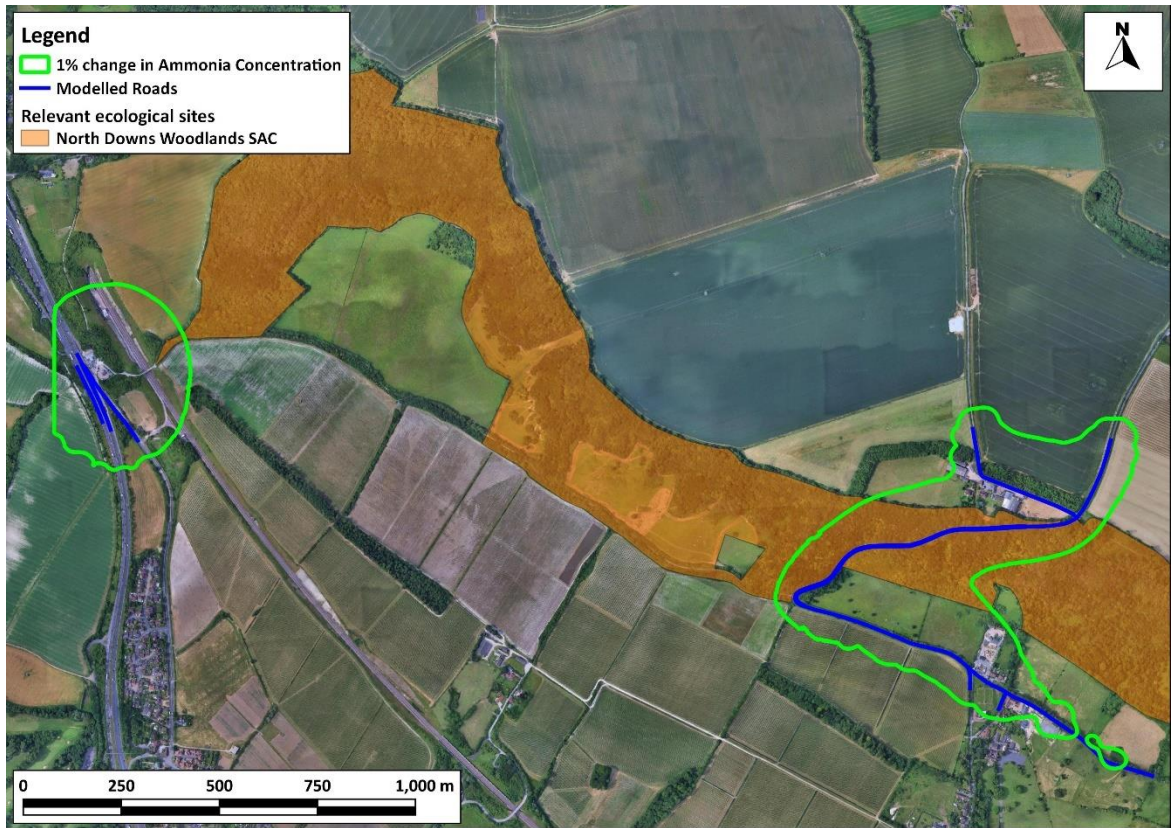
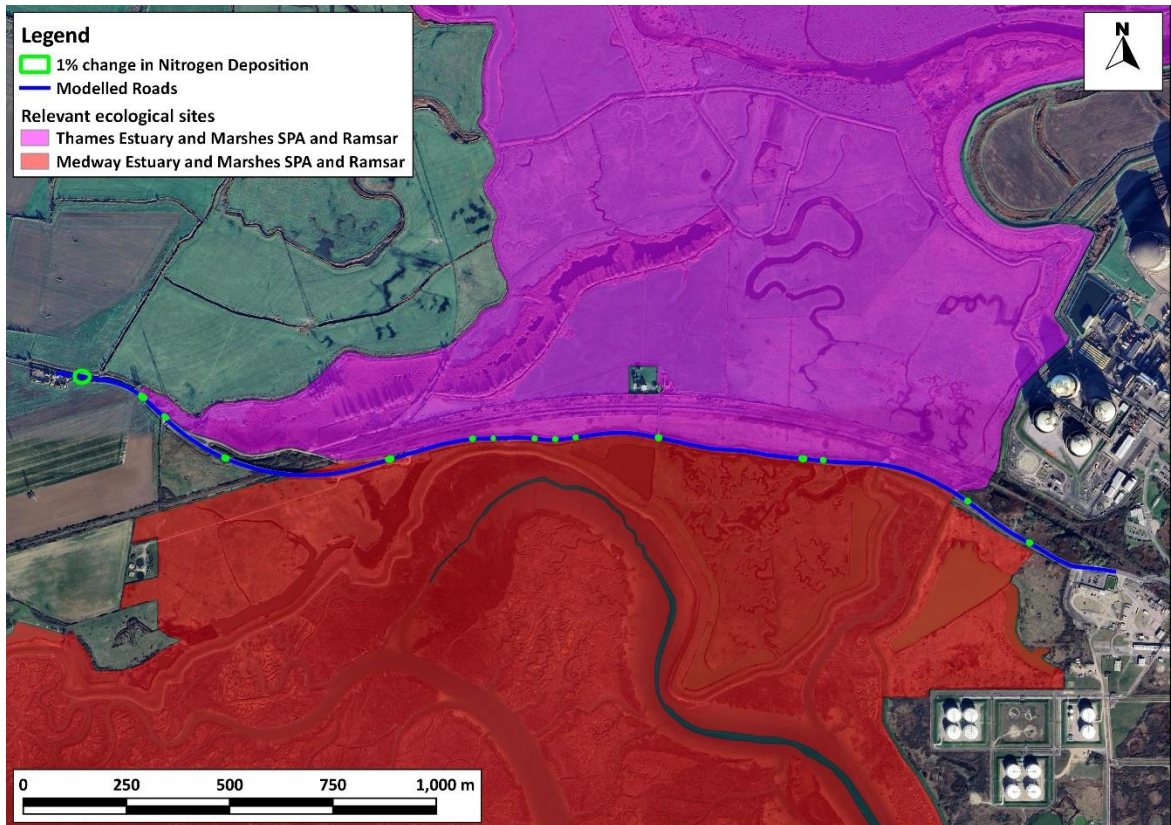


Figure 18: Areas Exceeding 1% of CLEs in North Downs Woodlands SAC (In Combination)

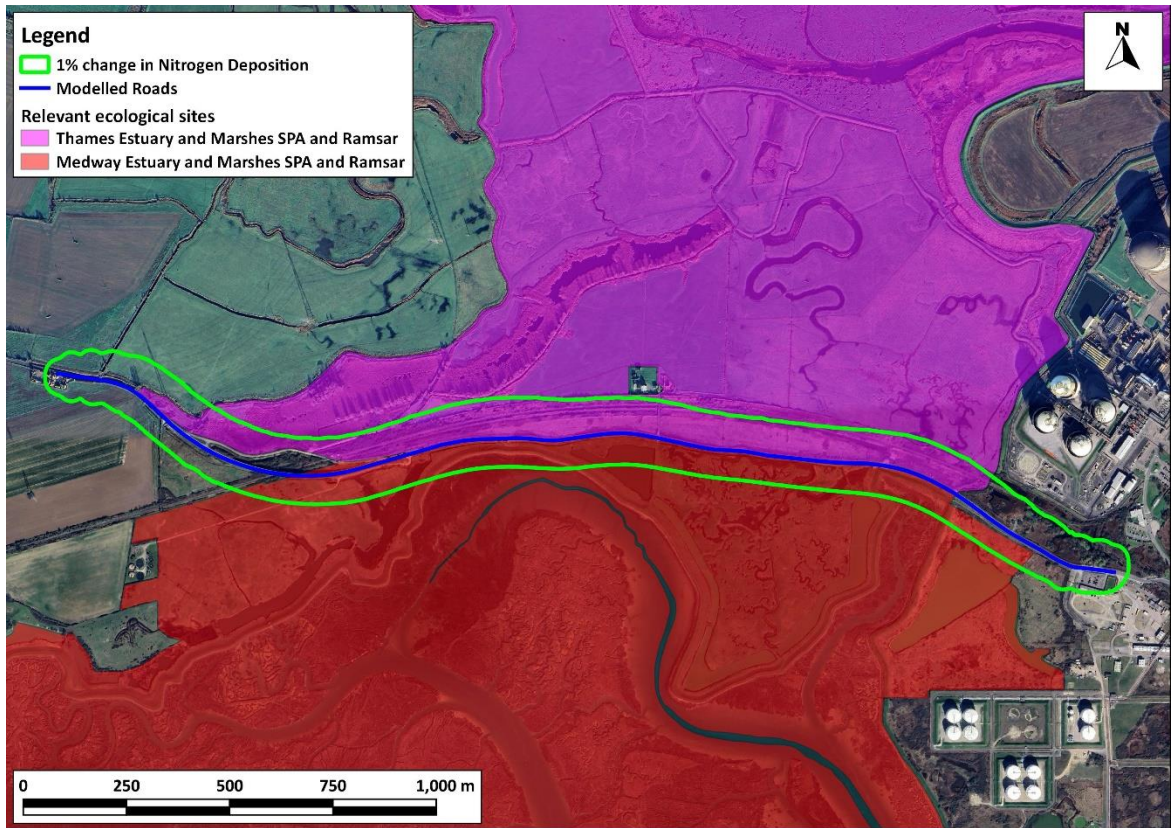
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## Nitrogen Deposition



**Figure 19: Areas Exceeding 1% of CLoS in the Thames and Medway Estuary and Marshes SPA and Ramsar Site**

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**Figure 20: Areas Exceeding 1% of CLoS in the Thames and Medway Estuary and Marshes SPA and Ramsar Site (In Combination)**

