TRANSFORMING LONDON STANSTED AIRPORT

35+ PLANNING APPLICATION

REVISION TO ANNEX 1: INFORMATION FOR EPPING FOREST

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STANSTED AIRPORT

35+ PROJECT

REVISION TO

INFORMATION FOR EPPING FOREST

Please note, this document supersedes the previous "Information for Epping Forest" sent on 5th July 2018.

This update is pursuant to a meeting held with Natural England and subsequently reflects the updated Natural England Guidance Note issued on 12th July 2018.

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1 INTRODUCTION

Background to the Study

1.1 RPS was commissioned by Stansted Airport Ltd (STAL) to undertake a Habitats Regulations Assessment of the proposed expansion of airside infrastructure at Stansted Airport to make the best use of the existing runway as well as an associated increase in passenger numbers, known as the 35+ application.

1.2 The wider Stansted Airport site has been subject to considerable ecological survey work and associated monitoring to inform the 25+ application to make better use of the existing runway (granted at appeal in 2008, planning ref: UTT/0717/06/FUL). While these studies identified several areas within the wider airport that were of ecological significance (such as the airside grassland as skylark habitat and the woodland/hedgerows within the airport site), the physical works associated with the 35+ application in terms of infrastructure development are limited to four locations:

- New Rapid Exit Taxiway (RET) to the south west of the existing runway;
- New Rapid Access Taxiway (RAT) to the north eastern end of the runway;
- Six new stands on the mid airfield (Yankee Remote Stands); and
- Three additional stands at the north eastern end of the airport (Echo Stands).

1.3 Discussions with Natural England have identified one European site that might be affected by the 35+ Project which should be screened for likely significant effects - Epping Forest Special Area of Conservation. The location of this site in relation to Stansted is shown on Figure 1.

1.4 In accordance with advice from Natural England, RPS has carried out a Habitats Regulations Assessment (HRA). This HRA constitutes an update and expansion of the previous screening report presented in Appendix 16.1 of the Environmental Statement (Preliminary Ecological Appraisal). This note incorporates the potential effects arising from aerial emissions from road traffic, based on the traffic modelling undertaken by Steer Davies Gleave (2017), on behalf of STAL, using the Highways Agency (now Highways England) DMRB methodology (HA 2007), to identify roads that could have higher traffic as a result of the 35+ Project.

1.5 A Screening approach is advocated in the DMRB and potentially affected roads are those that meet any of the following criteria:

- *Road alignment will change by 5m or more; or*
- *Daily traffic flows will change by 1,000 AADT or more; or*
- *Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or*
- *Daily average speed will change by 10km/hr or more; or*
- *Peak hour speed will change by 20km/hr or more.*

1.6 In this instance, all roads can be screened out as not significant with the exception of the M25 (J26-J27). Please refer to Section 3.9 where the assessment of this criterion can be found.

1.7 Only properties and Designated Sites within 200m of roads affected by the project need be considered.

1.8 Shape files for these sites were obtained from Natural England’s publicly-available download resource (hosted by data.gov.uk). These were plotted along with all roads meeting one of the above criteria; along with a 200m buffer marked on, as required by the DMRB methodology.

2 QUALIFYING INTEREST FEATURES

2.1 Special Areas of Conservation (SACs) are strictly protected sites designated under the European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (known as the Habitats Directive). Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended).

2.2 A sub-set of the Annex I habitat types are defined as being 'priority' because they are considered to be particularly vulnerable and are mainly, or exclusively, found within the European Union (Article 1d). The importance of these 'priority habitat' types is emphasised at several places in the Directive (Articles 4 and 5 and Annex III), not only in terms of the selection of sites, but also in the measures required for site protection (Article 6) and surveillance (Article 11).

2.3 The Epping Forest SAC stretches from Walthamstow to Epping, covering an area of 1,604.95 ha.

2.4 The citation for the site provides the following description of the SAC:

"*Epping Forest is a large ancient wood-pasture with habitats of high nature conservation value including ancient semi-natural woodland, old grassland plains, wet and dry heathland and scattered wetland. The semi-natural woodland is particularly extensive but the Forest plains are also a major feature and contain a variety of unimproved acid grasslands.*

The semi-natural woodlands of Epping Forest include important beech Fagus sylvatica forests on acid soils, which are important for a range of rare epiphytic species, including the moss Zygodon forsteri*. The long history of pollarding, and resultant large number of veteran trees, ensures that the site is also rich in fungi and invertebrates associated with decaying timber. Records of stag beetle* Lucanus cervus *are widespread and frequent.*

Areas of acidic grassland transitional with heathland are generally dominated by a mixture of fine-leaved grasses. In marshier areas, purple moor-grass Molinia caerulea *frequently becomes dominant. Broad-leaved herbs typical of acidic grassland and heathland are frequent, including heather* Calluna vulgaris*. The site also contains an example of wet dwarf-shrub heath with both heather and cross-leaved heath* Erica tetralix*."*

2.5 Qualifying features include a range of both habitats and species. Habitats include:

- Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*). (Beech forests on acid soils);
- European dry heaths; and
- Northern Atlantic wet heaths with *Erica tetralix*. (Wet heathland with cross-leaved heath).

2.6 The site is also designated for qualifying species, which include:

- Stag beetle *Lucanus cervus.*

2.7 The Conservation Objectives for a designated site set out the goals that are considered necessary to maintain or restore the qualifying features of a site to Favourable Conservation Status. Subject to natural change, the Conservation Objectives for the Epping Forest, are to maintain or restore:

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

Site Improvement Plan – Epping Forest SAC (14/12/2016)

2.8 The Site Improvement Plan (SIP) provides a high-level overview of the issues (both current and predicted) affecting the condition of the Natura 2000 features on the site and outlines the priority measures required to improve the condition of the features.

2.9 The current priority issues for the site are:

- Air pollution (Impact of atmospheric nitrogen deposition);
- Under grazing;
- Public access/disturbance;
- Changes in species distributions;
- Inappropriate water levels;
- Water pollution;
- Invasive species; and
- Disease.

2.10 There are several proposed actions to address the above priority issues.

3 HRA SCREENING

3.1 The screening stage of the HRA assesses the potential effects produced by the proposed development against the interest features of Epping Forest SAC (as set out in Section 2 above) in order to determine whether there could be a likely significant effect (LSE).

3.2 Screening for LSE involves identifying whether the proposed development is a source of potential effects that might affect any of the interest features of the relevant European Sites. If the scheme is a source of such an effect, it is then necessary to determine the length of any pathway of effect (i.e. is it possible for each effect to reach the site?) and, as such, whether there is a potential 'zone of influence' through which the proposed development could affect the interest features of relevant European Sites and what may reduce or prevent the potential effect reaching and/or influencing the relevant European Sites interest features and their conservation objectives.

3.3 The screening for LSEs undertaken identified those interest features from each relevant European Site where there was confidence that they are not likely to be significantly affected, and which therefore need not be considered further, as well as those features where LSEs could occur.

Potential impacts of the proposed Scheme

3.4 In order to ensure a robust assessment, all potential direct, indirect or secondary impacts of the scheme (either alone or in combination with other plans or projects) on the relevant European Sites, in the context of their conservation objectives, have been considered. These are summarised below in Table 3.2.

3.5 Note that decommissioning is not included in the screening as effects since there is no intended date or plan for decommissioning of the airport.

Table 3.2: Scheme activities, pathways and potential effects from the 35+ Project

Scheme Activities	Potential Pathway to an Interest Feature	Potential Effect
Construction		
Land take	Direct habitat loss for construction (SAC species feature)	Loss of habitat for SAC species feature Reduced numbers of SAC species features
	Direct habitat loss for construction (SAC habitat feature)	Reduction of extent of SAC habitat feature
	Habitat fragmentation	Reduced foraging opportunity for SAC species features Reduced breeding opportunity for SAC species features Reduced dispersal opportunity for SAC species features
Aerial emissions	Increase in atmospheric deposition and atmospheric	Damage to SAC habitat features

Scheme Activities	Potential Pathway to an Interest Feature	Potential Effect
	concentrations of pollutants from construction traffic	
Discharge of pollutants to water during construction	Deterioration in water quality	Damage to SAC habitat features Reduced foraging opportunity for SAC species features Reduced breeding opportunity for SAC species features Reduced dispersal opportunity for SAC species features
Noise and vibration generated during construction	Disturbance to species	Reduced foraging opportunity for SAC species features Reduced breeding opportunity for SAC species features Reduced dispersal opportunity for SAC species features
Light spill during construction	Disturbance to species	Reduced foraging opportunity for SAC species features Reduced breeding opportunity for SAC species features Reduced dispersal opportunity for SAC species features
Operation		
Aerial emissions	Increase in atmospheric deposition and atmospheric concentrations of pollutants	Damage to SAC habitat features
Aqueous emissions	Increase in aquatic concentrations of pollutants Increase in water temperature (thermal effects) Alteration to hydrological characteristics of fluvial habitats	Damage to SAC habitat features
	Increase in aquatic concentrations of pollutants Increase in water temperature (thermal effects)	Reduced foraging opportunity for SAC species features Reduced breeding opportunity for SAC species features Reduced dispersal opportunity for SAC species features
Noise generated during operation	Disturbance to species	Reduced foraging opportunity for SAC species features Reduced breeding opportunity for SAC species features Reduced dispersal opportunity for SAC species features

Screening Matrices

3.6 The screening matrices for the scheme ('the 35+ Project') are provided below. The purpose of the matrices is to provide the decision maker with a succinct summary of potential effects.

3.7 Potential effects greyed out in these matrices are those where there was clearly no further study required to conclude that no LSE would occur on a feature, such as direct habitat loss on sites some distance from the scheme. References and explanation for the evidential basis for these conclusions are provided in the accompanying notes.

3.8 Matrix Key:

✓ = Likely significant effect cannot be excluded without further assessment

✕ = Likely significant effect can be excluded

C = construction

O = operation.

Name of European Site	**Epping Forest SAC**													
Distance to Proposal site	23.1 km													
European site features	Land take		Habitat fragmentation		Aerial emission – Surface access		Aerial emissions – Airport operations		Aqueous emissions / discharges		Noise & Vibration		Lighting	
	C	*O*	*C*	*O*	*C*	*O*	*C*	*O*	*C*	*O*	*C*	*O*	*C*	*O*
9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)	✕a	✕a	✕b	✕b	✕c	✕d	✕e	✕e	✕f	✕f	✕g	✕g	✕h	✕h
4010 Northern Atlantic wet heaths with *Erica tetralix*	✕a	✕a	✕b	✕b	✕c	✕d	✕e	✕e	✕f	✕f	✕g	✕g	✕h	✕h
4030 European dry heaths	✕a	✕a	✕b	✕b	✕c	✕d	✕e	✕e	✕f	✕f	✕g	✕g	✕h	✕h
1083 Stag beetle *Lucanus cervus*	✕a	✕a	✕b	✕b	✕c	✕d	✕e	✕e	✕f	✕f	✕g	✕g	✕h	✕h

Evidence supporting conclusions

a.	Nearest element of the 35+ project is 23.1 km from site; no potential for direct habitat loss.
b.	Nearest element of the 35+ project is 23.1 km from site; no potential for fragmentation to affect habitats.
c.	Site 23.1 km from scheme; no potential for aerial emissions during construction work on site to affect habitats within SAC. Any generators etc. would be small scale and therefore, the potential zone of influence would be considerably smaller than this.
d.	Steer Davies Gleave traffic assessment has noted that the 35+ project will result in an increase of 1,493 vehicular movements per day on J26-J27 of the M25 which is within 200 m of Epping Forest SAC. Other sections of the M25, although close to the SAC are beyond the 200m buffer. This represents an increase in AADT on this stretch of the M25 of 0.88% and is therefore considered to be insignificant (i.e. <1%) in traffic flow terms. Further justification for this conclusion is provided below. The highest change in AADT as a result of the 35+ project on the local roads passing through Epping Forest was 12 on the northern section of the B1353 Epping Road. (Please see Appendix 2). On the basis of such a low change in AADT, traffic resulting from the 35+ project on these roads can reasonably be considered *de minimis* and therefore no further assessment of emissions from these local roads, either alone or in combination with other plans or projects, is necessary.
e.	Nearest element of the 35+ project is 23.1 km from site; no potential for effects from aerial emissions/discharges.
f.	Nearest element of the 35+ project is 23.1 km from site; no potential for effects from aqueous emissions/discharges.
g.	Nearest element of the 35+ project is 23.1 km from site; no potential for noise / vibration effects on species populations within SAC.
h.	Nearest element of the 35+ project is 23.1 km from site; therefore, no potential for lighting effects on species/habitats within SAC.

3.9 The main trip analysis reported in Chapter 6 of the ES (Surface Access) was prepared on a simple "no-alternative trip scenario", i.e. on the assumption that all additional traffic associated with the increased passenger movements at Stansted Airport would not otherwise arise. On this basis, in all scenarios/assessment years the only potentially relevant road (with >1000 AADT traffic increase) would be the M25 (J26-27) adjacent to Epping Forest SAC. This is also the only road with increases in traffic above a *de minimis* level within 200 m of the European Designated Site. Local roads within and directly adjoining the SAC were modelled and the largest increase is 12 AADT on the northern section of the B1353 Epping Road is considered *de minimis*. Therefore, even with a very robust assumption of "no alternative trips" which, for the new passengers, all roads but the M25 (J26-J27) can be screened out as not significant.

3.10 The assessment of the change in traffic flows on the M25 as a result of 35+ Project in the "no-alternative trip scenario" is predicted to attract an additional 1,493 vehicular movements per day on the M25 (J26-27) link as a result of passenger- and employee-related travel compared to the current predicted Do-Minimum scenario for the assessment year (2028).

Potential impacts compared to the predicted Do Minimum scenario

3.11 As noted above, the base assumption reported in Chapter 6 does not take in to account the fact that in the absence of expansion of operations at Stansted, given the DfT predicted increase in demand for air travel, the 8 million additional passenger trips that would be attracted to Stansted would otherwise be attracted to other UK airports (such as Bristol, Birmingham and East Midlands). Appendix H of the Transport Assessment (ES Volume 3) examines a more holistic approach and looks at the alternative routing of the additional car based trips to other airports in the without development (Do Minimum) scenario. The assessment contained in Appendix H (re-presented here as Appendix 1) concluded that the likely net effect of the airport expansion i.e. comparing the Development Case (termed the 'Do Something Case' in the TA) with the Do Minimum scenario, is neutral or results in small reduction of trips on the relevant section of the M25 in these alternative scenarios.

3.12 The London market demand will be constrained from 2022/3 when the available capacities of the main London airports (Heathrow, Gatwick and Stansted) become extremely limited; each airport being effectively 'full' at that time. These airports would therefore not be able to accommodate the 8mppa passenger demand predicted by STAL's expert forecasters ICF. However, it is expected that demand for air travel will remain unabated and that alternative airports further afield will attract these trips.

3.13 Results from the redistribution analysis (described in Appendix 1) for Birmingham Airport, East Midlands Airport and Bristol Airport all indicate between 1% and 12% more airport-derived vehicular trips will use the M25 (J26-27) link if the 35+ Project does not go ahead. These additional trips correspond proportionally to the additional passenger demand (8mppa), which would then redistribute to these alternative airports because Stansted would not be able to accommodate them. Of course, in practice, the alternative passenger trips could be anticipated to be shared amongst these and other smaller airports but the effect of traffic flows would be very similar.

3.14 The results of the detailed passenger displacement analysis show that the 35+ Project (Development Case) will actually have the less impact on the total traffic flows for the M25 (J26-27) link closest to Epping Forrest SPA – being +0.93% growth in vehicular traffic, compared to the displacement of passengers to alternative UK Airports - being between 0.94% and 1.04% growth in vehicular traffic, in the without development (Do Minimum) case.

3.15 Furthermore, it should be noted that the uplift in passengers is in comparison to the combined passenger and employee vehicle trips associated with the 35+ Development Case. It is therefore reasonable to assume that some potential employees would also be displaced to these other airports if the 35+ Project did not proceed, although this effect cannot be readily quantified. This would further increase the traffic growth on the M25 (J26-27) link in the without development (Do Minimum) case.

3.16 In summary, when comparing the Development Case and Do Minimum scenario, rather than there being a net increase of 1,493 AADT by 2028 (as reported in the main TA analysis), the more likely outcome would be a net reduction of between -15 and -184 AADT on the M25 (J26-27), depending on where the passengers redirect to as a result of 35+ Project not going ahead. The basis of this hypothesis has been agreed by Highways England.

3.17 In light of the above, 35+ Project is considered unlikely to give rise to a significant effect on Epping Forest SAC due to changes in air quality from traffic generation and will instead provide a net reduction in traffic on the key section of the M25 closest to the Epping Forest

SAC when compared to the traffic flows which would be generated without the development.

Potential impacts of the Development Case (Do-Something scenario)

3.18 Notwithstanding the assessment above, which reveals that by 2028 the 35+ Project will give rise to a lesser traffic increase than under the without development scenario, Natural England has previously indicated it has concerns about the absolute ('worst case') addition of 1,493 vehicular movements per day on the M25 (J26-27) link as a result of passenger and employee-related travel. This is an increase of <1% in the AADT on the M25 and is not considered significant in traffic terms on that basis. Nevertheless, an assessment of the potential for significant effects on the Epping Forest SAC from the traffic associated with this scenario is included in this report for clarity and completeness.

3.19 At the point at which it passes closest to the Epping Forest SAC, the M25 is underground within the Bell Common Tunnel with the eastern portal approximately 120 m east of the SAC boundary and the western portal approximately 15 m from the boundary. However, as the M25 is in a tree-lined cutting at this point, there is also significant vertical distance (circa 10 m) between the carriageway level and the SAC.

3.20 Current guidelines on the assessment of effects of increases in road traffic (HA 2007) require the consideration of designated sites within 200 m of the centre line of carriageways. The basis for this is the widely-observed trend in concentration of NO_x (and associated nutrient nitrogen deposition) to decrease in a logarithmic manner down to background by this distance, although some studies have shown small increases at distances greater than this. However, all studies have shown the greatest decrease in NO_x concentration within 100 m of the road (see Natural England 2016b and references therein).

3.21 For example, transect studies have shown that impacts are greatest within the first 50-100 m from roads. For example, Bignal *et al.* (2008) found that at Bradley Wood more than 60% of oak trees adjacent to the road had severely defoliated and discoloured crowns, but by 150 m from the road, no trees were severely defoliated. At Aston Rowant, the same authors found there was little difference in beech tree health between 50–200 m from a motorway except for leaf discolouration, which affected more than 30% of trees up to 100 m from the road.

3.22 This trend is supported by a study of local air quality monitoring at Epping Forest (Gadsdon & Power, 2009) which found NO_2 and NH_3 derived from traffic emissions on local roads within the SAC made a substantial contribution to the exceedance of critical levels and critical loads at roadside locations and up to 20 m from the edge of the carriageway. Although concentrations were above background for up to 250 m, the decrease in concentration in the initial 20-50 m from the road edge was most substantial. The decrease in NO_x concentration beyond 50m was very shallow. Data presented in that paper (Figure 1 (a)) shows the relationship between the distance from the road edge (x) and NO_x concentration (y) can be expressed by the equation $y = -2.859\ln(x) + 38.176$. Therefore, the measured distance at which the NO_x concentration dropped below the critical level of 30 $\mu g.m^{-3}$ in that study was 17.46 m from the roadside.

3.23 While elevated NO_x concentrations and associated nutrient nitrogen deposition have been noted at distances greater than 200 m (such as that observed in Gadsdon & Power, 2009), the ecological effect of such increases beyond this distance have not been identified with many studies showing no change in the particular indicator of ecological function such as Ellenburg Value or habitat species richness, despite slightly elevated pollutant levels (when compared to background). For example, a 520 m transect into Norway spruce woodland in Germany (Bernhardt-Römermann *et al*. 2006) away from motorways suggested that impacts on the composition of the field layer extended for up to 80 m upwind of the motorways (Epping Forest is upwind of the M25).

3.24 Also, a similar transect study of blanket bog at Moss Moor (part of the South Pennine Moors SAC) adjacent to the M62 (Bignal *et al*., 2007) used Ellenburg Values to show that species adapted to higher nitrogen availability had greater ground cover up to around 75 m from the motorway (consistent with the measured profile of NO_2), and declined to background levels at around 100 m.

3.25 Modelling of the increase in NO_x concentration and associated nutrient nitrogen deposition from the Development Case has been undertaken, based on the modelled traffic increase described above (Appendix 5) and using the accepted 200m distance criterion (NE 2018).

3.26 The maximum predicted change in NO_x concentration at the edge of the SAC as a result of the additional traffic from the 35+ project is 0.0931 $\mu g.m^{-3}$, well below either 1% of the critical level set for the protection of vegetation (30 $\mu g.m^{-3}$) or the 0.4 $\mu g.m^{-3}$ set within the DMRB. The associated change in nutrient nitrogen deposition is 0.0188 $kgN.ha^{-1}.yr^{-1}$, also well below 1% of the lower critical load for the Annex I woodland (10 $kgN.ha^{-1}.yr^{-1}$, taken from the Site-Relevant Critical Load Tool on the government's Air Pollution Information System (APIS), www.apis.ac.uk). Data presented in Appendix 5 also show that the contribution from the 35+ project decreases rapidly with distance from the M25, supporting the findings of previous work described above.

3.27 Such small increases in both NO_x concentration and nutrient nitrogen deposition rates are both below existing thresholds requiring further assessment (as set out in HA 2007 or Environment Agency 2012a & 2012b) and as such no likely significant effect would be predicted. These thresholds are considered to be *de minimis* (i.e. so small as to be inconsequential) and therefore not significant either alone or in combination with other plans/projects. The rationale behind the use of 1% is described in AQTAG21 (2015); essentially, it is set at a point that is three orders of magnitude below the EQS and is therefore sufficiently precautionary to minimise the risk of screening out potential impacts when the situation would otherwise merit further investigation.

3.28 To further support this conclusion, RPS undertook vegetation surveys of the northern section (in May 2018) of the Epping Forest SAC in the vicinity of the nearest section of the M25 motorway to the designated site, namely Unit 105 (Appendix 3), with a particular focus on the habitat within 200 m of the tunnel portals. The aim of the survey was to determine the habitats present (and specifically the features of interest for which the site is designated) within this unit, particularly within 200 m of the M25, and therefore the potential for significant effects on the SAC as a whole. The locations of the veteran trees (as the main host of potentially vulnerable epiphytes) were mapped and notes made on whether these displayed evidence of stress that could be associated with air pollution. A further aim was to determine the habitats present in relation to dominance by nitrophilous species (e.g. nettles, brambles etc.) that may result from eutrophication from nitrogen deposition. Further survey work in July 2018 followed, specifically focussed on the condition of the veteran trees using the Specialist Survey Method for veteran tree recording (SSM). This recorded % lichen cover as well as symptoms of stress on the veteran trees near to the M25 tunnel portals. Transects were also used to undertake a Lichen Indicator Survey (LIS) to calculate a nitrogen air quality index (NAQI) at different distances from the M25.

3.29 The most recent condition assessment of the underlying Site of Special Scientific Interest (SSSI) noted that the unit in this location (Unit 105) was in Favourable condition, however:

> *"… notwithstanding this assessment, there remains a very significant issue relating to air quality and the related deposition of acidity and of nitrogen. Many veteran trees within the unit display clear symptoms of stress (e.g. thin canopy and die-back of leading shoots), there is excessive growth of bramble, and there are dense stands of nettles along roadsides and ride edges."*

3.30 The only habitat present within 200 m of the M25 in Unit 105 is the woodland Annex I habitat Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*) – no dry or wet heath habitats were present.

3.31 No veteran trees occurred within 200 m of the Bell Common Tunnel eastern portal nor within 100 m of the western portal (see Figure 3). As described in the recent condition assessment, there was evidence of poor condition of oak trees (in the form of tip die back and significant epicormic growth) at the north of the survey area, including on the four veteran oak trees within 250 m although there did not appear to be any link with distance from road and it is not possible from the observational evidence alone to attribute the cause of such symptoms.

3.32 Epiphyte number and diversity were low across the entire study area with 1.43% on average (<10% everywhere and most trees had <1% lichen cover and similarly low bryophyte cover). There was no clear trend between % lichen cover and distance from the M25 (see Appendix 3; Figure A3.1). It is understood that the main area of epiphyte interest within the SAC is the core central zone well to the south of Unit 105 (*per comm.* J. Dagley CoLC). The number of veteran trees in the study area was also small (eight within 200 m of the M25). This is within the context of Epping Forest as a whole which supports over 50,000 veteran trees (CoL 2017) – i.e. <0.016% of the total resource. A full survey of the veteran tree resource within the SAC is currently underway by CoLC but it is understood that they have yet to survey Unit 105. Indications are that the total number of veteran trees is likely to be closer to 55,000 which would reduce this percentage further.

3.33 Areas of dense bramble and nettle occurred in areas dominated by oak outside and along the boundary of the SAC both close to and some distance from roads (see Appendix 3 Q9-Q11) but were absent from the beech-dominated interior of the woodland. The lack of epiphyte growth meant the locations where the LIS method to calculate the Nitrogen Air Quality Index (NAQI) was limited to two locations (see locations 1 and 6 on Figure 4) and so some caution should be used when interpreting the results. These locations are both on the edge of the woodland and both confirm that the current baseline is affected by N (NAQI values between 1.2 and 1.3 – 'N-polluted' or 'very N polluted'). The 'very N polluted' location (location 1) was within 50m of the M25 and directly alongside the High Road (B1393) and pollution levels fell away at location 6 which is within 200m of the eastern portal of the M25. This does appear to support other evidence from studies the forest that there are local effects from roads in the immediate vicinity (<50m) but which falls away within 200m.

3.34 On the basis of these surveys, the area of the SAC within buffer zones around the M25 were calculated (Figure 3 and Table 3.2). The total area of the SAC within 200 m of the M25 is 5.53 ha, 0.34% of the total area of the SAC and 0.85% of the 652.3 ha of Annex I beech woodland that occurs within the Forest (data taken from the Natura 2000 Standard Data Form for Epping Forest – Appendix 4). Therefore, the total area of woodland within 200 m of the M25 is so small as to be *de minimis* within the context of the SAC as a whole.

Table 3.2: Areas of the Epping Forest SAC within 200 m of the M25 portals

Distance from tunnel portal of M25	Area of SAC within buffer	% of total area of SAC	Number of veteran within buffer
20m buffer	0.01ha	0.0006%	0
50m buffer	0.19ha	0.01%	0
100m buffer	0.99ha	0.06%	0
150 m buffer	2.65ha	0.17%	3
200m buffer	5.53ha	0.34%	8
Total area of SAC 1,604.95 ha			

3.35 Therefore, on the basis that:

- the increase in AADT on the M25 associated with the 35+ project is <1% of the total traffic flow;
- associated maximum modelled increases in NO_x concentration and nutrient nitrogen deposition at the edge of the SAC are <<1% of the relevant thresholds and decrease very rapidly with distance;
- the overall condition of Unit 105 is described as being in favourable condition, despite the high background nutrient nitrogen deposition; and
- the total area of the SAC and total area of Annex I habitat within 200 m of the M25 are both <1% of the total resource while the total number of veteran trees within the same area is <<1% of the total number and the average epiphyte cover is very low (1.43% on average for lichens).

3.36 It is concluded that there is no potential for a likely significant effect on the Epping Forest SAC as a result of increased traffic flow on the M25 from the 35+ project.

3.37 The above is in relation to Unit 105 as the closest unit to the M25. Unit 109 is >200 m from the M25 so can also effects in this location can also be ruled out on the basis that there are no effects on the closer Unit 105.

In combination

3.38 Following current guidelines, the conclusion of no likely significant effect on the basis that the modelled increases in NO_x concentration and nitrogen deposition rates due to traffic increases are less than 1% is made for both alone and in combination assessments. The M25 is a strategically important motorway and one of the busiest in the country. Therefore, the traffic modelling set out in Appendix H of the Traffic Assessment within the ES uses TEMPro to build in strategic growth and can therefore be considered as a proxy for an in-combination assessment.

3.39 TEMPro is a program developed by the Department for Transport (DfT) providing traffic growth projections used in transport models and intended to act as a nationwide standardised distribution of growth in trip ends held with the National Trip End Model (NTEM). It also takes into account trends in the quantity and length of car trips per household. The Current TEMPro growth figures are predominantly associated with NETM increases. The TEMPro growth assumption adopted for all future year traffic predictions provided with the 35+ application is based on the 2016 release of TEMPro and based on the most recent NTEM, which is the most up-to-date dataset of trip ends available for use in transport business cases: both are acknowledged by DfT as a robust basis for developing forecasts in the vast majority of cases. TEMPro figures adopted for the analysis consider predicted future local housing and employment at a district level. The factors also include assumptions of future general changes in traffic levels resulting in trends of car usage.