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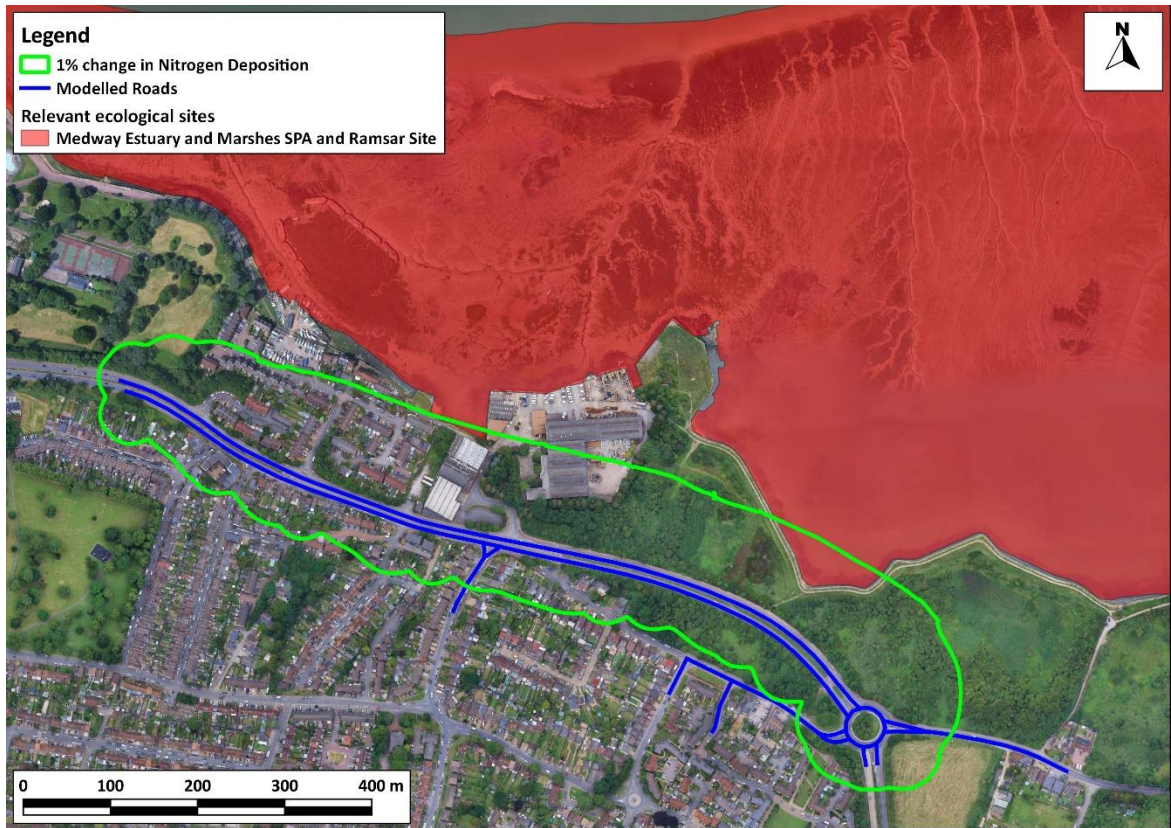


Figure 21: Areas Exceeding 1% of CLoS in the Medway Estuary and Marshes SPA and Ramsar Site

Imagery ©2025 Airbus, Maxar Technologies.

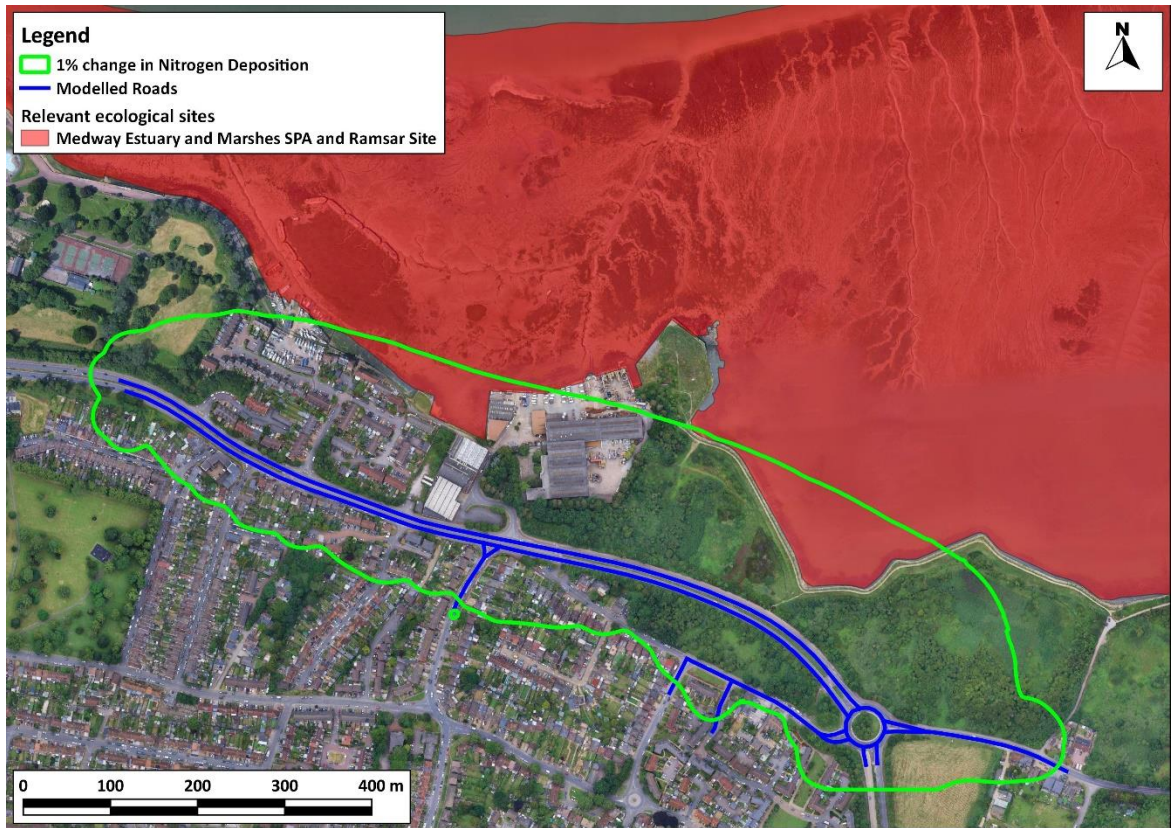


Figure 22: Areas Exceeding 1% of CLOs in the Medway Estuary and Marshes SPA and Ramsar Site (In Combination)

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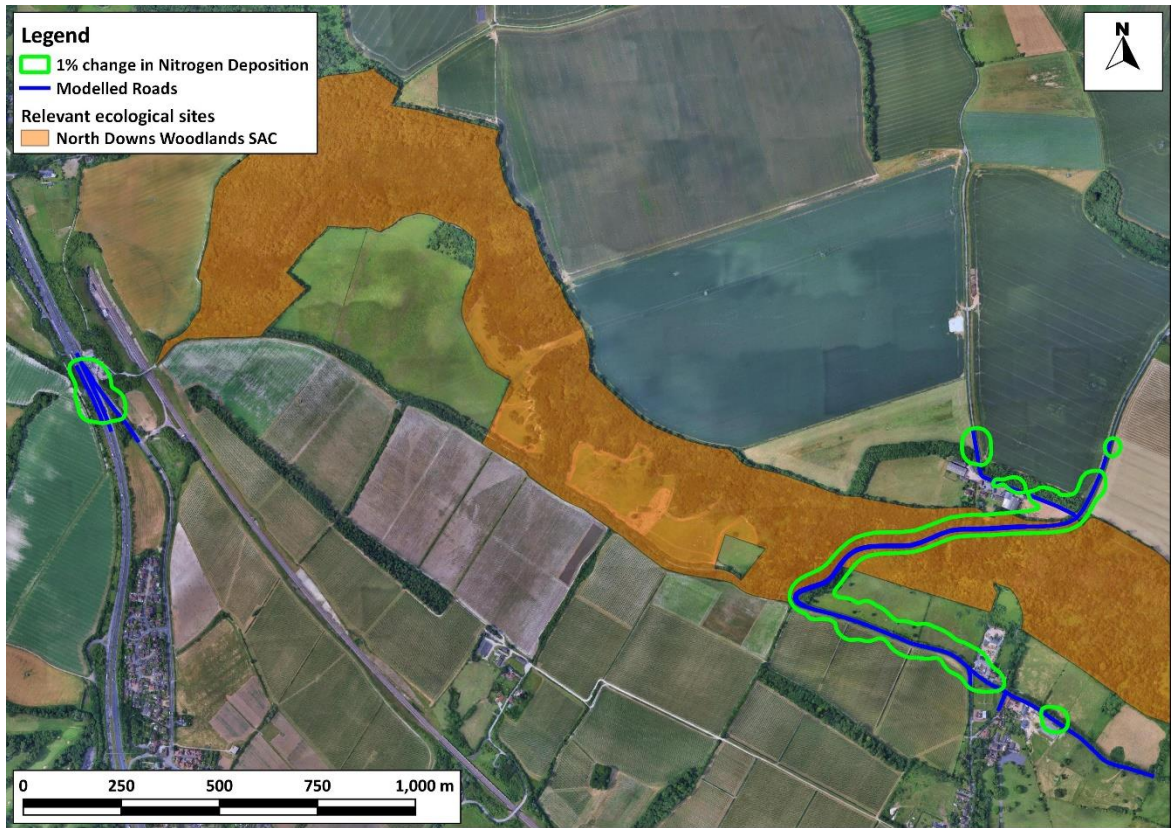
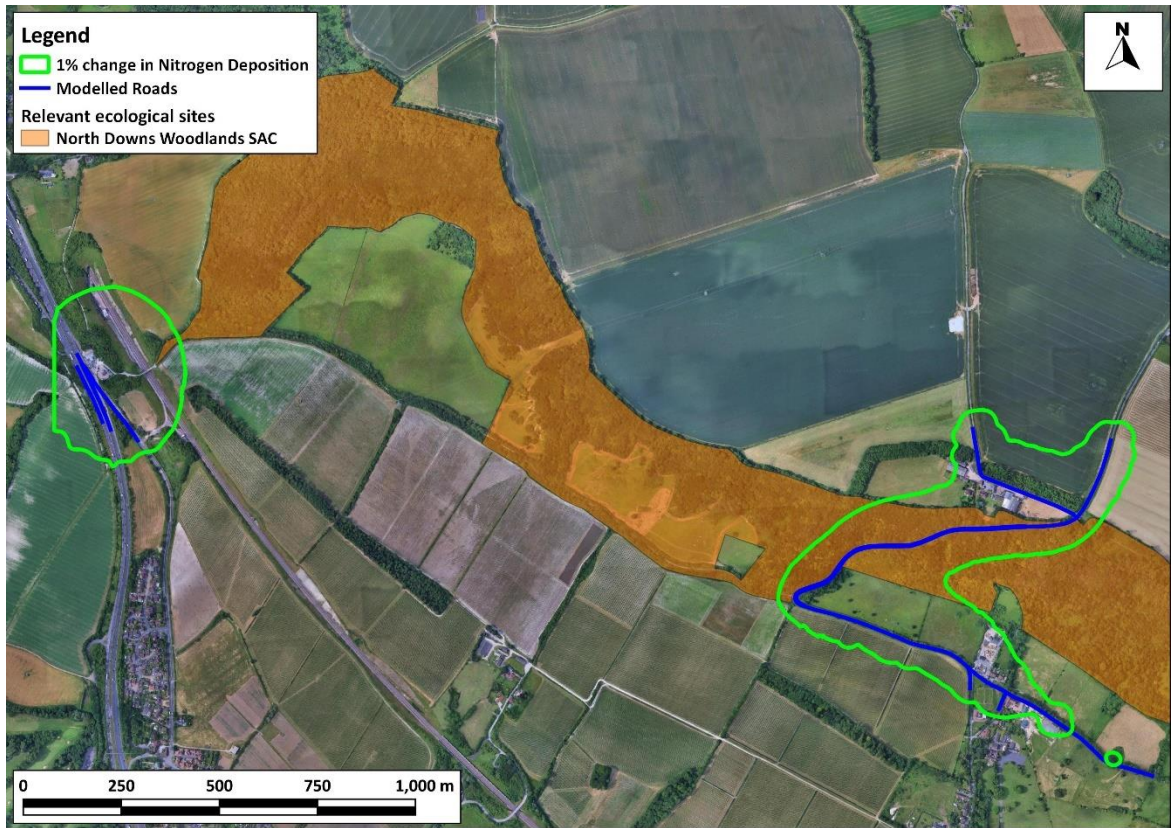