3.40 At a local level it is often appropriate to adjust TEMPro growth factors to take account of housing and employment allocations in a study area. So for instance, growth of traffic on the local roads within Epping Forrest could vary from TEMPro Assumptions if either local housing allocations in Epping and the immediate surrounding districts were higher or lower than those assumed within the NETM, and/or specific developments were anticipated to lead to traffic using specific roads to access sites. However, at a regional level this becomes more difficult to predict and less appropriate. For a strategic highway link such as the M25, local housing allocations will have only a marginal effect on the changes in total traffic passing along the link. This is because the M25 carries a wide range of longer distance trips and growth of traffic could be reasonably reflect changes in population and the propensity for people to undertake car trips across the whole of South East England, or indeed more generally across the UK.

3.41 The use of TEMPro growth above base traffic as a proxy for all other development likely to result in additional traffic on the M25 is appropriate as a robust assessment for understanding total future potential traffic. The complexity with 35+ Project is that a single year has been assessed for the EA impact based on 2028 being when the full implications of a 43mppa permission would be expected to first occur. The TEMPro growth factors included in the TA and EIA, which adds around 18% to existing traffic levels is the growth of traffic associated with other development between 2016 and 2028.

3.42 Therefore, the data supporting the conclusion above of no likely significant effect already has an in-combination component built in, due to the use of TEMPro within the traffic modelling.

3.43 Further, recently-published guidance on the assessment of traffic-related air quality impacts on designated sites (Natural England 2018) provides further clarification on which plans/projects should be included within an in-combination assessment:

In general terms, it is important for a competent authority to remember that the subject plan or project remains the focus of any in-combination assessment. Therefore, it is Natural England's view that care should be taken to avoid unnecessarily combining the insignificant effects of the subject plan or project with the effects of other plans or projects which can be considered significant in their own right. The latter should always be dealt with by its own individual HRA. alone. In other words, it is only the appreciable effects of those other plans and projects that are not themselves significant alone which are added into an in-combination assessment with the subject proposal (i.e. 'don't combine individual biscuits (=insignificant) with full packs (=significant)').

3.44 In other words, plans/projects which are themselves not significant alone, such as the 35+ Project considered here, should not be combined with other plans/projects which are themselves already significant (such as those local plans currently being updated for the West Essex/East Hertfordshire Housing Market Area, HMA), as these are already being dealt with via individual HRAs.

3.45 An exhaustive search of the local area has not been undertaken to determine those projects which are themselves insignificant but who, in-combination, may be. However, to further support the conclusion that there would be no likely significant effect in combination and given the difficulty in predicting changes in traffic flow on the M25 due to its strategic nature, the potential headroom in AADT before the change in NO_x concentration or associated nitrogen deposition exceeded the 1% threshold has been calculated.

3.46 The increase in AADT due to the 35+ Project is predicted to be 1,493 with a corresponding maximum increase in NO_x concentration of 0.0931 $\mu g.m^{-3}$ and nutrient N deposition of 0.0188 $kgN.ha^{-1}.yr^{-1}$. The relevant thresholds are 0.3 $\mu g.m^{-3}$ (using the more conservative 1% of the critical level rather than the 0.4 $\mu g.m^{-3}$ set out in the DMRB) and 0.1 $kgN.ha^{-1}.yr^{-1}$ (1% of the relevant critical load of 10 $kgN.ha^{-1}.yr^{-1}$). Therefore, the headroom before the 1% thresholds are breached would be 0.2069 $\mu g.m^{-3}$ and 0.0812 $kgN.ha^{-1}.yr^{-1}$.

3.47 All else being equal, therefore, assuming a linear relationship between change in NO_x concentration/nutrient N deposition and AADT, other plans/projects in the area would need to generate an additional 3,318 or 6,448 above the growth predicted by TEMPro before the 1% threshold were reached (i.e. 1,493/0.0931 x 0.2069 and 1,493/0.0188 x 0.0812).

3.48 On the basis of the above calculations, it would require at least two other developments of Stansted's size to come forward before the 1% for NO_x were reached and at least four others before that for nutrient nitrogen were reached, It is highly unlikely that such large-scale development would come forward within the period covered by the 35+ Project, outwith the growth already associated with TEMPro or the local plans for the HMA which are already subject significant in their own right,

4 CONCLUSIONS

4.1 Following advice from Natural England, a Habitats Regulations Assessment (HRA) of the effects of the proposed 35+ project on the Epping Forest Special Area of Conservation (SAC) was undertaken. An initial screening of Likely Significant Effects did not identify any issues likely to result in such an effect. This included on the M25 between J26/27 where the change in AADT was <1% of existing flows. Traffic increases on all other roads were so small as to be *de minimis*.

4.2 For the purposes of supporting (or otherwise) the conclusion of no likely significant effect, further assessment of the Epping Forest SAC in relation to the M25 has therefore been undertaken. Based on a Do-Minimum scenario that accounts for the diversion of passengers to other airports in the event that the 35+ application is unsuccessful, the Development Case shows a net decrease in traffic on the M25 adjacent to the SAC. Therefore, rather than an additional 1,493, as reported in the body of the TA, a more reasonable assumption for change in AADT due to 35+ Project would be between -15 and -184, depending on where the passengers redirect to as a result of 35+ Project not going ahead.

4.3 Notwithstanding this, additional modelling of changes in air quality show that both NO_x concentration and nutrient nitrogen deposition has been undertaken for the AADT change of 1,493 in the absence of any form of passenger redirection. Maximum values for both are <1% of the relevant thresholds at the edge of the SAC and decrease rapidly with distance into the designated site. Given that the TEMPro model used within the traffic modelling incorporates traffic growth associated with a strategic road such as the M25, these data are relevant for both alone and in-combination scenarios.

4.4 Also, a further survey of the vegetation present in the north of the SAC identified that no heathland habitats occurred within 200 m of the M25. The survey noted that 0.85% of the Annex 1 woodland habitat (5.53 ha of a total of 652.3 ha) and 0.34 % of the total SAC area occurred within this 200m buffer from the M25 and that this unit (Unit 105) is recorded as being in favourable condition. The total number of veteran trees present (as the key hosts for the most sensitive epiphytes) was 8, <0.016% of the total resource within Epping Forest and the existing epiphyte cover was very low (1.43% lichen cover on average).

4.5 Therefore, on the basis of the above, no significant effect on the SAC as a result of the 35+ Project is predicted, either alone or in combination. As such, there is no requirement to undertake an Appropriate Assessment.

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APPENDIX 1 – REDISTRIBUTION TRAFFIC MODELLING

steer davies gleave

Technical Note

To	Natural England
Cc	Stansted Airport Limited, RPS
From	Steer Davies Gleave
Date	15 December 2017
Project	Stansted 35+ Project

Project No. 23003401

Epping Forest SSSI – Impact of Stansted 35+ Project

Introduction

1. Steer Davies Gleave (SDG) was commissioned by Stansted Airport Limited (STAL) to provide surface access transport consultancy advice in support of the planning application to increase the allowable passenger throughput at Stansted Airport from 35 million passengers per annum (mppa) to 43mppa (hereby referred to as the 'Stansted Airport 35+ Project').

2. An Environmental Statement (ES) scoping report was produced for the proposed planning application and issued to a number of stakeholders in July 2017. Natural England (NE) was amongst the stakeholders approached for comment. NE is the UK government's statutory advisor for the natural environment, who "*help to protect England's nature and landscapes for people to enjoy and for the services they provide*".

3. In response to the ES scoping report, NE set out the following response regarding the Epping Forest SSSI:

   "we advise that your ES submission needs to include a traffic assessment with predictions for traffic levels including key roads near Epping Forest SAC, SSSI. It should be noted that the current baseline levels of road traffic movements are for aircraft passenger levels (and staffing/operational traffic associated with current operations) are below the permitted passenger levels of 35mppa, so predictions need to be provided for road traffic movements that would meet the 35mppa level within indicated growth timetables and to meet 43mppa within the timetables indicated."

4. Epping Forest SSSI comprises 1,728 hectares of land and expands across Epping Forest District, London Borough of Waltham Forest and the London Borough of Redbridge.

5. It was designated as an SSSI in 1953 (Under 1949 Act) and 1980 (Under 1981 Act). It is one of few remaining large-scale examples of ancient wood-pasture in lowland Britain. The environment has retained "*habitats of high nature conservation value including ancient semi-natural woodland, old grassland plains and scattered wetland*". The semi-natural woodland is particularly extensive, forming one of the largest coherent blocks in the country. Another major feature is the forest plains, which contain a variety of unimproved acid grasslands, uncommon elsewhere in Essex and London. Epping Forest SSSI also supports "*a nationally outstanding assemblage of invertebrates, major amphibian interest and an exceptional breeding bird community*".

6. It is considered that the key consideration is the impact associated with an increase in vehicular traffic on the M25, Junction 26-27 link associated with a proportion of the additional 8 million passengers.

7. This note sets out the forecast traffic flows expected on this link of the M25 as a result of the passenger cap increase at Stansted Airport, compared to consented conditions, i.e. the vehicle movements associated with 8 million additional passenger movements and associated increased employee vehicle trips, both taking into account predicted modes of travel and average car occupancies.

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8. It sets out a comparison of the additional traffic flows to and from Stansted Airport for the Stansted Airport 35+ Project compared to the volume of traffic that would utilise this link of the M25 should the 8 million passengers use alternative airports once Stansted Airport reaches its current 35mppa cap.

Methodology

Passenger and Employee Forecasts

9. To inform the surface access travel patterns at Stansted Airport for the existing and future baselines, the following data sources have been used to derive up-to-date and robust information:

- Civil Aviation Authority (CAA) 2016 Passenger Survey data;
- ICF Passenger Outputs (2016); and
- Employee Travel Survey (2015).

10. These sources were used to derive existing and future baseline passenger and employee modes of travel and places of residence; to inform the distribution of employees and passengers travelling to/from Stansted Airport, and to further delineate the proportion that would travel via the M25 (J26-27).

Mode Share

11. The mode share from the 2016 CAA passenger survey was used to derive the number of vehicle trips for passengers in 2028.

12. The baseline modal split for employees was forecast from the Employee Travel Survey (2015). The future mode share for employees was derived from the existing modal share and the targets outlined in Stansted Airport's 2015 Sustainable Development Plan to reduce the number of single car occupancy trips for employees at Stansted Airport.

13. The proportion of the mode share which comprises vehicle trips for passengers and employees in 2028, is therefore shown in Table 1.

Table 1: Future Vehicular Mode Share – Passengers and Employees

	Proportion of Vehicle Trips (%)*
Passengers	50%
Employees	55%

*This includes all trips made by car, car passenger and taxis. An average occupancy of 1.6 persons was applied to car passenger and taxi trips to derive the number of vehicles. More information is provided in Technical Note 01 and the Transport Assessment.

14. To forecast the quantum of vehicle trips generated by passengers and employees in the 2028 35mppa and 2028 43mppa future year scenarios, the average daily passenger and employee forecasts were applied to the vehicle mode splits presented in Table 1. These results are shown in Table 2.

Table 2: Average Total Daily Vehicle Trips

Scenario	Daily Passenger Vehicle Trips	Daily Employee Vehicle Trips	Total
2028 (35mppa) 'Do Minimum'	36,454	8,163	**44,617**
2028 (43mppa) 'Do Something'	42,815	10,018	**52,833**

Place of Residence

15. In order to determine the proportion of persons (passengers and employees) using the M25 (J26-27) link, a trip origin/destination was assigned to predicted trips. The surface origin of air passengers was derived

from the CAA 2016 passenger survey. The 2015 Employee Survey informed the distribution of employees. The baseline trip distribution was also used to inform the 2028 scenarios, as the catchment for passengers and employees is not anticipated to alter significantly. Table 3 shows the aggregated distributions for passengers and employees.

Table 3: Place of Residence – Passengers and Employees

	Passengers	Employees
East Midlands	6%	1%
West Midlands	2%	0%
Southwest and Wales	3%	0%
East Anglia	13%	7%
Outer South East NW	3%	2%
Outer South East NE	14%	77%
Outer South East SE	3%	1%
Outer South East SW	2%	1%
Inner London	31%	1%
Outer London NE	7%	6%
Outer London NW	9%	3%
Outer London SE	2%	1%
Outer London SW	2%	0%
Rest of UK	2%	0%
Total	**100%**	**100%**

Routing of Passengers and Employees

16. Future additional traffic flows on the M25 (J26-27) link were forecast using the system application 'Network Analyst' in ArcGIS to assign the trip distribution to the highway network based on lowest journey times.

17. The network used was 'Pitney Bowes 2016 Speed profiles – Night (22:00 – 04:00)', which provides a reliable proxy for free flow conditions and suitable for the 24 hour operation at the airport. This was then edited by SDG to account for the A14 improvements and Huntingdon Bypass which will be complete and operational by 2028.The national speed limit was adopted as the link speed for this new route.

18. The network was used to calculate the quickest timed routes from weighted population centres from each residential district to the Airport. The districts were weighted according to population density, which was calculated by deriving the median coordinates for each district, weighted by population at Lower Super Output Area (LSOA) level (2011). A number of employee/passenger vehicles were assigned to each district, based on the relative size (area) of each district, compared with the overall aggregate zone where:

$$\left(\frac{\text{District Population}}{\text{Total zone population}}\right) \times \text{No. of passengers and employees in the overall zone}$$

19. It was then assumed that all passengers and employees within each district took the fastest route to Stansted Airport. Passenger only trips were calculated for the alternative airports tested, as the number of employees affected is not directly comparable. Employee travel characteristics are usually determined by locality.

Results

Travel to Stansted Airport

20. In order to quantify the increase in traffic posed by the passenger cap application for 43mppa, results were produced for:

- 2028 (35mppa) 'Do Minimum' Scenario; and
- 2028 (43mppa) 'Do Something' Scenario.

21. The distribution of passengers and employees to/from Stansted Airport as derived from the existing passenger and employee surveys, is presented in Figure 1.

Figure 1: Passenger and Employee Routing to Stansted Airport

22. Based on the passenger and employee routings shown in Figure 1, the proportion of vehicle trips via the M25 (J26-27) link was derived. Table 4 illustrates the number of vehicles per scenario which are predicted to travel via the M25 (J26-27) link, according to place of residence.

Table 4: Vehicle movements on M25 (J26-27) – Stansted Airport

Aggregate zone	Travel to Stansted Airport on M25 (J26-27)						
	Projected Employees (2028 35mppa)	Projected Employees (2028 43mppa)	Difference in Employees (2028 35mppa vs 43mppa)	Projected Passengers (2028 35mppa)	Projected Passengers (2028 43mppa)	Difference in Passengers (2028 35mppa vs 43mppa)	Total Difference (Employees + Passengers)
East Midlands	1	1	**0**	57	70	**13**	**13**
West Midlands	0	0	**0**	0	0	**0**	**0**
Southwest and Wales	10	12	**2**	768	944	**176**	**178**
East Anglia	0	0	**0**	0	0	**0**	**0**
Outer South East NW	84	103	**19**	1,316	1,618	**302**	**321**
Outer South East NE	1,016	1,246	**231**	1,392	1,711	**319**	**550**
Outer South East SE	0	0	**0**	0	0	**0**	**0**
Outer South East SW	31	38	**7**	606	745	**139**	**146**
Inner London	0	0	**0**	0	0	**0**	**0**
Outer London NE	0	0	**0**	0	0	**0**	**0**
Outer London NW	54	66	**12**	1,188	1,460	**272**	**284**
Outer London SE	0	0	**0**	0	0	**0**	**0**
Outer London SW	0	0	**0**	0	0	**0**	**0**
Rest of UK	0	0	**0**	0	0	**0**	**0**
Total	**1,195**	**1,466**	**271**	**5,327**	**6,549**	**1,222**	**1,493**

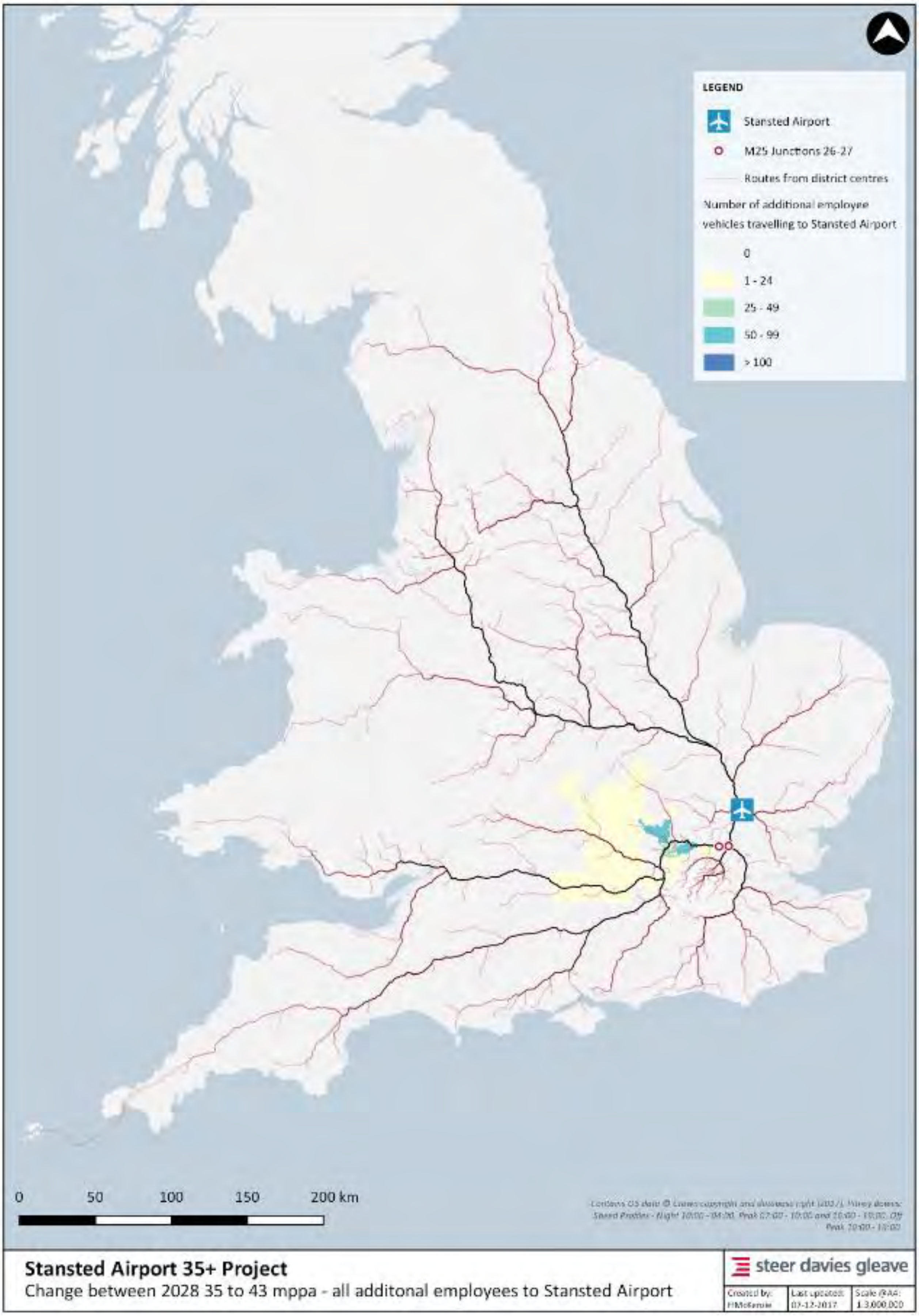
23. As Table 4 shows, a combined total of 1,493 daily trips are predicted for the M25 (J26-27) link in the 2028 (43mppa) 'Do Something' scenario compared to the consented 2028 (35mppa) 'Do Minimum' results to Stansted Airport.

24. The largest proportion of passengers using the M25 (J26-27) are located in the 'Outer South East NE' and 'Outer South East NW' zones., with a similar distribution of employees.

25. Figure 2 and Figure 3 visually present the proportion of trips made by passengers and employees respectively to Stansted Airport, between the two scenarios tested.

Figure 2: Proportion of Passengers using the M25 (J26-27) link – Stansted Airport

Figure 3: Proportion of Employees using the M25 (J26-27) link– Stansted Airport



Potential Future Travel – Other Airports

26. The Department for Transport predicts a steady increase in air travel demand and their modelling suggests that demand distributes between airports based on ability to handle demand. Hence, whilst the increased cap application will attract vehicular trips on the M25 (J26-27) link for travel to and from Stansted Airport; without the cap application, the same 8mppa passengers will still be expected to travel, but via other UK Airports where there is suitable capacity.

27. The potential for associated vehicle trips to otherwise use the M25 (J26-27) link for travel to other UK Airports has therefore been analysed to consider the impact of the Stansted 35+ Project, compared to alternative of increased passenger travel to other airports.

28. In the current absence of alternative permitted expansion of other south-east England airports, the airports selected for analysis are as follows:

- Birmingham Airport;
- East Midlands Airport; and
- Bristol Airport.

29. All of the options above have been considered as they display 'spare' operating capacity at 2028, sufficient to accommodate, between them, the displaced 8mppa. In order to provide a simple direct comparison, three scenarios have been tested:

- **Option 1** – All Passengers displaced to Birmingham Airport;
- **Option 2** – All Passengers displaced to East Midlands Airport; and
- **Option 3** – All Passengers displaced to Bristol Airport.

30. In practice, any displacement would be expected to be a mix of the three options. No London-based Airports were tested as all are projected to be operating at capacity by 2028[1].

Option 1 – All Passengers displaced to Birmingham Airport

31. Birmingham Airport is the seventh largest airport in the UK, located in the Metropolitan Borough of Solihull, eight miles south east of Birmingham city centre.

32. In 2016, a total of 11.6 million passengers were recorded to travel through Birmingham Airport (CAA passenger survey, 2016). The maximum throughput of passengers is estimated presently at 27mppa (Towards 2030 (Airport Masterplan to 2030), Birmingham Airport 2007). It is noted that a new masterplan is being prepared by the airport to support further growth to 55mpaa by 2050.

33. The routing of passengers to/from Birmingham Airport, based on the origins presented in Table 3 and the same assignment technique as adopted above, is presented in Figure 4.

[1] It is acknowledged that London Heathrow Airport will not have a third runway by 2028, and forecasts show that 2030 is a realistic timescale for opening.

Figure 4: Passenger Routing to Birmingham Airport

34. The assignment of vehicle trips via the M25 (J26-27) link was derived based on the passenger routings shown in Figure 4. Table 5 illustrates the number of vehicles per scenario which are predicted to travel across the M25 (J26-27) link, according to place of residence.

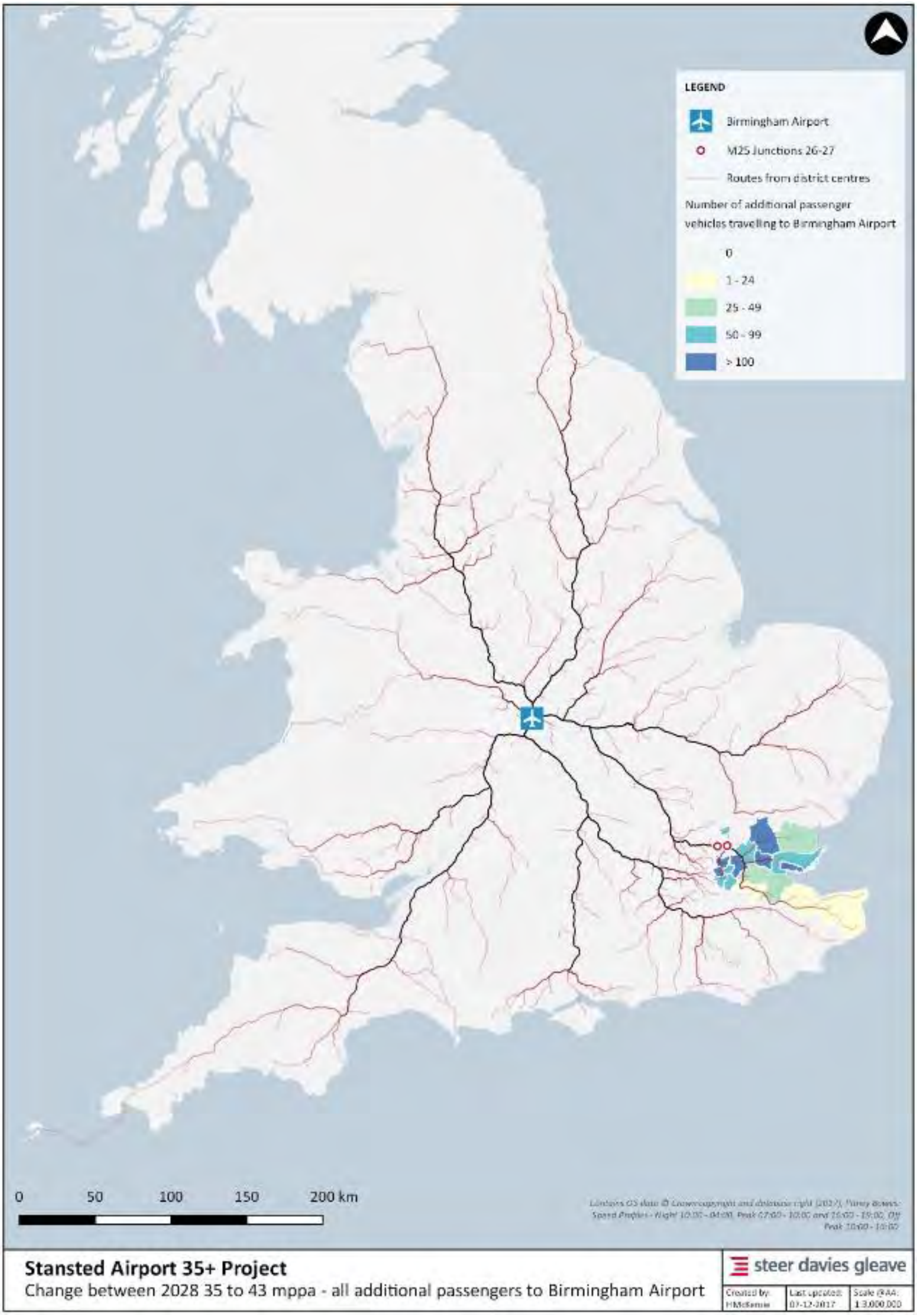
Table 5: Vehicle movements on M25 (J26-27) – Birmingham Airport

Aggregate Zone	Total additional Employee and Passenger trips to Stansted Airport 2028 43 (8mppa)	Displacement of additional Passenger trips to Birmingham Airport 2028-43 (8mppa)	Difference in M25 (J26-27) trips (+/-)
Rest of UK	0	0	0
East Midlands	13	0	-13
West Midlands	0	0	0
Southwest and Wales	179	0	-179
East Anglia	0	0	0
Outer South East NW	321	0	-321
Outer South East NE	550	684	+134
Outer South East SE	0	184	+184
Outer South East SW	146	0	-146
Inner London	0	74	+74
Outer London NE	0	516	+516
Outer London NW	285	0	-285
Outer London SE	0	52	+52
Outer London SW	0	0	0
Total	**1,493**	**1,508**	**+15**

35. As Table 5 shows, a total of 1,508 passenger related vehicle trips would use the M25 (J26-27) link to travel to Birmingham Airport in the absence of the 35+ Project at Stansted Airport. This is 15 more vehicle trips than the traffic increase forecast for this link associated with travel to and from Stansted Airport with the 35+ Project including Passengers and employees.

36. Figure 5 visually present the origin/destinations of the displaced passengers respectively to Birmingham Airport.

Figure 5: Proportion of Passengers using the M25 (J26-27) – Birmingham Airport



Option 2 – All Passengers displaced to East Midlands Airport

37. Option 2 sets out the proportion of vehicle trips travelling on the M25 (J26-27) link in the instance that the 8mppa is displaced to East Midlands Airport.

38. East Midlands Airport is located in Leicestershire, within 14 miles of Loughborough, Derby and Nottingham. In 2016, a total of 4.65 million passengers were recorded to travel through East Midlands Airport (CAA passenger survey, 2016). The maximum throughput of passengers is estimated at 10mppa (EMA Sustainable Development Plan, 2015), however, all 8 million trips have been assigned to the airport for this comparison exercise.

39. The routing of passengers to/from East Midlands Airport is presented in Figure 6.

40. Based on the passenger routings shown in Figure 6 and the assignment method previously adopted, the predicted number of passenger related vehicle trips attracted to the M25 (J26-27) link was derived. Table 6 illustrates the number of vehicles per scenario which are predicted to travel on the M25 (J26-27) link, according to place of residence.