Figure 23: Areas Exceeding 1% of CLoS in North Downs Woodlands SAC

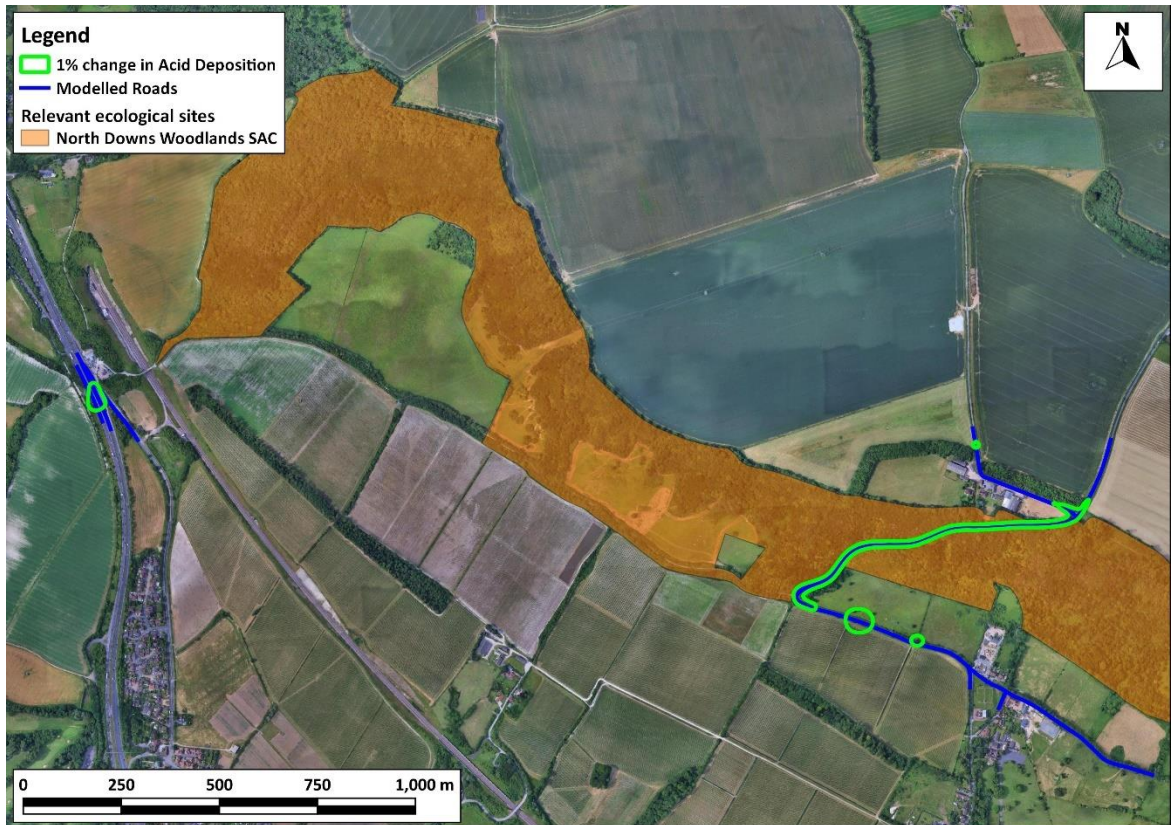
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**Figure 24: Areas Exceeding 1% of CLoS in North Downs Woodlands SAC (In Combination)**

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## Acid Deposition



**Figure 25: Areas Exceeding 1% of CLOs in North Downs Woodlands SAC**

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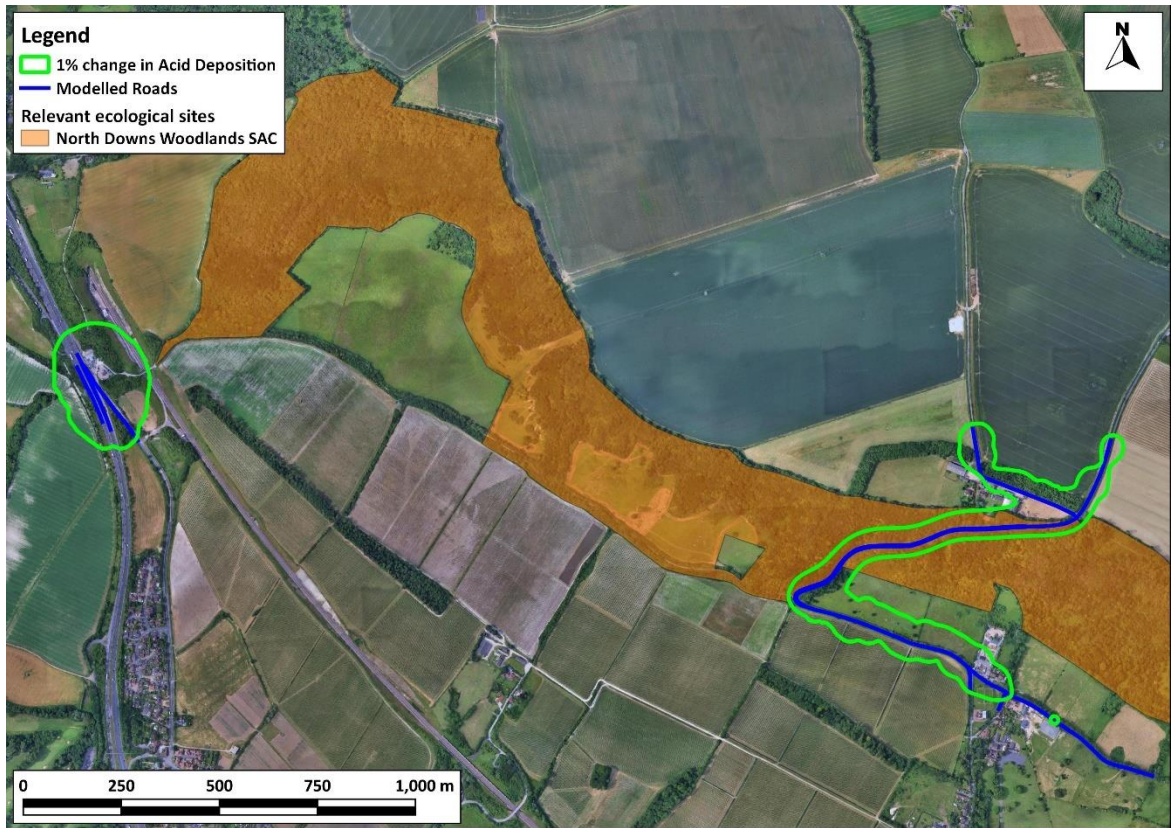


Figure 26: Areas Exceeding 1% of CLoS in North Downs Woodlands SAC (In Combination)

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## 7 Glossary

AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AODM	Area of Detailed Modelling
APIS	Air Pollution Information System
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
CLe	Critical Level - 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
CLo	Critical Load – 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
CREAM	Calculator for Road Emissions of AMmonia
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EFT	Emissions Factors Toolkit
EU	European Union
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HRA	Habitats Regulations Assessment
IAQM	Institute of Air Quality Management
JNCC	Joint Nature Conservation Committee
kph	Kilometres Per hour
LAQM	Local Air Quality Management
µg/m <sup>3</sup>	Microgrammes per cubic metre
NO	Nitric oxide
NO <sub>2</sub>	Nitrogen dioxide

NOx	Nitrogen oxides (taken to be NO <sub>2</sub> + NO)
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PC	Process Contribution
PEC	Predicted Environmental Concentration
SAC	Special Area of Conservation
SPA	Special Protection Area
WHO	World Health Organisation

## 8 Appendices

# A1 Professional Experience

## Dr Ben Marner, BSc (Hons) PhD CSci MEnvSc MIAQM

Dr Marner is the Director of Air Quality Modelling and Assessment at AQC and has more than 20 years' relevant experience. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has acted as expert witness at public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has developed a range of widely-used air quality models and contributed to the development of best practice. Dr Marner has provided support and advice to foreign governments, Highways England, Transport Scotland, Transport for London, Greater London Authority, the Joint Nature Conservation Committee, the Environment Agency, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist. He currently advises the UK Government on air quality as part of its Air Quality Expert Group (AQEG), where his specific area of expertise relates to air quality assessment in the development control process, and has separately provided advice on air quality issues to Defra's Chief Scientific Adviser, the UK Chief Medical Officer, and the UK Chief Planner.

## Dr Imogen Heard, BSc (Hons) MSc PhD

Dr Heard is an Associate of AQC with over 12 years' experience in the field of air quality. She has been involved in numerous development projects including road schemes, energy from waste facilities, urban extensions and energy centres. These have included the use of ADMS-5 and ADMS-Roads dispersion models to study the impacts of a variety of pollutants, including nitrogen dioxide, PM<sub>10</sub> and PM<sub>2.5</sub>, and the preparation of air quality assessment reports and air quality chapters for Environmental Statements. She also has experience in undertaking construction dust risk assessments, Air Quality Neutral assessments and human health risk assessments, as well as in preparing local authority reports. Prior to joining AQC she worked as a scientist in the Atmospheric Dispersion and Air Quality area at the UK Met Office for four years, modelling the dispersion of a range of pollutants over varying spatial and temporal scales.

## A2 Modelling Methodology

### Model Inputs

A2.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 13.1) published by Defra (Defra, 2025). Model input parameters are summarised in Table A2-1 and, where considered necessary, discussed further below.

**Table A2-1: Summary of Model Inputs**

Model Parameter	Value Used
Terrain Effects Modelled?	Yes – 12 km x 12 km Cartesian grid at 50 m resolution
Variable Surface Roughness File Used?	Yes – 12 km x 12 km Cartesian grid at 50m resolution
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	No
Noise Barriers Modelled?	No
Gradients?	Yes
Meteorological Monitoring Site	Shoeburyness, East Malling
Meteorological Data Year	2019
Dispersion Site Surface Roughness Length (m)	N/A (variable surface roughness file used)
<b>Dispersion Site Minimum MO Length (m)</b>	
Thames and Medway Estuary and Marshes SPA and Ramsar sites	30
North Downs Woodlands SAC	1
<b>Met Site Surface Roughness Length (m)</b>	
Shoeburyness	0.2
East Malling	N/A (variable surface roughness file used)
<b>Met Site Minimum MO Length (m)</b>	
Shoeburyness	1
East Malling	1

A2.2 AADT flows, diurnal flow profiles, speeds, and vehicle fleet composition data have been provided by Medway Council. Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. The traffic data used in this assessment are summarised in Table A2-2. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (DfT, 2025).

**Table A2-2: Summary of Traffic Data used in the Assessment <sup>a</sup>**

Road Link	2019		2041 (Without Scheme)		2041 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
1	13,930	4.0	16,340	4.0	20,572	3.3
2	14,713	4.3	17,685	4.2	22,024	3.3
3	15,150	4.1	17,845	4.1	21,548	3.2
4	2,079	0.9	2,578	1.2	2,985	1.0
5	6,587	7.7	7,571	7.5	8,049	5.8
6	13,080	2.7	15,045	2.7	17,408	2.6
7	13,147	2.5	15,584	2.6	19,932	2.3
8	5,040	0.7	4,932	0.7	3,835	0.8
9	3,162	1.0	3,387	1.1	3,655	1.0
10	3,146	0.2	3,508	0.3	3,418	0.5
11	3,146	0.2	3,508	0.3	3,418	0.5
12	7,080	7.0	8,045	7.0	8,792	5.6
13	5,372	6.6	6,305	6.5	6,533	5.5
14	4,624	3.9	5,023	4.1	5,162	4.0
15	3,589	6.6	4,555	6.1	4,717	5.0
16	37,142	5.1	51,178	4.5	52,589	4.4
17	39,723	5.1	51,160	4.9	51,603	4.7
18	36,495	5.5	48,122	5.1	48,261	5.0
19	3,126	0.4	2,943	0.5	3,236	0.5
20	1,527	2.8	3,108	1.4	3,590	1.3
21	8,906	3.7	10,566	2.6	11,291	2.2
22 <sup>a</sup>	5,009	3.2	5,292	2.1	6,036	1.9
23 <sup>a</sup>	5,424	3.9	8,382	2.5	8,846	2.1
24 <sup>b</sup>	5,009	3.2	5,292	2.1	6,036	1.9
25 <sup>b</sup>	5,424	3.9	8,382	2.5	8,846	2.1
26 <sup>c</sup>	5,009	3.2	5,292	2.1	6,036	1.9
27 <sup>d</sup>	5,424	3.9	8,382	2.5	8,846	2.1
28	10,433	3.5	13,674	2.3	14,881	2.0
29	6,707	2.4	8,472	1.6	9,157	1.2

Road Link	2019		2041 (Without Scheme)		2041 (With Scheme)	
	AADT	%HDV	AADT	%HDV	AADT	%HDV
30	3,726	5.7	5,202	3.6	5,724	3.2
31	3,403	6.2	3,604	5.1	4,014	4.6
32	324	0	1,598	0	1,710	0
33	4,881	7.3	10,872	3.8	11,530	3.5

<sup>a</sup> Road link modelled with a gradient of 6.1%.

<sup>b</sup> Road link modelled with a gradient of 17.0%.

<sup>c</sup> Road link modelled with a gradient of 10.6%.

<sup>d</sup> Road link modelled with a gradient of 12.1%.

A2.3 Figure A2-1 to Figure A2-5 show the road network included within the model, along with the speeds at which each link was modelled.

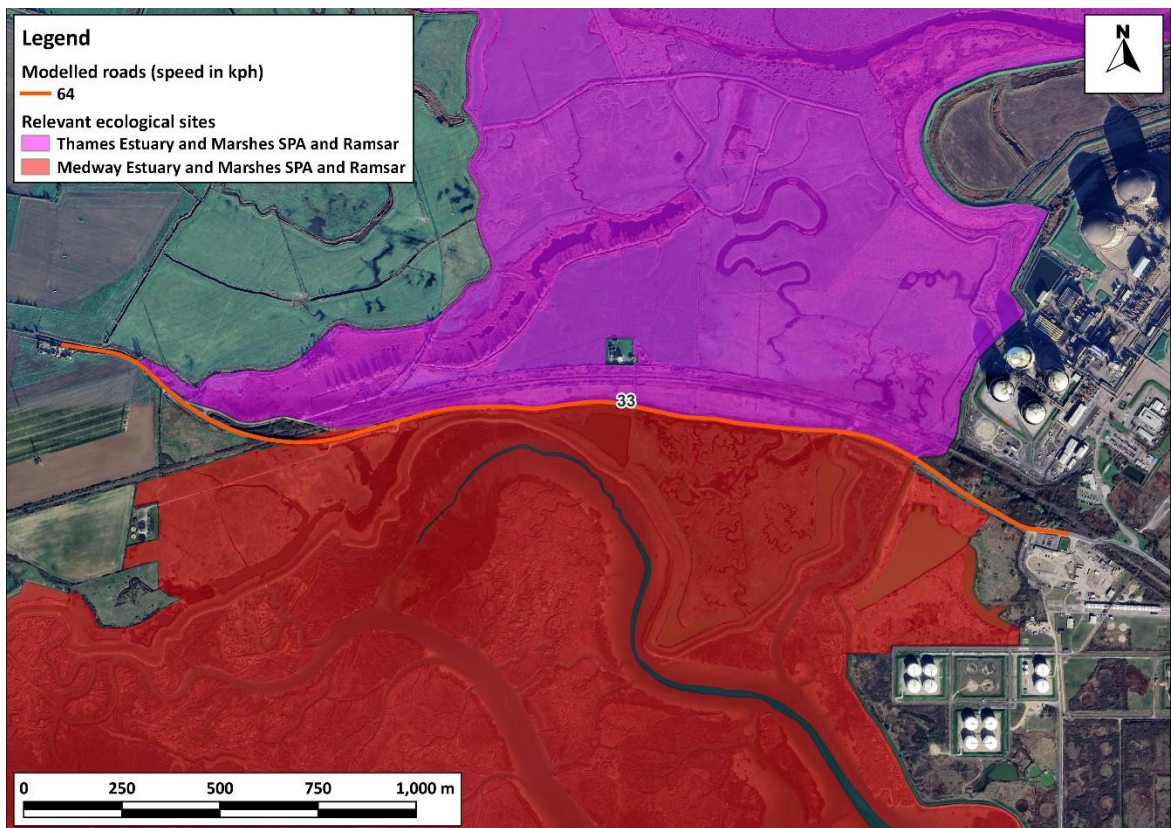


Figure A2-1: Modelled Road Network & Speed

Imagery ©2025 Airbus, Maxar Technologies.