Table 6: Vehicle movements on M25 (J26-27) – East Midlands Airport

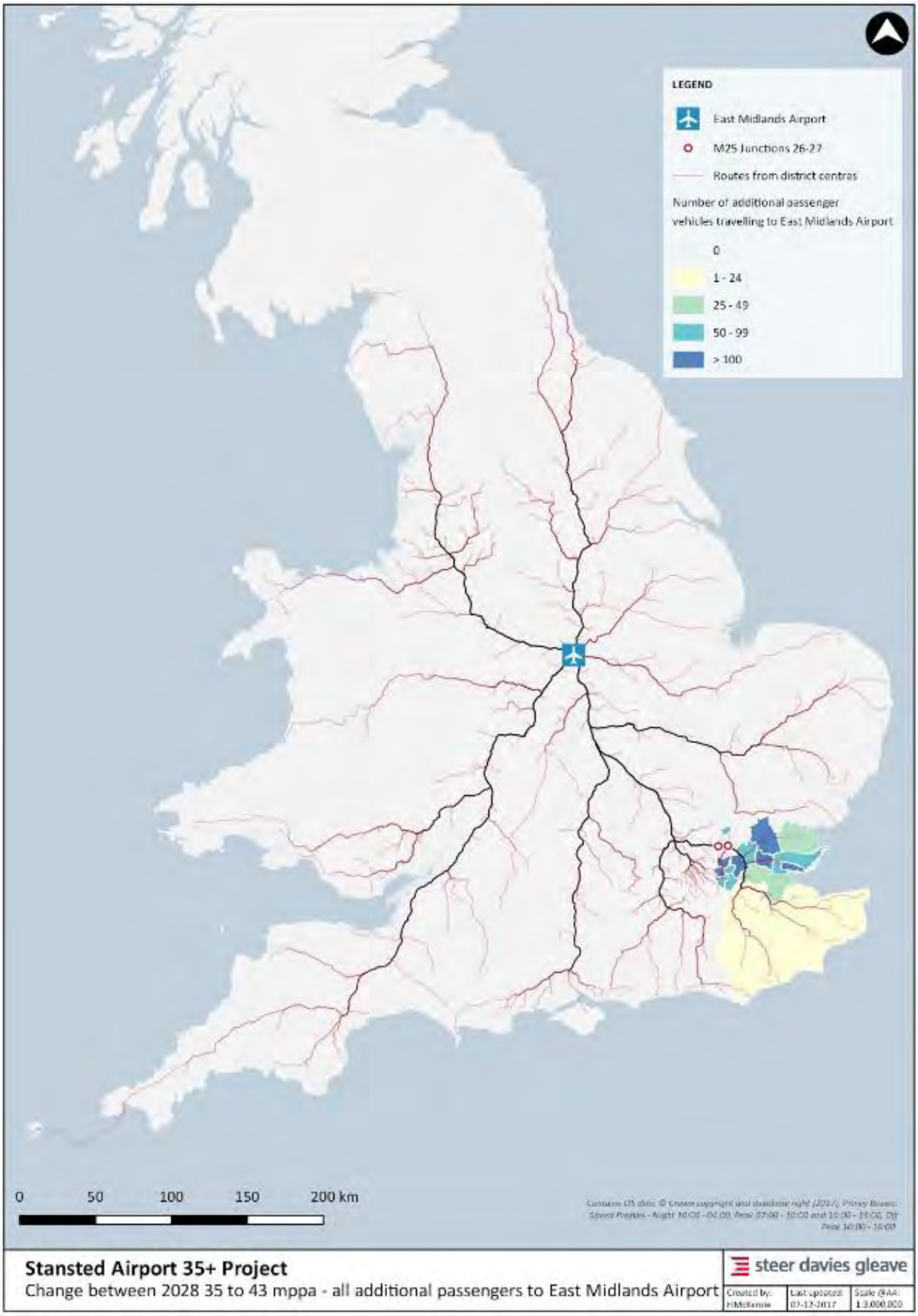
Aggregate Zone	Total additional Employee and Passenger trips to Stansted Airport 2028 43 (8mppa)	Displacement of additional Passenger trips to East Midlands Airport 2028-43 (8mppa)	Difference in M25 (J26-27) trips (+/-)
Rest of UK	0	0	0
East Midlands	13	0	-13
West Midlands	0	0	0
Southwest and Wales	179	0	-179
East Anglia	0	0	0
Outer South East NW	321	0	-321
Outer South East NE	550	684	+134
Outer South East SE	0	352	+352
Outer South East SW	146	0	-146
Inner London	0	74	+74
Outer London NE	0	516	+516
Outer London NW	285	0	-285
Outer London SE	0	52	+52
Outer London SW	0	0	0
Total	**1,493**	**1,677**	**+184**

41. As Table 6 shows, a total of 1,677 passenger related vehicle trips would use the M25 (J26-27) link to travel to and from East Midlands Airport in the absence of the 35+ Project at Stansted Airport. This is 184 vehicle trips compared to the traffic forecast for passengers and employees combined, towards Stansted Airport for the 35+ project.

42. Passengers using the M25 (J26-27) are located in the ‘Outer South East NE’, ‘Outer London NE’ and ‘Outer South East SE’ zones. Figure 7 visually presents the origin/destinations of the displaced passengers to East Midlands Airport.

Figure 6: Passenger Routing to East Midlands Airport

Figure 7: Proportion of Passengers using the M25 (J26-27) – East Midlands Airport



Option 3 – All Passengers displaced to Bristol Airport

43. Bristol Airport is the UK's ninth largest airport, located in Lulsgate Bottom in North Somerset. In 2016, a total of 7.6 million passengers were recorded to travel through Bristol Airport (CAA passenger survey, 2016). The maximum throughput of passengers is estimated at 15mppa by 2030 (Bristol Airport 'Preparing for the Future', 2017).

44. The predicted trip assignment of vehicles for passengers to/from Bristol Airport is presented in Figure 8.

45. Based on the passenger routings shown in Figure 8 and the assignment method previously adopted, the predicted number of vehicle trips attracted to the M25 (J26-27) link was derived. Table 7 illustrates the number of vehicles per scenario which are predicted to travel on the M25 (J26-27) link, according to place of residence.

Table 7: Vehicle movements on M25 (J26-27) – Bristol Airport

Aggregate Zone	Total additional Employee and Passenger trips to Stansted Airport 2028 43 (8mppa)	Displacement of additional Passenger trips to Bristol Airport 2028-43 (8mppa)	Difference in M25 (J26-27) trips (+/-)
Rest of UK	0	0	0
East Midlands	13	0	-13
West Midlands	0	0	0
Southwest and Wales	179	0	-179
East Anglia	0	305	+305
Outer South East NW	321	0	-321
Outer South East NE	550	1,090	+540
Outer South East SE	0	0	0
Outer South East SW	146	0	-146
Inner London	0	0	0
Outer London NE	0	121	+121
Outer London NW	285	0	-285
Outer London SE	0	0	0
Outer London SW	0	0	0
Total	**1,493**	**1,516**	**+23**

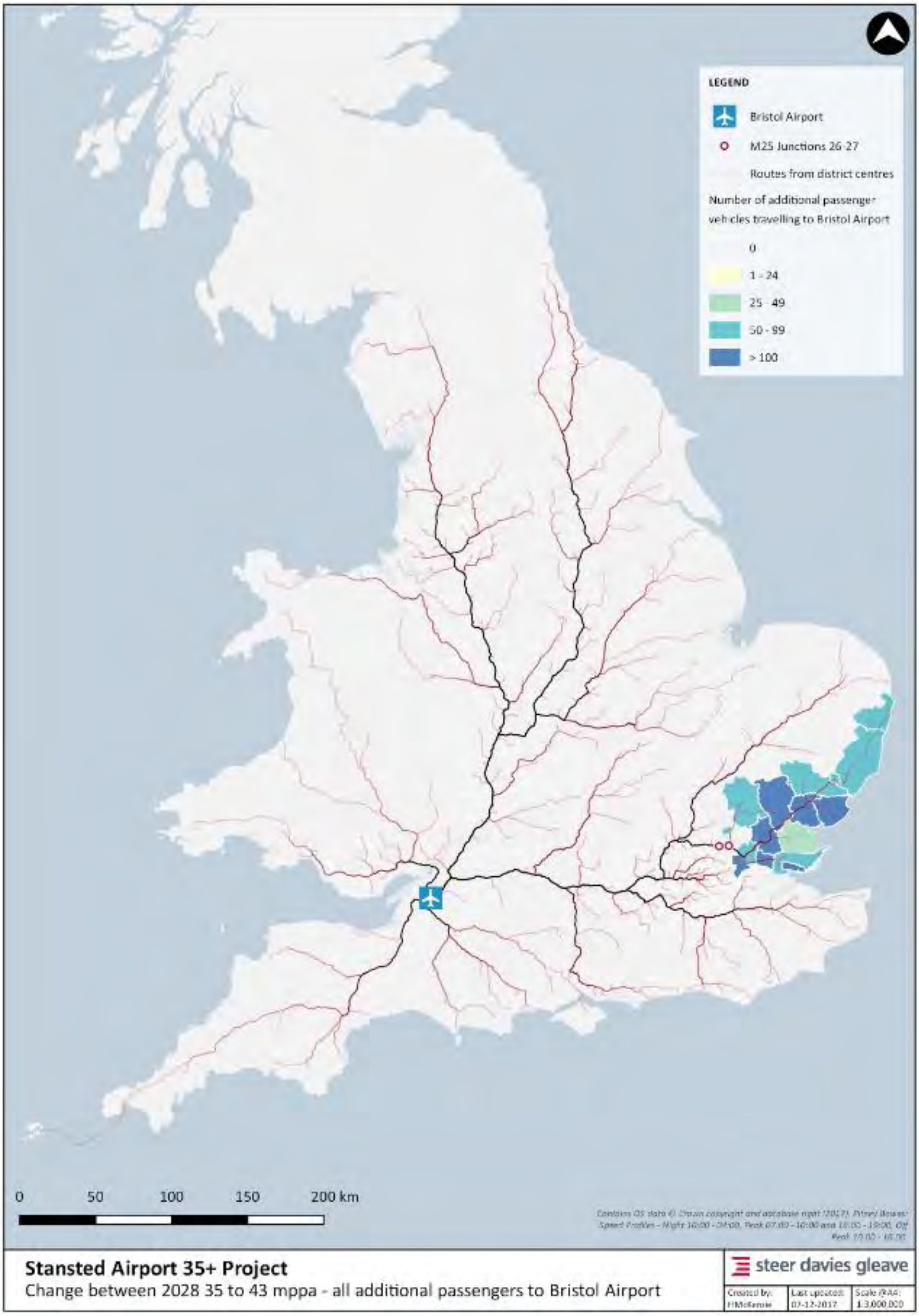
46. As Table 7 shows, a total of 1,516 vehicle passenger related trips would use the M25 (J26-27) link to travel to Bristol Airport in the absence of the 35+ Project at Stansted Airport. This is 23 additional vehicle trips compared to the traffic forecast for passengers and employees combined, towards Stansted Airport for the 35+ Project.

47. Passengers using the M25 (J26-27) are located in 'East Anglia', the 'Outer South East NE' and 'Outer London NE' zones. Figure 9 visually presents the origin/destinations of the displaced passengers to Bristol Airport.

Figure 8: Passenger Routing to Bristol Airport

48.

Figure 9: Proportion of Passengers using the M25 (J26-27) – Bristol Airport



Summary and Conclusions

49. Stansted Airport 35+ Project is predicted to attract an additional 1,493 vehicular movements per day on the M25 (J26-27) link as a result of passenger and employee related travel.

50. In the absence of expansion of operations at Stansted, 8 million additional passenger trips will be diverted from Stansted to other UK airports.

51. The London market demand will be constrained from 2022/3 when the available airport capacities become limited in their operating capacities, and would therefore not be able to accommodate the 8mppa passenger demand. However, in accordance with DfT predictions, it is reasonable to anticipate that demand for air travel will remain and that alternative airports will attract these trips.

52. Results from the redistribution analysis for Birmingham Airport, East Midlands Airport and Bristol Airport all indicate between 1% and 12% more vehicular trips will use the M25 (J26-27) link if the Stansted 35+ Project does not go ahead, associated with a proportion of the passenger travel (8mppa). In practice, the alternative passenger trips could be anticipated to be shared amongst these and other smaller airports. This uplift in passengers is in comparison to the combined passenger and employee vehicle trips associated with the Stansted Airport 35+ application. It is considered that any future displaced employee travel to other airports would further increase the traffic growth on the M25 (J26-27) link.

Background Traffic Comparison

53. In all scenarios tested, there is an increase in vehicular traffic across the M25 (J26-27), however to understand the impact of growth compared to background traffic, 2016 existing traffic flow data was derived from the DfT at this point on the M25 as a baseline. 2016 data was used as this is the latest fully dataset provided. TEMPro was used to growth the background traffic for the assessment year: 2028. The background traffic growth is shown in Table 8, for the 1026 and 2028 scenarios, with and without traffic to Stansted Airport. The 2028 (35mppa) ‘Do Minimum’ scenario has been included as this has received planning consent.

Table 8: Consented and Forecast Background Traffic Growth

Assessment Scenario	Volume of Traffic on M25 (J26-27)
2016 Baseline Traffic	135,453
2016 Background Traffic (No Airport)	131,033
2028 Background Traffic (No Airport)	154,422
2028 35mppa at Stansted Airport (consented)	160,943

54. To understand the impact of the Stansted 35+ Project compared to the background flows presented in Table 8, the forecast additional 8mmpa trips to Stansted Airport and alternative airports: Birmingham, East Midlands and Bristol, were added and compared to the background flows, and a percentage change was calculated per airport to consider the proportional impact. The results are presented in Table 9.

Table 9: Traffic Growth on M25 (J26-67) With/Without Stansted 35+ Project

Assessment Scenario	Volume of Traffic on M25 (J26-27)	% Growth
2028 43mppa at Stansted Airport	162,436	+0.93%
2028 43mppa (8mppa to Birmingham Airport)	162,451	+0.94%
2028 43mppa (8mppa to East Midlands Airport)	162,620	+1.04%
2028 43mppa (8mppa to Bristol Airport)	162,459	+0.94%

55. The results of the analysis indicate that the 35+ Project at Stansted Airport will have the least impact on the total traffic flows for the M25 (J26-27) link of +0.93% growth in vehicular traffic compared to the displacement of passengers to alternative UK Airports which varies between +0.94 and +1.04% growth, if the consented 35mppa cap at Stansted Airport is retained. This additional growth represents passengers only compared to the combined passenger and employee demand at Stansted Airport. Potential future employee travel could further exacerbate the traffic flows on the M25 (J26-27) for other UK airports.

APPENDIX 2 – LOCAL ROAD TRAFFIC IMPACTS

Traffic Impact in Epping Forrest

1.1 SDG have undertaken detailed catchment analysis to identify likely attraction of using local roads passing through Epping Forrest. As anticipated, figures are very small. There are very low population densities in the Forest and the roads through the forest have only a very local attraction as a route to Stansted. The largest potential impact of the change from 35mpppa to 43mppa would be on the northern section of B1393, High Road as it reaches the north of the forest, crossing the M25. At this point we anticipate an additional 12 daily trips, compared with an AADT in 2028 of around 23,600 vehicles, i.e. 0.05% impact.

Analysis

1.2 Historic database information has been used to understand travel time prioritised, car driving routing to identify the catchment area that could be expected to choose to use the local roads and then the B1393 to travel northwards through the forest. The routing is shown in Figure 1 below:

Figure 1: Identified catchment likely to route through Epping Forest

1.3 GIS analysis has then been used to identify the populations of postcode zones lying within the catchment and compared those with the total populations of the districts in which they sit. Population in areas routing through Epping Forest (at LSOA level, ran from population weighted centroids) – are as set out in the table below:

Table 1: B1393 Catchment

LA_Name	Total Population	Population routing through Epping Forest	%
Redbridge	278,970	1,337	0.48%
Waltham Forest	258,249	12,026	4.66%
Epping Forest	124,659	3,794	3.04%

1.4 These proportions have then been applied to our employee and passenger used for the modelling reported in the application TA/EA, as set out in Tables 2 and 3 below:

Table 2: Potential employee travel on B1393

District	Proportion of employees within whole district	Proportion of routing through Epping Forest	Proportion of Total Employees	Daily Trips 2016	Daily Trips 35mppa	Daily Trips 43mppa
Redbridge	1.3%	0.48%	0.01%	0	0	0
LB Waltham Forrest	1.3%	4.66%	0.06%	2	2	3
Epping	1.7%	3.04%	0.05%	2	2	2
Total	-	-	**0.12%**	**4**	**4**	**5**

Table 3: Potential passenger travel on B1393

District	Proportion of passengers using car within whole district	Proportion of routing through Epping Forest	Proportion of total car passengers	Daily Trips 2016	Daily Trips 35mppa	Daily Trips 43mppa
Redbridge	1.6%	0.48%	0.008%	2	3	3
LB Waltham Forrest	2.7%	4.66%	0.126%	31	46	56
Epping	2.3%	3.04%	0.070%	17	25	31
Total	-	-	**0.141%**	**50**	**74**	**90**

1.5 The current B1393 AADT are of the order of 20,000 vehicles. This could be anticipated to increase to around 23,600 by 2028. Of this total, Stansted related traffic is currently 54 trips increasing to 78 trips by 2028 with current permission and to 95 with the expanded operations as set out in Table 4 below:

Table 4: B1393 Predicted AADT

Scenario	Background Traffic	Stansted Traffic	Stansted Traffic Proportion
2016	20,000	54	0.27%
2028- 35mppa	23,600	78	0.33%
2028- 43mppa	23,600	90	0.38%
Impact of 35+	**23,600**	**12**	**0.05%**

1.6 The analysis indicates de minimis impacts on the identified minor roads of within Epping Forrest

APPENDIX 3 – EPPING FOREST SURVEY NOTE

Epping Forest Ecology Survey Briefing Note

RPS were commissioned by Stansted Airport Ltd. (STAL) to undertake vegetation surveys of the northern section of the Epping Forest Special Area of Conservation (SAC) in the vicinity of the nearest section of the M25 motorway to the designated site, namely Unit 105 of the site. The most recent condition assessment of the underlying Site of Special Scientific Interest (SSSI) noted that the unit in this location (Unit 105) was in Favourable condition, however:

"… notwithstanding this assessment, there remains a very significant issue relating to air quality and the related deposition of acidity and of nitrogen. Many veteran trees within the unit display clear symptoms of stress (eg thin canopy and die-back of leading shoots), there is excessive growth of bramble, and there are dense stands of nettles along roadsides and ride edges."

The aim of the survey was therefore to determine the habitats present (and specifically the features of interest for which the site is designated) within this unit, particularly within 200m of the M25. The locations of the veteran trees and other potentially vulnerable receptors (such as epiphytes) were mapped and notes made on whether these displayed evidence of such stress. A further aim was to determine the habitats present in relation to dominance by nitrophilous species that may result from eutrophication from nitrogen deposition.

Methodology and sampling strategy

Veteran trees

Four transects were walked in May 2018 aiming to cover as much ground within the northernmost 300m of the SAC adjacent to the M25. Where possible, straight transect lines were adhered to; however, due to the nature of the site some areas were blocked by fallen trees and areas dominated by holly *Ilex aquifolia*. In these cases the route was redirected. The location of veteran trees was mapped (see Figure 3). While walking all transects, notes were made of any evidence of high nitrogen deposition were assessed by mapping areas of vigorous ruderal growth such as that of common nettle *Urtica dioica* and bramble *Rubus fruiticosus agg.*

Habitat community and species identification

The transects were used to map species composition and habitat community type, as well as the Common Standards Monitoring (CSM) indicators to assess the 'condition' of the woodland component of the SSSI. Therefore, the sampling strategy followed the NVC standard methodology but with less emphasis was on delimiting homogenous stands across the site.

The transect was based on the guidelines outlined in the Common Standards Monitoring Guidance for Woodlands Habitats (JNCC 2004). This method was chosen to account for small changes in species composition across the site and to better understand the potential drivers of such composition. Eleven 4x4m quadrats were paced out along the transect. Ground cover and canopy cover were both noted along with percentage cover of each species (see Table A3.2 and Figure 4).

Specialist Survey Method for veteran tree recording (SSM)

Further survey work in July 2018 followed, specifically focussed on the condition of the veteran trees using the Specialist Survey Method for veteran tree recording (SSM). This recorded % lichen cover as well as symptoms of stress on the veteran trees near to the M25 tunnel portals.

Lichen Indicator Survey (LIS) to calculate a nitrogen air quality index (NAQI)

Transects were also used to undertake a Lichen Indicator Survey (LIS) on oaks present (the method looks at lichens on either oak and birch only) to calculate a nitrogen air quality index (NAQI) at different distances from the M25 (FSC 2013).

Results

SAC within 200 m of the M25

Table A3.1 below describes the area of the SAC within the buffer zones around the two Bell Common Tunnel portals (Figure 3). Only 0.34% of the total SAC area occurs with 200 m of the portals [5.53ha from a total area of 1,604.95ha].

Table A3.1: Areas of the Epping Forest SAC within 200 m of the M25 portals

Distance from tunnel portal of M25	**Area of SAC within buffer**	**% of total area of SAC**	**Number of veteran within buffer**
20m buffer	0.01ha	0.0006%	0
50m buffer	0.19ha	0.01%	0
100m buffer	0.99ha	0.06%	0
150 m buffer	2.65ha	0.17%	3
200m buffer	5.53ha	0.34%	8
Total area of SAC 1,604.95ha			

Habitat type

No acid grassland or heathland habitats were recorded within the survey area.

Data collected within the quadrats are presented in Table A3.2. The habitat types present in this part of Epping Forest show an affinity with a mixture of W10 *Quercus robur-Pteridum aquilinum-Rubus fruiticosus* woodland and W14 *Fagus sylvatica-Rubus Fruiticosus* woodland. The second of these is characteristic of the Annex I woodland habitat *Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae or Ilici-Fagenion*)* that is a primary reason for selection of Epping Forest as an SAC. Mature woodland is across the survey area including directly adjacent to the roads.

Habitat description

The habitat across the majority of the site is largely homogenous being of varying levels of maturity of mainly beech, oak, hornbeam and holly. The ground cover is mostly bare, with occasional hornbeam saplings establishing. One clearing was dominated by bracken (Quadrat 8).

The woodland rides and edges are notably different to the rest of the woodland being dominated by oak and ruderal species such as nettle and bramble. There are however other herbaceous woodland species found along these open areas not seen within the woodland such as yellow pimpernel, lords-and-ladies and enchanter's nightshade.

In particular, north of the SAC boundary adjacent to the cricket pitch over the Bell Common Tunnel, the woodland is dominated by oak and to a lesser degree hornbeam with infrequent immature beech, distinctly different from the woodland habitat present within the SAC. The understorey in this area was particularly dominated by bramble and nettle.

Areas of dense bramble and nettle occurred in areas dominated by oak outside and along the boundary of the SAC both close to and some distance from roads (see Q9-Q11) but were absent from the beech-dominated interior of the woodland.

Table A3.2: Quadrats taken along transect and species composition.

Quadrant		Species	Common Name	Percentage Cover
Q1	**Ground**	*N/A*		
	Canopy	*Illex aquifolium*	Holly	100%
		Quercus robur	Common Oak	80%
Q2	**Ground**	*Carpinus betulus*	Hornbeam	10%
		Illex aquifolium	Holly	1%
		Moss (To be ID'd)		10%
	Canopy	*Illex aquifolium*	Holly	100%
		Carpinous betulus	Hornbeam	100%
Q3	**Ground**	*Oxalis acetosella*	Wood Sorel	1%
		Moss (T B I)		40%
		Carpinus betulus	Hornbeam	1%
	Canopy	*Quercus robur*	Common Oak	1%
		Illex aquifolium	Holly	60%
		Carpinous betulus	Hornbeam	40%

Q4	**Ground**	*N/A*		
	Canopy	*Illex aquifolium*	Holly	80%
		Fagus sylvatica	Beech	40%
Q5	**Ground**	*Carpinous betulus*	Hornbeam	10%
		Moss (TBI)		1%
	Canopy	*Illex aquifolium*	Holly	80%
		Quercus Robur	Common Oak	60%
		Fagus sylvatica	Beech	40%
Q6	**Ground**	*Moss (TBI)*		30%
	Canopy	*Fagus sylvatica*	Beech	100%
Q7	**Ground**	*N/A*		
	Canopy	*Carpinous betulus*	Hawnbeam	40%
		Acer pseudoplantanus	Sycamore	50%
		Sorbus aucuparia	Rowan	40%
		Fagus sylvatica	Beech	20%
Q8	**Ground**	*Pteridium aquilinum*	Bracken	40%
	Canopy	*Carpinus betulus*	Hornbeam	10%
Q9	**Ground**	*Alleria petiolate*	Garlic Mustard	40%
		Rubus fruiticosus	Bramble	60%
		Geum urbanum	Wood avens	10%
	Canopy	*Quercus cerris*	Turkey Oak	40%
		Sorbus aucuparia	Rowan	40%
Q10	**Ground**	*Rubus fruiticosus*	Bramble	90%
	Canopy	*Quercus robur*	Common Oak	20%
		Betula pubescence	Downy Birch	30%
Q11	**Ground**	*Cardamine flexuosa*	Wavey Bitter-Cress	10%
		Circaea lutetiana	Enchanters Nightshade	10%
		Geum urbanum	Wood avens	10%

		Urtica diocia	Stinging Nettle	30%
		Rubus fruiticosus	Bramble	20%
		Silene dioca	Red Campion	10%
		Chamerion angustifolium	Great Willowherb	10%
		Gallium aparine	Cleavers	10%
	Canopy	*Quercus robur*	Common Oak	30%

Other species noted around the site not included within the quadrats include: red-veined dock *Rumex sanguinus,* rhododendron *Rhododendron ponticum,* herb-robert *Geranium robertianum,* lord's-and-ladies *Arum maculatum,* hawthorn *Cretagous monogyna,* cherry laurel *Prunus laurocerasus* and yellow pimpernel *Lysimachia nemorum*.

Distribution of veteran trees

No veteran trees occurred within 200 m of the Bell Common Tunnel eastern portal nor within 100 m of the western portal (Figure 3).

Veteran trees were inspected from ground level for epiphytic lichen and bryophytes, species were identified, and percentage cover of the tree estimated. Coverage was low in all trees, most trees supported only one lichen (*Lepraria incana*), excluding one where no lichen was recorded. Where present, bryophytes were also limited to a single species (*Aulacomnium androgynum*). The only exception was tree 3, where an addition 2 lichen and 3 bryophyte species were present, although these were recorded on a large piece of fallen deadwood, rather than the standing tree.

Table A3.3 SSM survey results for veteran trees

Tree no.	Publicly visible	Species	Girth (m)	Form	Standing	Deadwood	Holes	Hollows	Fallen deadwood	Damage	Animal signs	Lichen cover	Bryophyte cover
1	No	Beech	3.6	Maiden	Upright	None	Present	Absent	Present	Tear	None	<1%	1%
2	No	Oak	4.5	Maiden	Upright	Large branch	Present	Absent	Present	Tear	None	<1%	0%
3	Yes	Beech	5.0	Maiden	Upright	None	Absent	Absent	Absent	Tear	None	<1%	<1%
4	No	Beech	3.8	Maiden	Upright	Standing	Present	Absent	Present	Tear	None	1%	0%
5	Yes	Oak	4.7	Maiden	Upright	None	Absent	Absent	Present	None	None	1%	0%
6	No	Hornbeam	3.5	Maiden	Upright	None	Present	Absent	Present	None	None	<1%	<1%
7	No	Beech	5.2	Maiden	Upright	None	Present	Absent	Absent	None	None	<1%	1%
8	No	Beech	4.1	Maiden	Upright	None	Present	Absent	Present	Tear	Deer in vicinity	10%	5%
9	No	Beech	3.9	Maiden	Upright	Some	Absent	Absent	Absent	Tear	None	<1%	<1%
10	No	Beech	3.5	Maiden	Upright	Some	Absent	Absent	Present	None	None	1%	0%
11	Yes	Beech	4.8	Maiden/ pollard	Upright	None	Present	Present	Absent	None	None	<1%	<1%
12	No	Beech	4.2	Maiden	Leaning	Some	Absent	Absent	Present	Tear, scars	None	<1%	1%
13	No	Beech	4.2	Maiden	Upright	Multiple	Present	Absent	Absent	Tears	None	<1%	<1%

						branches							
14	No	Beech	4.2	Maiden	Upright	Multiple large branches	Present	Absent	Present	Tear	Deer in vicinity	<1%	1%
15	No	Oak	4.7	Maiden	Upright	None	Absent	Absent	Absent	None	None	<1%	<1%
16	No	Oak	5.0	Maiden	Upright	Some	Absent	Absent	Present	None	None	0%	0%
17	Yes	Oak	4.6	Maiden	Upright	Some	Absent	Absent	Present	Fallen branch	None	10%	1%

Condition of trees and epiphyte cover

In general, the mature/veteran beech trees across the survey were in reasonable condition with some trees displaying extensive damage by leaf-mining invertebrates. Oak was most frequent towards the edges of the SAC and along the rides. As described by Natural England, many of these displayed evidence of stress including abundant epicormic growth and branch die-back. It is not possible from observational evidence to determine the cause of this stress, although nutrient imbalance due to nitrogen enrichment may be a contributory factor.