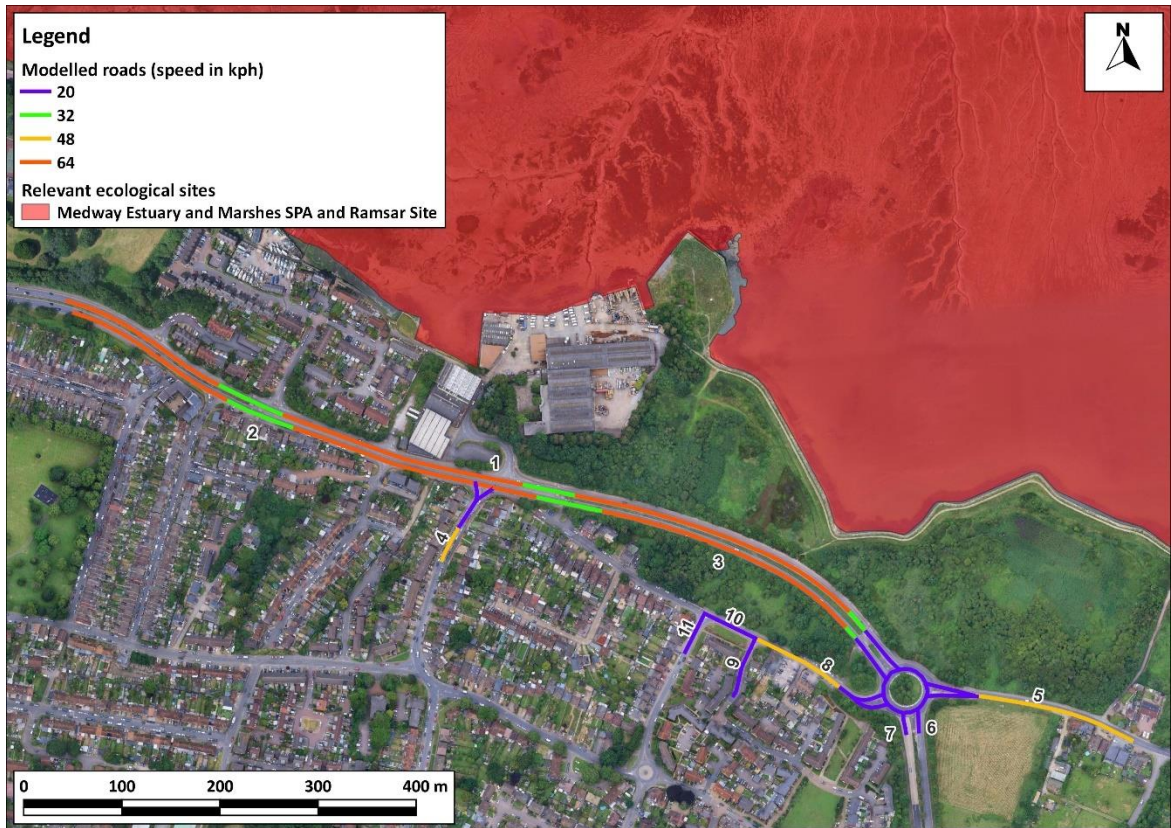


Figure A2-2: Modelled Road Network & Speed

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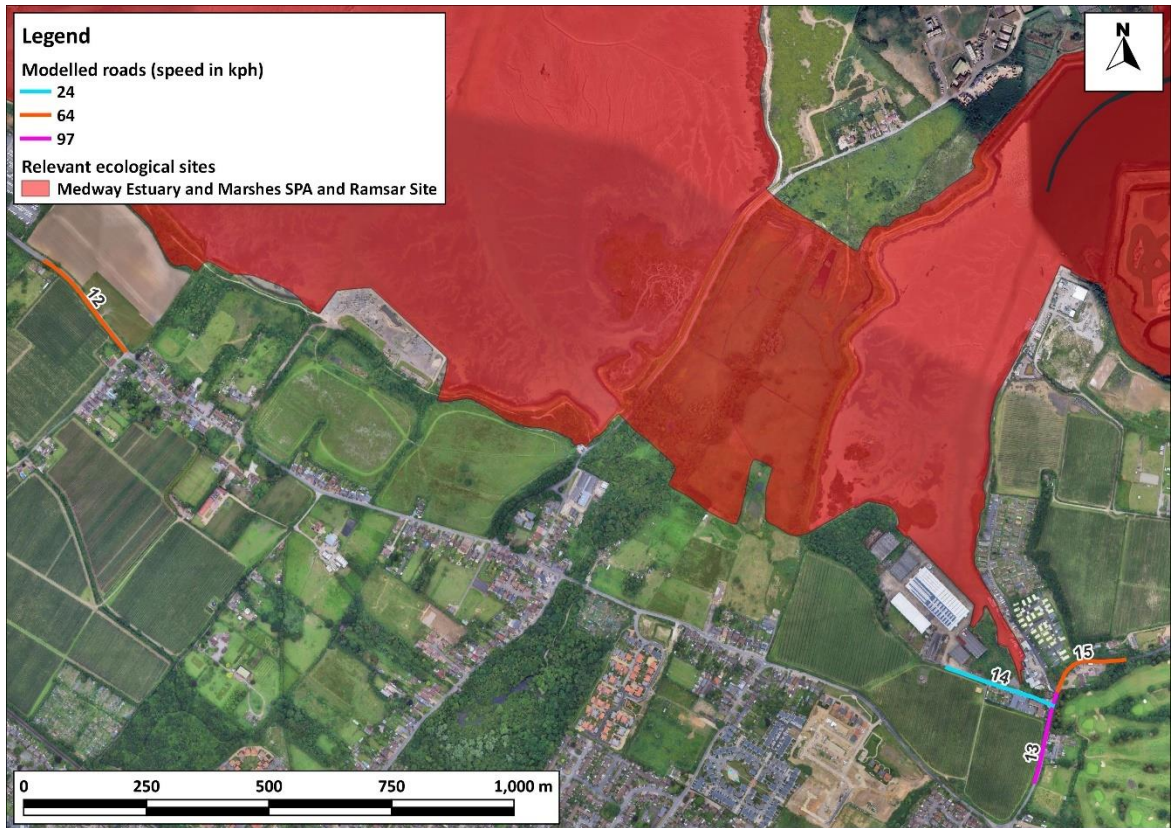


Figure A2-3: Modelled Road Network & Speed

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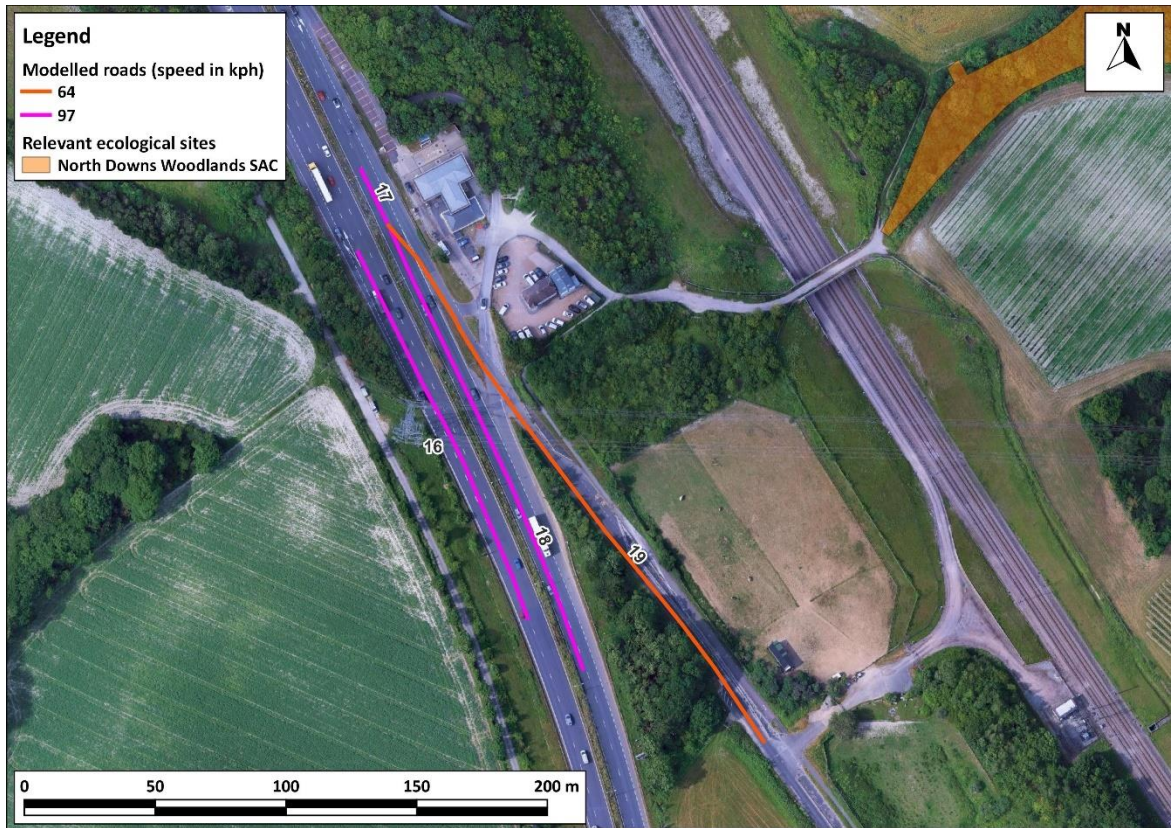
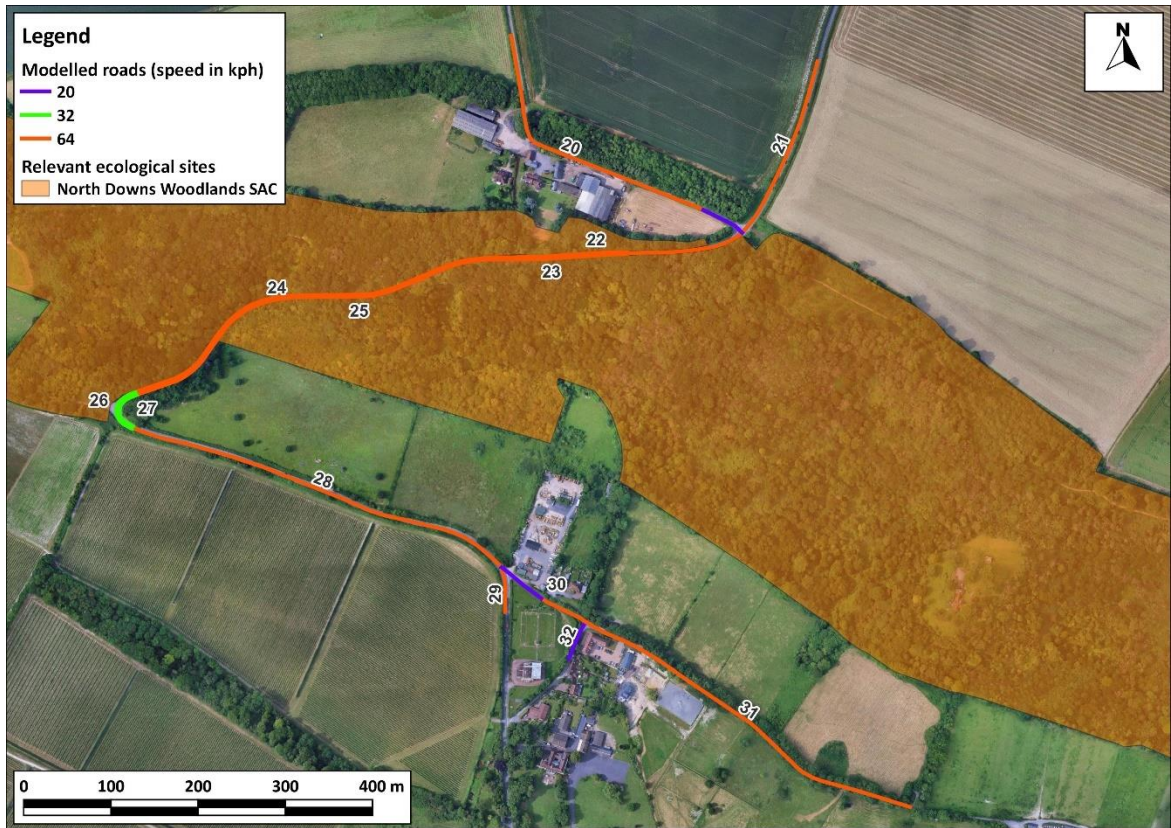


Figure A2-4: Modelled Road Network & Speed

Imagery ©2025 Airbus, Maxar Technologies.



**Figure A2-5: Modelled Road Network & Speed**

Imagery ©2025 Airbus, Maxar Technologies.

A2.4 Hourly sequential meteorological data in sectors of 10 degrees from Shoeburyness Landwick and East Malling for 2019 have been used in the model. The Shoeburyness Landwick meteorological monitoring station is located approximately 5 km to the north east of the Thames Estuary. It is the nearest monitoring station representative of meteorological conditions in the vicinity of the Thames and Medway Estuary and Marshes SPA and Ramsar sites; the SPA and Ramsar sites and the Shoeburyness Landwick meteorological monitoring station are all located at near-coastal locations in south east England where they will be influenced by the effects of coastal meteorology. The East Malling meteorological monitoring station is located approximately 5.5 km to the south west of the North Downs Woodlands SAC. It is the nearest monitoring station representative of meteorological conditions in the vicinity of the SAC; both the SAC and the East Malling meteorological monitoring station will be influenced by the effects of inland meteorology. Wind roses for both sites for 2019 are provided in Figure A2-6. The stations are operated by the UK Met Office. Data were provided by the Met Office.