Epiphyte number and diversity were low across the entire study area with 1.43% on average (<10% everywhere and most trees had <1% lichen cover and similarly low bryophyte cover). There was no clear trend between % lichen cover and distance from the M25 (see Figure A3.1).

LIS

The survey was limited to oak trees due to the low occurrence of birch in the woodland. Locations along five transect lines were chosen and suitable trees surveyed for LIS, the locations were evenly spaced where the presence of oak allowed. Trunk data was recorded for all trees, the LIS score for all 6 locations was 0, as no indicator species were present. Branch data was only recorded for those close to the edge of the forest (location 1 & 6), in all other locations branches within sight of the ground were absent, although *Punctelia subrudecta* was found on fallen bark and branches underneath the trees so likely present higher in the canopy.

Table A3.4 Lichen indicator score for locations where branches were visible from the ground.

Location 1 <50m from M25							
	Tree 1	Tree 2	Tree 3	Tree 4	Tree 5		
Aspect	W S E	W S E	W S E	W S E	W S E	Count	Average
N-sensitive	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0	0
N-tolerant	0 0 2	0 1 2	1 1 1	0 0 0	0 0 0	9	1.8
LIS indicator score = -1.8; NAQI = 1.3							
Location 6 within 200m of M25							
	Tree 1	Tree 2	Tree 3	Tree 4	Tree 5		
Aspect	W S E	W S E	W S E	W S E	W S E	Count	Average
N-sensitive	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0	0
N-tolerant	1 1 1	0 0 1	0 1 0	0 1 1	0 0 0	7	1.4
LIS indicator score = -1.4; NAQI = 1.2							

Photographs of Epping Forest

Photograph 1: Epping Forest beech pollards

Photograph 2: Epping Forest beech pollards with holly understorey

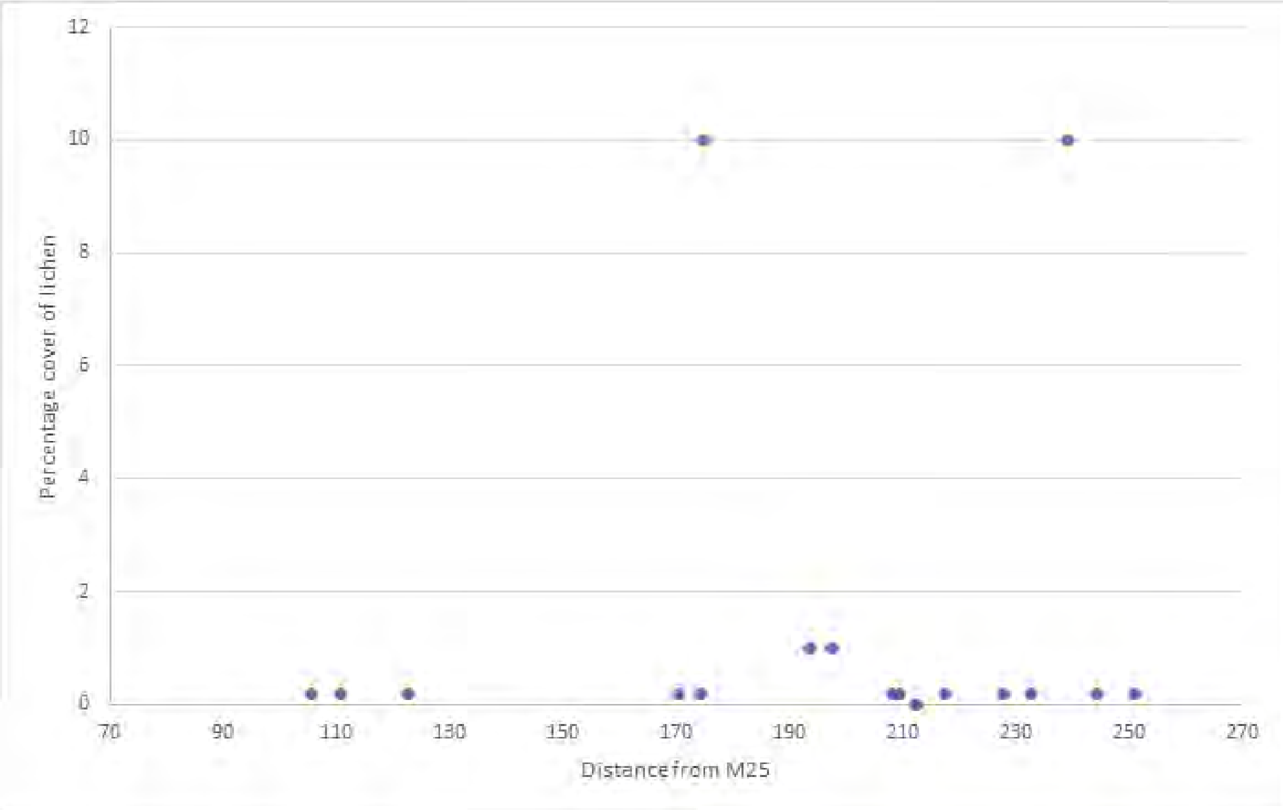
Photograph 3: Evidence of localised nutrient enrichment along path edge due to dogs

Photograph 4: Oak-dominated woodland to north of SAC with bramble/nettle ground flora

Photograph 5: Epicormic growth on oak

Photograph 6 – M25 west-bound

Figure A3.1: Percentage lichen cover on veteran trees with distance from M25



APPENDIX 4 – EPPING FOREST SAC STANDARD DATA FORM

NATURA 2000 – STANDARD DATA FORM

Special Areas of Conservation under the EC Habitats Directive (includes candidate SACs, Sites of Community Importance and designated SACs).

Each Natura 2000 site in the United Kingdom has its own Standard Data Form containing site-specific information. The data form for this site has been generated from the Natura 2000 Database submitted to the European Commission on the following date:

22/12/2015

The information provided here, follows the officially agreed site information format for Natura 2000 sites, as set out in the Official Journal of the European Union recording the Commission Implementing Decision of 11 July 2011 (2011/484/EU).

The Standard Data Forms are generated automatically for all of the UK's Natura 2000 sites using the European Environment Agency's Natura 2000 software. The structure and format of these forms is exactly as produced by the EEA's Natura 2000 software (except for the addition of this coversheet and the end notes). The content matches exactly the data submitted to the European Commission.

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

Further technical documentation may be found here
http://bd.eionet.europa.eu/activities/Natura_2000/reference_portal

As part of the December 2015 submission, several sections of the UK's previously published Standard Data Forms have been updated. For details of the approach taken by the UK in this submission please refer to the following document:
http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

More general information on Special Areas of Conservation (SACs) in the United Kingdom is available from the SAC home page on the JNCC website. This webpage also provides links to Standard Data Forms for all SACs in the UK.

Date form generated by the Joint Nature Conservation Committee
25 January 2016.

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE	**UK0012720**
SITENAME	**Epping Forest**

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- 6. SITE MANAGEMENT

1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
B	UK0012720

1.3 Site name

Epping Forest

1.4 First Compilation date	1.5 Update date
1996-01	2015-12

1.6 Respondent:

Name/Organisation:	Joint Nature Conservation Committee
Address:	Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY
Email:	

Date site proposed as SCI:	1996-01
Date site confirmed as SCI:	2004-12
Date site designated as SAC:	2005-04
National legal reference of SAC designation:	Regulations 11 and 13-15 of the Conservation of Habitats and Species Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/490/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude
0.0225

Latitude
51.64416667

2.2 Area [ha]:

1630.74

2.3 Marine area [%]

0.0

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKI2	Outer London
UKH3	Essex

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.1 Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
4010			3.26		G	C	C	B	C
4030			11.42		G	C	C	B	C
9120			652.3		M	A	B	A	A

- **PF:** for the habitat types that can have a non-priority as well as a priority form (6210, 7130, 9430) enter "X" in the column PF to indicate the priority form.
- **NP:** in case that a habitat type no longer exists in the site enter: x (optional)
- **Cover:** decimal values can be entered
- **Caves:** for habitat types 8310, 8330 (caves) enter the number of caves if estimated surface is not available.
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation)

3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
I	1083	Lucanus cervus			p				P	DD	C	A	C	B
A	1166	Triturus cristatus			p				P	DD	D			

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N09	20.0
N16	70.0
N07	0.2
N08	3.8
N06	6.0
Total Habitat Cover	100

Other Site Characteristics

1 Terrestrial: Soil & Geology: acidic,neutral,sand,clay 2 Terrestrial: Geomorphology and landscape: lowland

4.2 Quality and importance

Northern Atlantic wet heaths with Erica tetralix for which the area is considered to support a significant presence. European dry heaths for which the area is considered to support a significant presence. Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion) for which this is considered to be one of the best areas in the United Kingdom. Lucanus cervus for which this is one of only four known outstanding localities in the United Kingdom.

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
	Threats and	Pollution	inside/outside

Positive Impacts			
Rank	Activities, management	Pollution (optional)	inside/outside

Rank	pressures [code]	(optional) [code]	[i|o|b]
H	M02		B
H	H04		B
H	G01		I
H	J02		B
H	A04		I

	[code]	[code]	[i|o|b]
H	B02		I
H	A04		I
H	A02		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification,

T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions

i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): http://publications.naturalengland.org.uk/category/6490068894089216

http://publications.naturalengland.org.uk/category/3212324

http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK04	100.0				

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

- [ ] Yes
- [ ] No, but in preparation
- [X] No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE NATURA 2000 STANDARD DATA FORMS

The codes in the table below are also explained in the official European Union guidelines for the Standard Data Form. The relevant page is shown in the table below.

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	Designated Special Protection Area	53
B	SAC (includes candidates Special Areas of Conservation, Sites of Community Importance and designated SAC)	53
C	SAC area the same as SPA. Note in the UK Natura 2000 submission this is only used for Gibraltar	53

3.1 Habitat representativity

CODE	DESCRIPTION	PAGE NO
A	Excellent	57
B	Good	57
C	Significant	57
D	Non-significant presence	57

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippophaë rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	15%-100%	58
B	2%-15%	58
C	< 2%	58

3.1 Conservation status habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global grade habitat

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	15%-100%	62
B	2%-15%	62
C	< 2%	62
D	Non-significant population	62

3.2 Conservation status species (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' Or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Assemblages types

CODE	DESCRIPTION	PAGE NO
WATR	Non breeding waterfowl assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code
BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

CODE	DESCRIPTION	PAGE NO
E03	Discharges	65
E04	Structures, buildings in the landscape	65
E06	Other urbanisation, industrial and similar activities	65
F01	Marine and Freshwater Aquaculture	65
F02	Fishing and harvesting aquatic ressources	65
F03	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)	65
F04	Taking / Removal of terrestrial plants, general	65
F05	Illegal taking/ removal of marine fauna	65
F06	Hunting, fishing or collecting activities not referred to above	65
G01	Outdoor sports and leisure activities, recreational activities	65
G02	Sport and leisure structures	65
G03	Interpretative centres	65
G04	Military use and civil unrest	65
G05	Other human intrusions and disturbances	65
H01	Pollution to surface waters (limnic & terrestrial, marine & brackish)	65
H02	Pollution to groundwater (point sources and diffuse sources)	65
H03	Marine water pollution	65
H04	Air pollution, air-borne pollutants	65
H05	Soil pollution and solid waste (excluding discharges)	65
H06	Excess energy	65
H07	Other forms of pollution	65
I01	Invasive non-native species	65
I02	Problematic native species	65
I03	Introduced genetic material, GMO	65
J01	Fire and fire suppression	65
J02	Human induced changes in hydraulic conditions	65
J03	Other ecosystem modifications	65
K01	Abiotic (slow) natural processes	65
K02	Biocenotic evolution, succession	65
K03	Interspecific faunal relations	65
K04	Interspecific floral relations	65
K05	Reduced fecundity/ genetic depression	65
L05	Collapse of terrain, landslide	65
L07	Storm, cyclone	65
L08	Inundation (natural processes)	65
L10	Other natural catastrophes	65
M01	Changes in abiotic conditions	65
M02	Changes in biotic conditions	65
U	Unknown threat or pressure	65
XO	Threats and pressures from outside the Member State	65

5.1 Designation type codes

CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK02	Marine Nature Reserve	67
UK04	Site of Special Scientific Interest (UK)	67

APPENDIX 5 – AIR QUALITY MODELLING

Technical Note

ARUP

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Project title	Stansted Airport 35+ Planning Application (UTT/18/0460/FUL)	Job number	253360-00
cc	STAL / RPS	File reference	AQ/TN/005
Prepared by	Arup	Date	15 June 2018
Subject	Impact of 35+ Planning Application on Epping Forest Special Area of Conservation (SAC)		

Natural England has raised the impact of the 35+ Planning Application on ecological receptors in Epping Forest Special Area of Conservation (SAC) as a potential concern. We have undertaken an investigation into the potential impact on nutrient nitrogen deposition in the SAC in 2028, using forecast traffic data from Steer Davies Gleave (SDG).

The data used as input to the modelling is given in Appendix A1. The results are presented in section 1 and conclusions are in section 2.

1 Nutrient Nitrogen Deposition Results

Table 1 presents the predicted concentrations and nutrient nitrogen deposition at receptors in Epping Forest SAC due to the road traffic on the M25 between junction 26 and 27 in 2028, and the road traffic plus background, without the 35+ Planning Application. The background concentrations are assumed to include the impact of all relevant emission sources and the six road links nearest to the ecological receptors in Epping Forest have been modelled explicitly to capture the maximum impact of the predicted change in traffic. Results are presented with the following ADMS-Roads model options: complex terrain, variable surface roughness, noise barriers and tunnel portals. Meteorological data from Stansted Airport for 2016 has been used. Section A1.11 discusses sensitivity of the results to the model options and section A1.12 discusses the sensitivity to meteorological data.

Table 2 presents the predicted increase in NOx concentrations and nutrient nitrogen deposition in 2028 at the receptors due to the 35+ Planning Application. The change is given in terms of deposition rate (kgN/ha/yr) and the change in deposition rate as a function of the minimum critical load. The maximum predicted change in deposition rate is 0.17% of the minimum critical load of 10kgN/ha/yr.

Figure 1 and Figure 2 present the predicted deposition rate as contour plots: due to traffic on the M25 without the 35+ Planning Application (Figure 1) and the predicted change due to the 35+ Planning Application (Figure 2). It can be observed that the deposition rate decreases rapidly with distance from the road.