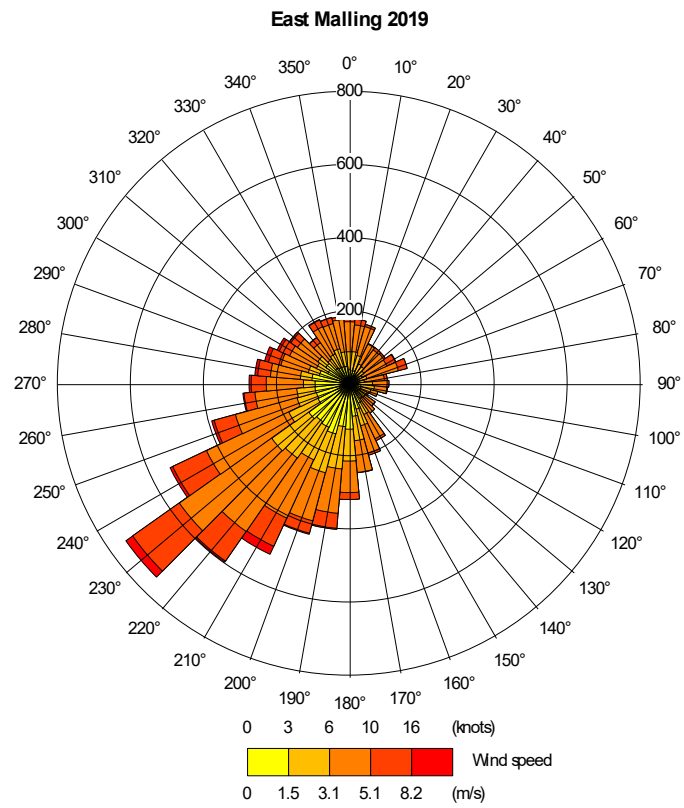
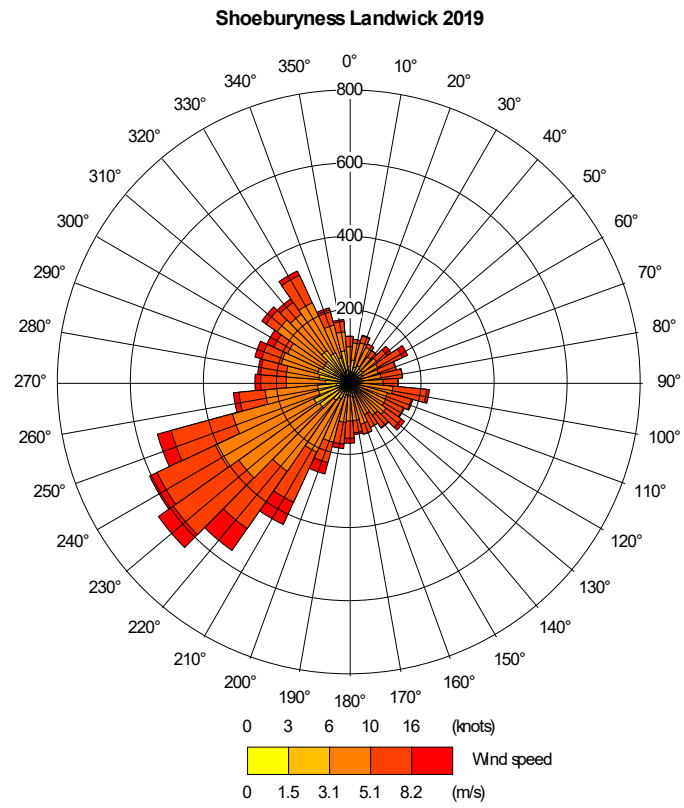


Figure A2-6: Wind Roses

## Model Verification

A2.5 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra’s EFT has tended to systematically under-predict roadside nitrogen dioxide concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean nitrogen dioxide concentrations during 2019 at the DT25, DT26, DT27, DT41 and DT42 diffusion tube monitoring sites. These sites have been selected because they are adjacent to roads included in the traffic AODM and are representative of roads adjacent to the designated ecological sites. Site DT40 has been excluded from the model verification because data for one of the adjacent roads is not included in the traffic AODM. The model has been run twice, once using meteorological data from Shoeburyness Landwick and once using data from East Malling, to calculate adjustment factors for the Thames and Medway Estuary SPA and Ramsar sites and the North Downs Woodlands SAC respectively.

## Background Concentrations

A2.6 The background annual mean nitrogen dioxide concentrations used in the model verification have been derived from the national maps provided by Defra for Local Air Quality Management and are shown in Table A2-3.

**Table A2-3: Background Concentrations used in the Model Verification**

Site ID	NO <sub>2</sub> (µg/m <sup>3</sup> )
DT25	35.8
DT26	24.4
DT27	34.1
DT41	23.1
DT42	18.8

## Traffic Data

A2.7 AADT flows, and the proportions of HDVs, for the roads adjacent to the monitoring sites, have been taken from Medway Council’s strategic traffic model. Traffic data used in the model verification are summarised in Table A2-4 and shown in Figure A2-7 and Figure A2-8.

**Table A2-4: 2019 Traffic Data used in the Model Verification**

Road Link	AAADT	%HDV
1	14,342	4.6
2	14,754	4.5
3	14,680	4.6
4	4,769	0.7
5	5,044	0.7
6	14,750	4.4
7	15,230	4.4

Road Link	AADT	%HDV
8	15,382	4.3
9	15,280	4.4
10	15,153	4.4
11	230	0.1
12	188	0.1
13	127	1.3
14	22,882	3.8
15	3,008	1.2
16	11,059	4.6
17	10,972	2.9

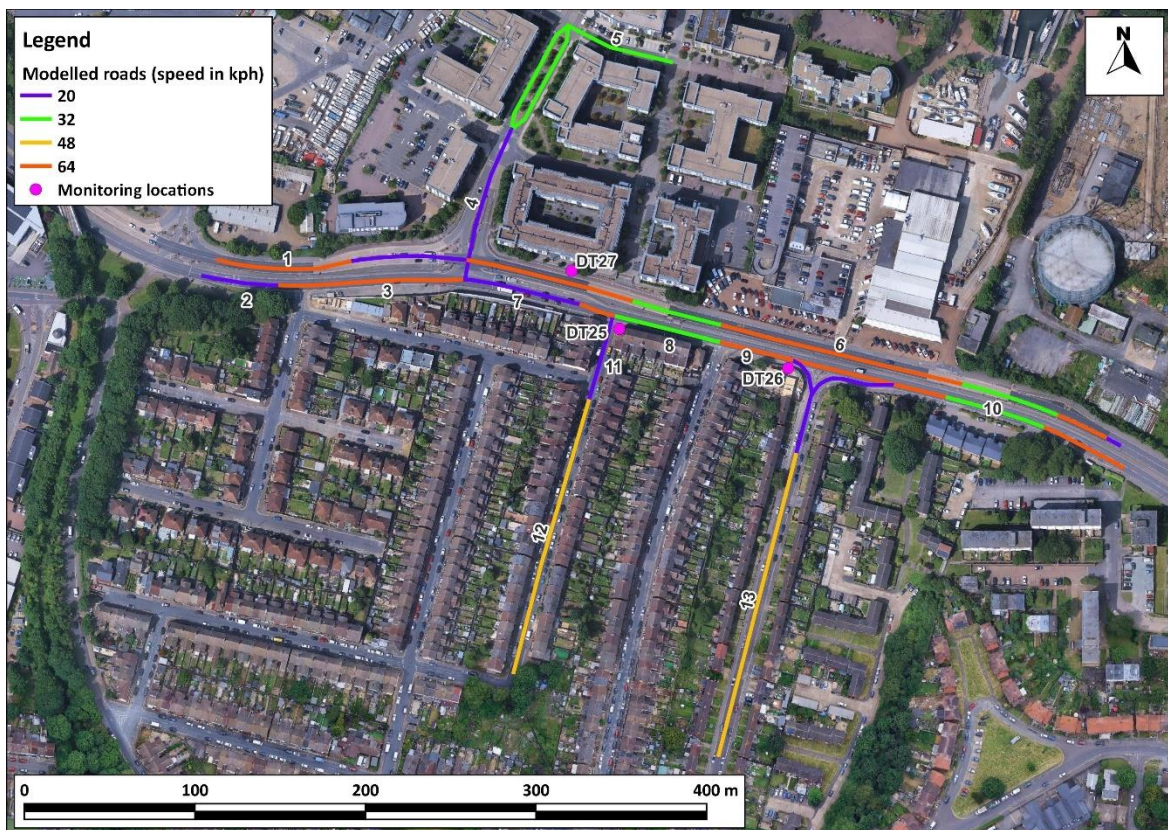
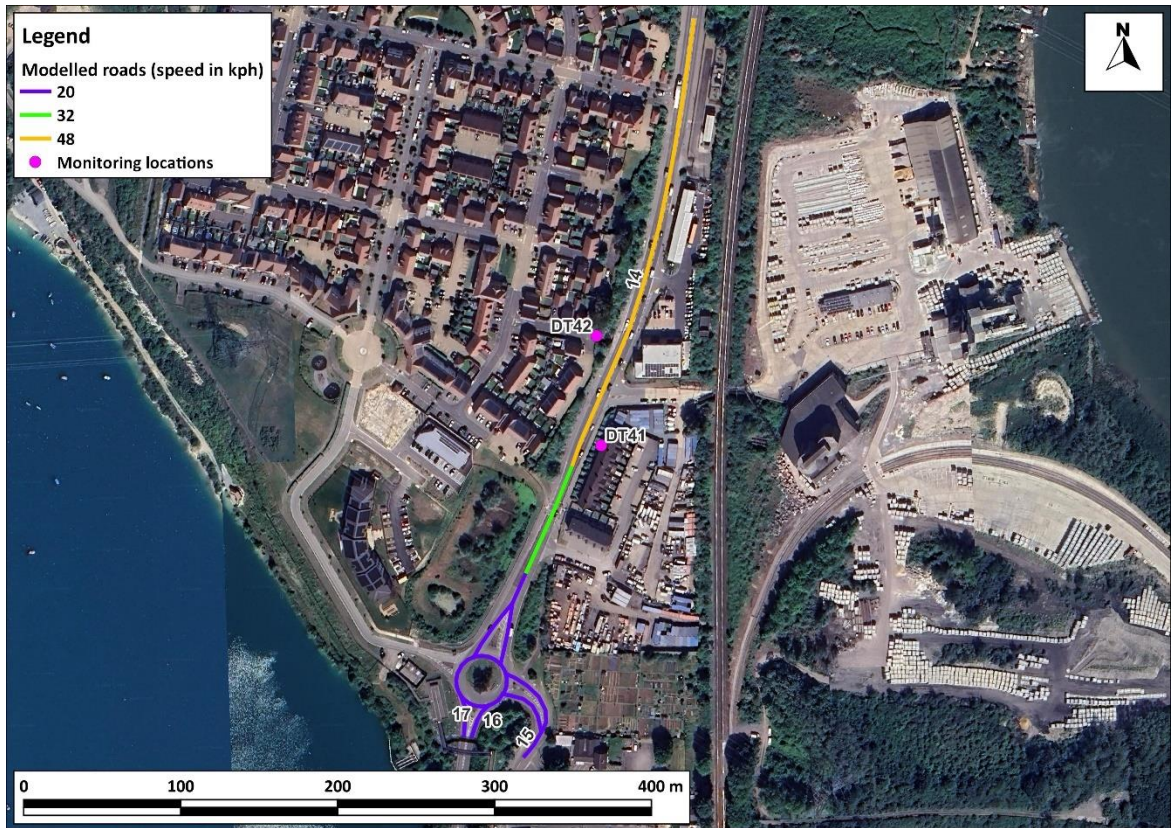


Figure A2-7: Modelled Road Network & Speed

Imagery ©2025 Airbus, Maxar Technologies



**Figure A2-8: Modelled Road Network & Speed**

Imagery ©2025 Airbus, Maxar Technologies

### Nitrogen Dioxide

- A2.8 Most nitrogen dioxide (NO<sub>2</sub>) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NO<sub>x</sub> = NO + NO<sub>2</sub>).
- A2.9 The model output of road-NO<sub>x</sub> (i.e. the component of total NO<sub>x</sub> coming from road traffic) has been compared with the 'measured' road-NO<sub>x</sub>. Measured road-NO<sub>x</sub> has been calculated from the measured NO<sub>2</sub> concentrations and the predicted background NO<sub>2</sub> concentration using the NO<sub>x</sub> from NO<sub>2</sub> calculator (Version 8.1) available on the Defra LAQM Support website (Defra, 2025).
- A2.10 The unadjusted models have under predicted the road-NO<sub>x</sub> contribution; this is a common experience with this and most other road traffic emissions dispersion models. Adjustment factors have been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A2-9 and Figure A2-10). The calculated adjustment factors of 1.922 (Shoeburyness Landwick) and 1.360 (East Malling) have been applied to the modelled road-NO<sub>x</sub> concentrations for each receptor in the relevant area to provide adjusted modelled road-NO<sub>x</sub> concentrations.
- A2.11 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NO<sub>x</sub> concentrations with the predicted background NO<sub>2</sub> concentration within the NO<sub>x</sub> to NO<sub>2</sub> calculator. Figure A2-11 and Figure A2-12 compare final adjusted modelled total NO<sub>2</sub> at each of the monitoring sites to measured total NO<sub>2</sub>, and show a close agreement.

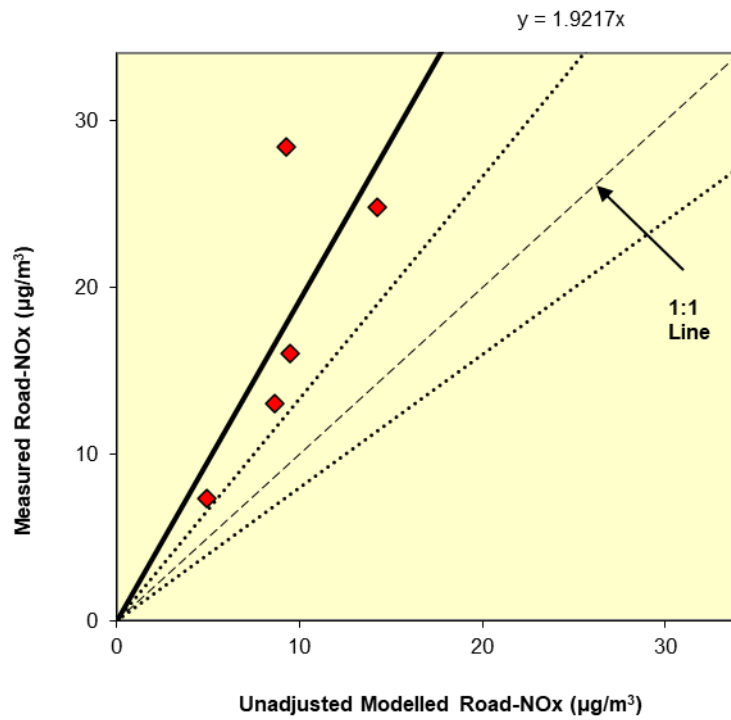


Figure A2-9: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations using the Shoeburyness Landwick meteorological monitoring site. The dashed lines show ± 25%.

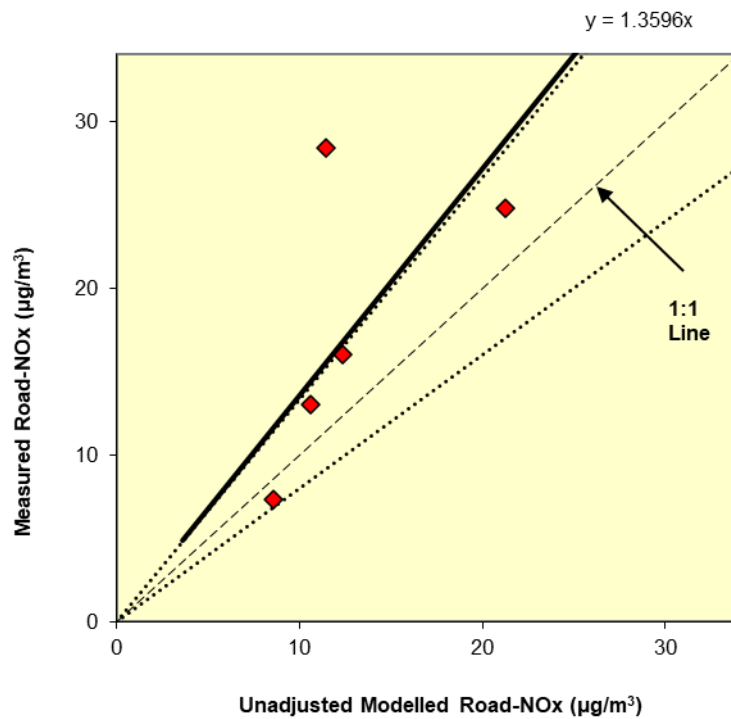


Figure A2-10: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations using the East Malling meteorological monitoring site. The dashed lines show ± 25%.

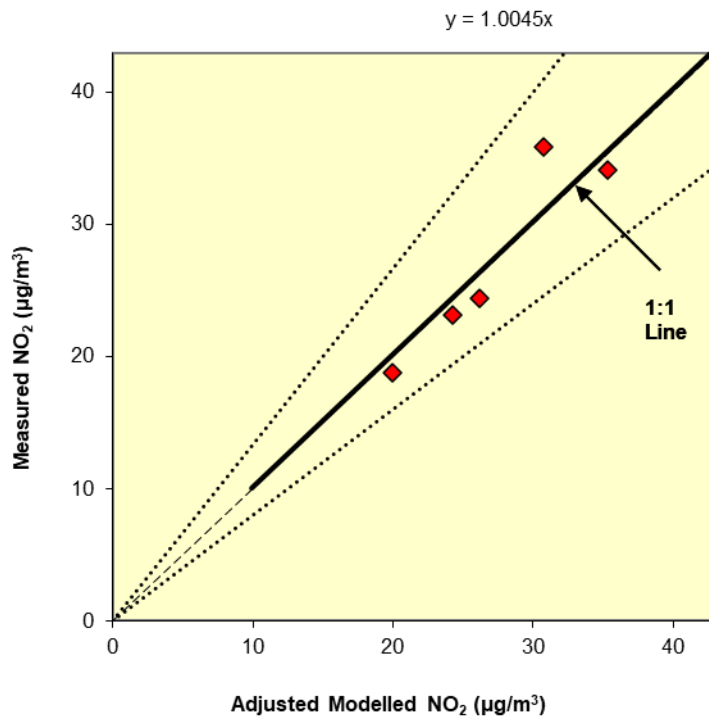


Figure A2-11: Comparison of Measured Total NO<sub>2</sub> to Final Adjusted Modelled Total NO<sub>2</sub> Concentrations using the Shoeburyness Landwick meteorological monitoring site. The dashed lines show ± 25%.

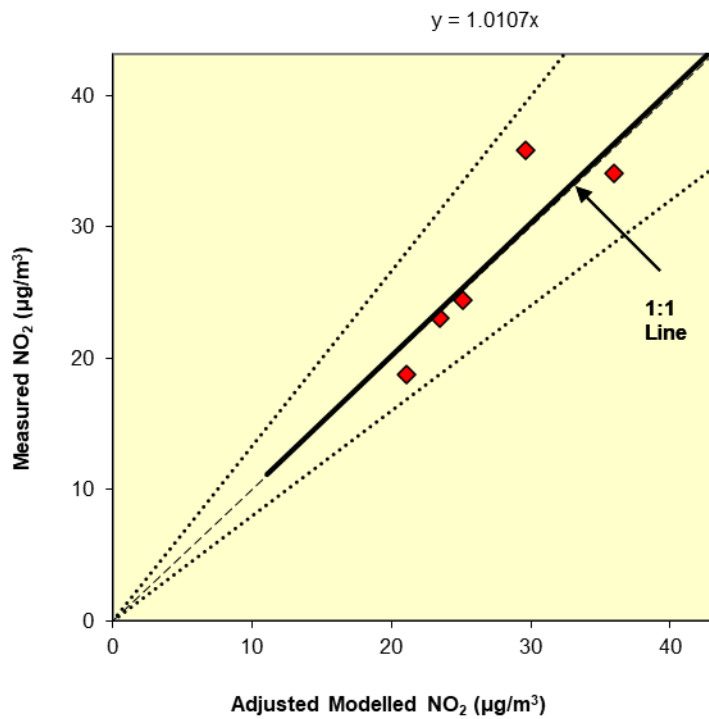


Figure A2-12: Comparison of Measured Total NO<sub>2</sub> to Final Adjusted Modelled Total NO<sub>2</sub> Concentrations using the East Malling meteorological monitoring site. The dashed lines show ± 25%.

A2.12 Table A2-5 shows the statistical parameters relating to the performance of the model, as well as the 'ideal' values (Defra, 2022). The values calculated for the model demonstrate that it is performing well.

**Table A2-5: Statistical Model Performance**

Statistical Parameter	Model-Specific Value	'Ideal' Value
<b>Shoeburyness Landwick</b>		
Correlation Coefficient <sup>a</sup>	0.93	1
Root Mean Square Error (RMSE) <sup>b</sup>	2.57	0
Fractional Bias <sup>c</sup>	0.00	0
<b>East Malling</b>		
Correlation Coefficient <sup>a</sup>	0.89	1
Root Mean Square Error (RMSE) <sup>b</sup>	3.08	0
Fractional Bias <sup>c</sup>	0.01	0

<sup>a</sup> Used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship.

<sup>b</sup> Used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared (i.e. µg/m<sup>3</sup>). TG22 (Defra, 2022) outlines that, ideally, a RMSE value within 10% of the air quality objective (4µg/m<sup>3</sup>) would be derived. If RMSE values are higher than 25% of the objective (10 µg/m<sup>3</sup>) it is recommended that the model is revisited.

<sup>c</sup> Used to identify if the model shows a systematic tendency to over or under predict. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.

### NH<sub>3</sub>

A2.13 There are no local roadside NH<sub>3</sub> monitoring sites which can be used to verify the model results for traffic-related NH<sub>3</sub> emissions. Development of the CREAM emissions models (AQC, 2020; 2025) included verification of concentrations predicted using the ADMS-Roads dispersion model and measured traffic data against ambient measurements from the most detailed network of roadside monitoring sites which has ever been run in the UK. No further adjustment to the model predictions is considered appropriate.

### Post-processing

A2.14 The model predicts road-NO<sub>x</sub> concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO<sub>2</sub>, has been processed through the NO<sub>x</sub> to NO<sub>2</sub> calculator available on the Defra LAQM Support website (Defra, 2025). The traffic mix within the calculator has been set to "All other urban UK traffic" for the verification sites and the Thames and Medway SPA and Ramsar sites and to "All non-urban UK traffic" for the North Downs Woodlands SAC, which are considered suitable for the study areas. The calculator predicts the component of NO<sub>2</sub> based on the adjusted road-NO<sub>x</sub> and the background NO<sub>2</sub>.

## Deposition Rates

A2.15 Deposition of NO<sub>2</sub> has not been included within the dispersion model because this is calculated from NO<sub>x</sub> outside of the model. Instead, deposition has been calculated from the predicted ambient concentrations using the deposition velocities set out in Table A2-6. Deposition velocities refer to a height above ground, typically 1 or 2 m, although in practice the precise height makes little difference and here they have been applied to concentrations predicted at a height of 1.5 m above ground. The velocities are applied simply by multiplying a concentration (µg/m<sup>3</sup>) by the velocity (m/s) to predict a deposition flux (µg/m<sup>2</sup>/s) and then scaling by time and area to represent kg/ha/yr of the nitrogen component of the molecule. The deposition velocity for NH<sub>3</sub> has been included within the dispersion model to allow for the calculation of depletion. NH<sub>3</sub> deposits much more rapidly than NO<sub>2</sub>, meaning that while it is important to include depletion for NH<sub>3</sub>, it is relatively trivial for NO<sub>2</sub>.

**Table A2-6: Deposition Velocities Used in This Assessment**

Pollutant	Deposition Velocity (m/s)	Reference
Nitrogen Dioxide	0.0015 m/s (Grassland); 0.003 m/s (Forest)	AQTAG06 (AQTAG, 2011)
NH <sub>3</sub>	0.02 m/s (Grassland); 0.03 m/s (Forest)	AQTAG06 (AQTAG, 2011)

A2.16 Wet deposition of the emitted pollutants close to the emission source will be restricted to wash-out, or below cloud scavenging. For this to occur, rain droplets must come into contact with the gas molecules before they hit the ground. Falling raindrops displace the air around them, effectively pushing gasses away. AQTAG06 guidance (AQTAG, 2011) is that the wet deposition of sulphur dioxide, nitrogen dioxide and NH<sub>3</sub> is not significant within a short range. It has thus not been included.

A2.17 Deposition may have an acidifying effect through the release of acid protons during chemical transformation in the soil or biota. Thus, even alkaline gases such as NH<sub>3</sub> can have an acidifying effect. The acidity Cios are expressed as equivalents ('eq'), referring to the molar equivalent of potential acidity. This is calculated from the mass (in g) of the deposited element, taking account of both its atomic mass and its valency. For example, the acidifying potential (in eq) of both ammonium (NH<sub>4</sub><sup>+</sup>) and nitrate (NO<sub>3</sub><sup>-</sup>) is 1/14 times the deposited mass in grammes (with 14 being the atomic mass of nitrogen), while for sulphate (SO<sub>4</sub><sup>2-</sup>) it is 2/32 (with 32 being the atomic mass of sulphur). The species included in the calculation of acid deposition, and their calculated acidifying potentials, are set out in Table A2-7.

**Table A2-7: Species Included in Acid Deposition Calculations**

Pollutant	Calculation (kg deposition to keq)
N (from deposited NO <sub>2</sub> , NH <sub>3</sub> )	0.071

## A3 Retardation

- A3.1 Nitrogen deposition in 2041 will be less than at present. This is because of natural turnover of the vehicle fleet as well the response to policies to reduce emissions from many sectors across Europe. Natural England sometimes requests that the degree of ‘retardation’ to ongoing reductions in nitrogen deposition should be calculated, and that this should be done assuming a linear trajectory between the existing baseline and the future which also continues at the same rate after the future assessment year<sup>7</sup>. This calculation has focused on the transect within each site with the highest PC in-combination with other projects and plans.
- A3.2 As explained in Paragraph 3.19, background deposition has been assumed to change between 2021 and 2041 based on JNCC’s Nitrogen Futures Business-as-Usual modelling, but only allowing 9 years of change because Nitrogen Futures did not make predictions beyond 2030. The total reductions to 2041 are therefore highly likely to have been under-predicted, which makes the ‘retardation’ calculation particularly worst-case.
- A3.3 The first step of the ‘retardation’ calculation is to show the magnitude of improvement which is forecast between the existing base and the 2041 Zero Growth scenario, and between the existing base and the 2041 With Plan scenario. These improvements are shown in Table A3-1, expressed both as the total and as the change per year<sup>8</sup>. For example, deposition in 2041 at 2 m from the road along Transect E1\_N is expected to be 1.04 kg-N/ha/yr lower than in 2019 if there is no increase in traffic over this 22-year period. With all forecast traffic growth, including that associated with the Submission Plan, deposition will be 0.1 kg-N/ha/yr lower than in 2019.

**Table A3-1: Reduction in Nitrogen Deposition between 2019 and 2041 at Worst-case Transects in Each Designated Site (kg-N/ha/yr)<sup>a</sup>**

Dist from Road (m)	Change from Existing Base to ‘2041 Zero Growth’		Change from Existing Base to ‘2041 With Plan’	
	total	per year	total	per year
<b>Thames Estuary and Marshes SPA and Ramsar (Transect E1_N)</b>				
2	-1.04	-0.05	-0.10	-0.004
3	-0.99	-0.04	-0.13	-0.006
5	-0.90	-0.04	-0.18	-0.008
9	-0.80	-0.04	-0.25	-0.011
17	-0.68	-0.03	-0.31	-0.014
33	-0.58	-0.03	-0.36	-0.016
65	-0.52	-0.02	-0.40	-0.018
129	-0.48	-0.02	-0.41	-0.019

<sup>7</sup> In practice, the first of these assumptions is invalid and the second one is also unlikely to be true, however this is the only robust basis to provide this calculation which is sometimes required by Natural England.

<sup>8</sup> Assuming 22 years.

Dist from Road (m)	Change from Existing Base to '2041 Zero Growth'		Change from Existing Base to '2041 With Plan'	
	total	per year	total	per year
200	-0.46	-0.02	-0.42	-0.019
<b>Medway Estuary and Marshes SPA and Ramsar (Transect E1_S)</b>				
2	-0.98	-0.04	-0.14	-0.006
3	-0.93	-0.04	-0.17	-0.008
5	-0.86	-0.04	-0.21	-0.010
9	-0.77	-0.04	-0.27	-0.012
17	-0.67	-0.03	-0.32	-0.015
33	-0.58	-0.03	-0.37	-0.017
65	-0.51	-0.02	-0.40	-0.018
129	-0.47	-0.02	-0.42	-0.019
200	-0.45	-0.02	-0.42	-0.019
<b>North Downs Woodlands SAC (Transect W4_N)</b>				
2	-5.3	-0.24	-3.7	-0.17
3	-4.9	-0.22	-3.5	-0.16
5	-4.4	-0.20	-3.2	-0.15
9	-3.8	-0.17	-2.9	-0.13
17	-3.1	-0.14	-2.5	-0.11
33	-2.5	-0.11	-2.2	-0.10
65	-2.1	-0.09	-1.9	-0.09
110	-1.8	-0.08	-1.7	-0.08

<sup>a</sup> Values are shown as negatives since they are reductions over time.

A3.4 The next step is to divide the PC by the 'per year' improvements to the 2041 Zero Growth scenario. These results are shown in Table A3-2.

A3.5 It should be stressed that this calculation is highly precautionary. The expected reduction in nitrogen deposition in the future is likely to have been underestimated because it has used JNCC's Business-as-Usual assumptions to 2030 in calculating the backgrounds. While this is the only approach to using JNCC's forecasts with which Natural England currently agrees, the approach assumes that the UK will break long-standing legal commitments to reduce emissions by 2030. Further improvements between 2030 and 2041 are also not included. Regarding the years after 2041, which are invoked by the concept of a 'delay', while these years have not been modelled it is reasonable to expect a significant volume of electric vehicles in the fleet by this time, which have no local emissions of NOx or NH<sub>3</sub>. This means that the years of delay statistics are likely to have been overpredicted.

**Table A3-2: Years Delay to Reductions in Nitrogen Deposition at Worst-case Transects in Each Designated Site**

Dist from Road (m)	Plan Alone		Plan In Combination	
	PC (kg/N/ha/yr)	Years Delay <sup>a</sup>	PC (kg/N/ha/yr)	Years Delay <sup>a</sup>
<b>Thames Estuary and Marshes SPA and Ramsar (Transect E1_N)</b>				
2	0.09	1.9	0.9	19.9
3	0.08	1.8	0.9	19.0
5	0.07	1.7	0.7	17.5
9	0.05	1.4	0.5	15.1
17	0.04	1.1	0.4	11.9
33	0.02	0.8	0.2	8.4
65	0.01	0.5	0.1	5.2
129	0.01	0.3	0.1	2.9
200	0.00	0.2	0.0	2.0
<b>Medway Estuary and Marshes SPA and Ramsar (Transect E1_S)</b>				
2	0.08	1.8	0.8	18.9
3	0.07	1.7	0.8	18.0
5	0.06	1.6	0.7	16.6
9	0.05	1.4	0.5	14.4
17	0.03	1.1	0.4	11.5
33	0.02	0.8	0.2	8.1
65	0.01	0.5	0.1	4.8
129	0.00	0.2	0.1	2.4
200	0.00	0.1	0.0	1.5
<b>North Downs Woodlands SAC (Transect W4_N)</b>				
2	0.5	2.0	1.6	6.6
3	0.4	1.9	1.4	6.3
5	0.4	1.8	1.2	5.9
9	0.3	1.5	0.9	5.2
17	0.2	1.2	0.6	4.2
33	0.1	0.9	0.4	3.1

Dist from Road (m)	Plan Alone		Plan In Combination	
	PC (kg/N/ha/yr)	Years Delay <sup>a</sup>	PC (kg/N/ha/yr)	Years Delay <sup>a</sup>
65	0.1	0.6	0.2	2.0
129	0.0	0.3	0.1	1.2
200	0.5	2.0	1.6	6.6

<sup>a</sup> i.e. the PC divided by the 'per year' reductions to the 2041 Zero Growth scenario.



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