Table 1: 2028 without 35+ Planning Application: NOx concentration (µg/m³) and nutrient nitrogen deposition (kgN/ha/yr), road contribution and total (road plus background)

ID	Easting	Northing	NOx concentration (µg/m³)		Nutrient nitrogen deposition rate (kgN/ha/yr)	
			Road contribution	Road + background	Road contribution	Road + background
a	544591	201032	10.3	36.9	1.45	28.33
b	544570	201016	10.7	37.4	1.51	28.39
c	544548	200999	8.0	34.7	1.13	28.01
d	544525	200981	5.8	32.5	0.83	27.71
e	544499	200962	4.2	30.8	0.60	27.48
f	544471	200941	3.0	29.6	0.43	27.31
g	544611	201017	5.2	31.8	0.74	27.62
h	544635	201000	3.0	29.7	0.43	27.31
i	544662	200993	2.0	28.7	0.29	27.17
j	544696	200984	1.4	28.1	0.20	27.08
k	544762	200988	0.9	27.6	0.14	27.02
l	544801	200990	0.8	27.5	0.12	27.00
m	544837	200989	0.8	27.5	0.12	27.00
n	544878	200987	0.8	27.5	0.12	27.00
o	544918	200978	1.0	27.7	0.15	27.03
p	544944	200967	1.3	28.0	0.19	27.07
q	544938	200942	1.3	28.0	0.20	27.08
r	544933	200917	1.3	28.0	0.19	27.07

Table 2: 2028 35+ Planning Application: change in NOx concentration (µg/m^3) nutrient nitrogen deposition (kgN/ha/yr)

ID	Change in NOx concentration due to 35+ (µg/m^3)	Change in deposition rate due to 35+ (kgN/ha/yr)	Total deposition rate with 35+ (kgN/ha/yr)	Change as a percentage of the lower critical load (%)
a	0.11	0.02	28.35	0.17
b	0.12	0.02	28.41	0.17
c	0.09	0.01	28.03	0.12
d	0.06	0.01	27.72	0.09
e	0.05	0.01	27.48	0.06
f	0.03	<0.01	27.31	0.03
g	0.06	0.01	27.63	0.09
h	0.03	0.01	27.32	0.06
i	0.02	<0.01	27.18	0.03
j	0.02	<0.01	27.09	0.03
k	0.01	<0.01	27.02	<0.01
l	0.01	<0.01	27.00	0.03
m	0.01	<0.01	27.00	0.03
n	0.01	<0.01	27.00	<0.01
o	0.01	<0.01	27.03	0.03
p	0.01	<0.01	27.08	0.03
q	0.01	<0.01	27.08	<0.01
r	0.01	<0.01	27.07	<0.01

2 Conclusions

The impact of the 35+ Planning Application on traffic on the M25 between junctions 26 and 27 is predicted to be zero in 2023 and 1,493 AADT (2-way) in 2028. The impact of this change in traffic on receptors in Epping Forest SAC has been calculated. The maximum increase in nutrient nitrogen deposition is predicted to be 0.02kgN/ha/yr, which corresponds to 0.17% of the minimum critical load. Levels of deposition drop off rapidly away from the road.

Changes of less than 1% of a critical level or critical load can be assumed to be insignificant, an approach used consistently by Highways England, Natural England, the Environment Agency and the Institute of Air Quality Management[1]. The effect of the 35+ Planning Application on nutrient nitrogen deposition in this area is therefore **not significant**.

[1]Highways England Interim Advice Note 174/13, Updated advice for evaluating significant local air quality effects for users of DMRB 11, Section 3, Part 1. Annex A, A.2.

Technical Note

253360-00 15 June 2018

Figure 1: Nutrient nitrogen deposition (kgN/ha/yr) without the 35+ Planning Application change in traffic (road + background) within 200m of the portal centreline

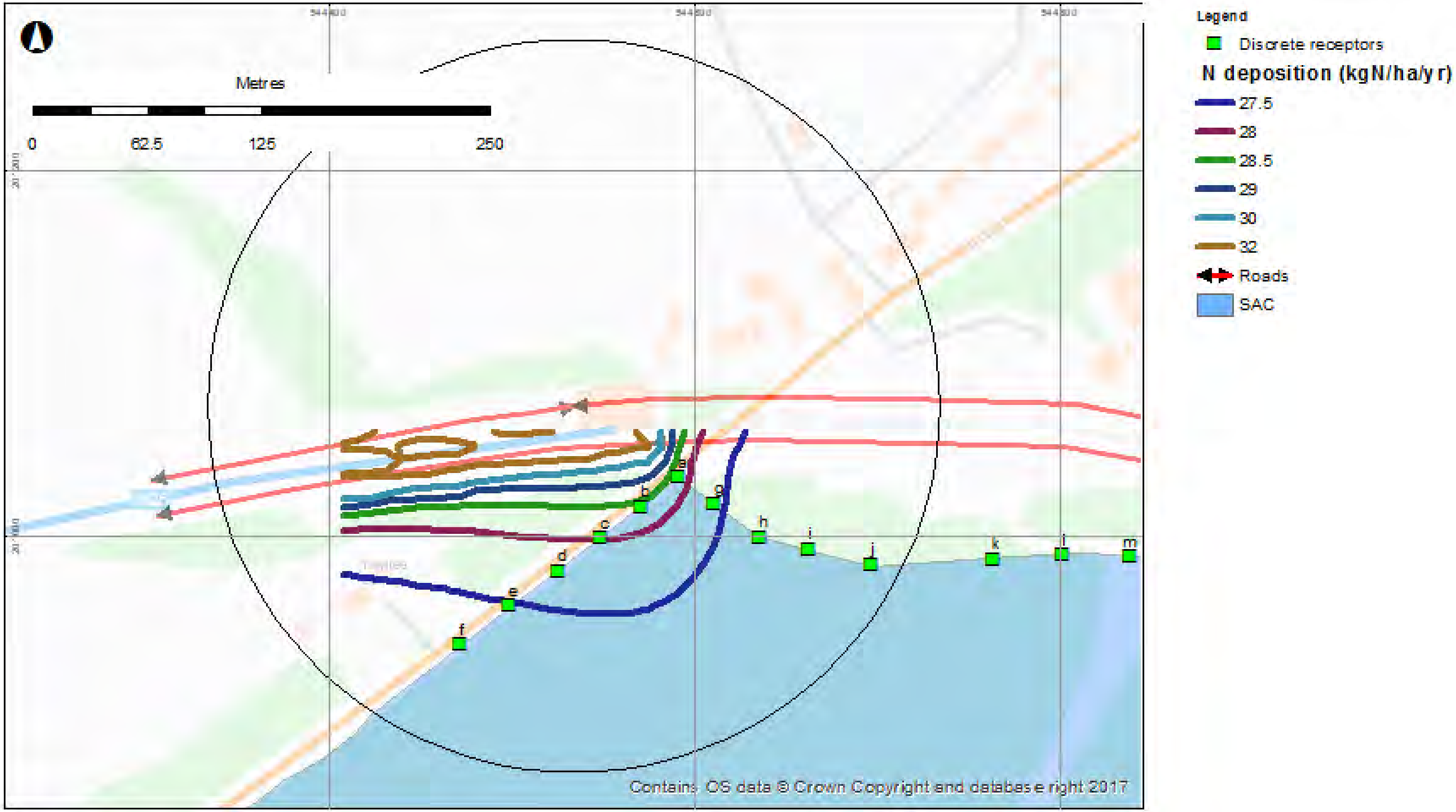
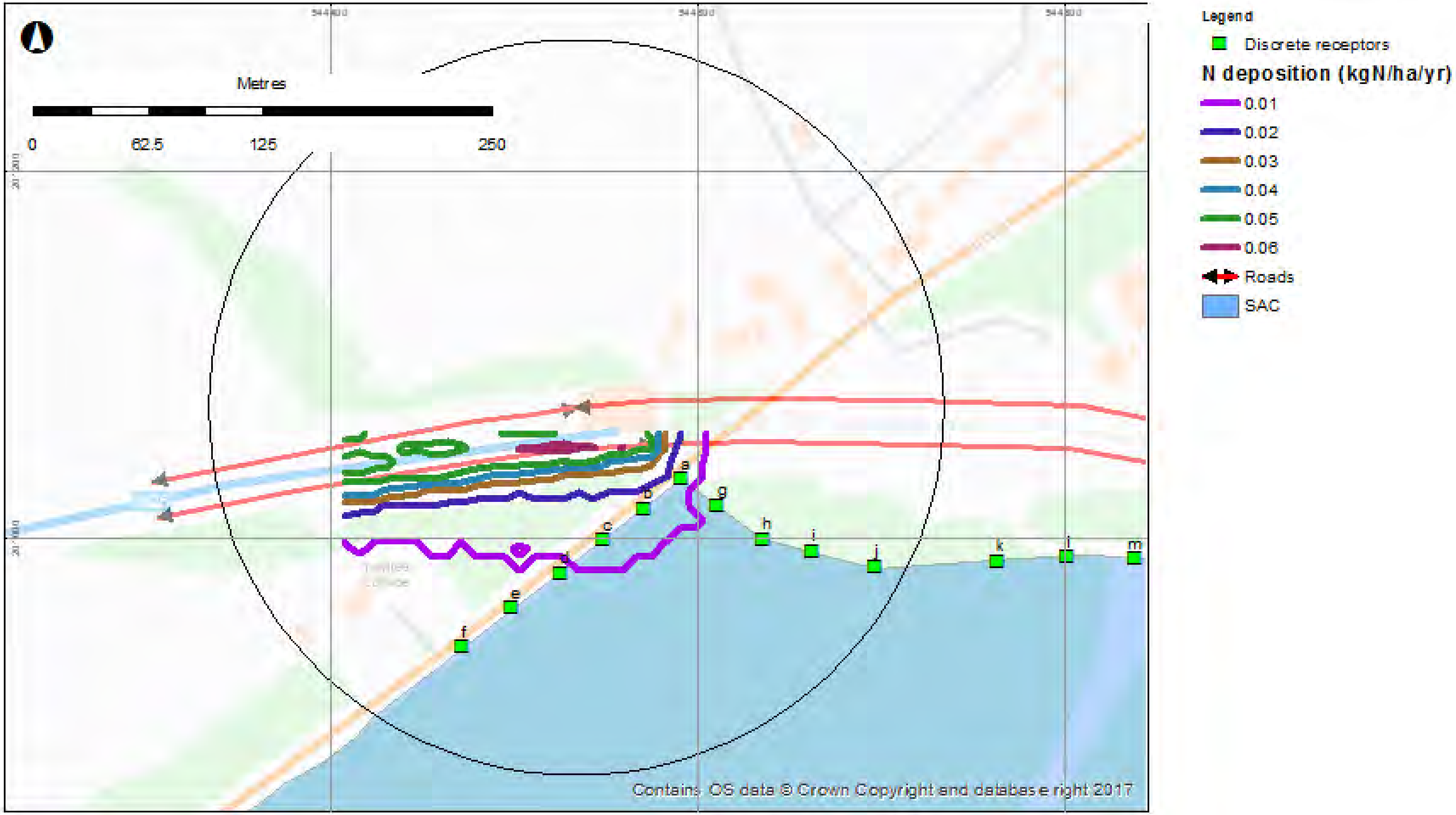


Figure 2: Nutrient nitrogen deposition (kgN/ha/yr), change due to the 35+ Planning Application change in traffic within 200m of the portal centreline



A1 Model Input Data

A1.1 Traffic Data

2016 data on the links near the SAC between junctions 26 and 27 of the M25 were obtained from the Department for Transport's (DfT's) webtris website[2]. The annual average daily traffic (AADT) data for each link is given in Table 3 and the links are shown in Figure 3. A width of 15m was assumed for each road link and a speed of 96kph (60mph). Emissions were calculated using the latest Emission Factor Toolkit (EFT) from Defra, version 8.0.1[3].

SDG supplied forecasts of the projected growth in baseline traffic between 2016 and 2028 (Tempro), and the impact of the currently consented capacity (35mppa) and the 35+ Planning application (43mppa). The ratio between the 2028 AADT without 35+ and the 2016 total without 35+ is 1.20. The AADT flows in Table 3 were therefore multiplied by 1.20 to give the link-specific AADT flows in 2028 (Table 4).

The predicted change in traffic due to the 35+ Planning application is 1,493, which exceeds one of the criteria set by Highways England in the Design Manual for Roads and Bridges (DMRB)[4] for defining *"whether there are likely to be significant impacts associated with particular broadly defined routes or corridors"*. The criterion is that there is a change of 1,000 AADT in daily traffic flow.

Table 3: 2016 AADT data for modelled road links, from DfT webtris website

Site	Name	AADT
10363	5570_EB	68,405
10362	5570_WB	68,355
10527	5573_EB	71,138
10527	5573_WB	71,138
10444	5576_EB	68,444
10538	5576_WB	67,807
Note: At DfT Count ID 28049 the HGVs are 14.3% of total vehicles. This percentage of HGVs was assumed to be the same for all road links.		

Table 4: 2-way AADT between M25 junctions 26 and 27, supplied by SDG

ID	Scenario	AADT		
		2016	2023	2028
A	Baseline	137,155	137,155	137,155
B	Tempro	0	15,066	26,830
C	Change due to 35 mppa	4,845	6,522	6,522
D	Total without 35+	142,000	158,743	170,507
E	Change due to 35+	0	0	1,493*
Note: *The percentage of HDVs was assumed to be 2%				

[2] Webtris http://webtris.highwaysengland.co.uk/ [Accessed June 2018]
[3] https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html [Accessed June 2018]
[4] HA207/07 Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1, May 2007, paragraph 3.12

A1.2 Dispersion Model

The dispersion model ADMS-Roads version 4.0.1.0 was used. It allows the ADMS-Roads options of road traffic, tunnel portals and noise barriers to be modelled with hills (complex terrain).

No model verification was carried out due to the high level nature of this assessment and the lack of suitable monitoring data. However, the verification described in the ES for receptors near to motorways concluded that no adjustment factor was required. Therefore, there is a high degree of confidence that the modelling results provide an accurate prediction of pollutant concentrations close to the modelled links.

A1.3 Receptors

Figure 3 shows the discrete receptors at which nutrient nitrogen deposition was calculated (receptors a to r) and the extent of the gridded output (green rectangle) used to plot contours. Results were also calculated at receptors at a 2m resolution along a 200m transect starting at the western tunnel exit. Figure 4 shows the location of the receptors with respect to the ends of each road link.

Figure 3: Road links (blue), discrete receptors (green) and Epping Forest SAC (grey)

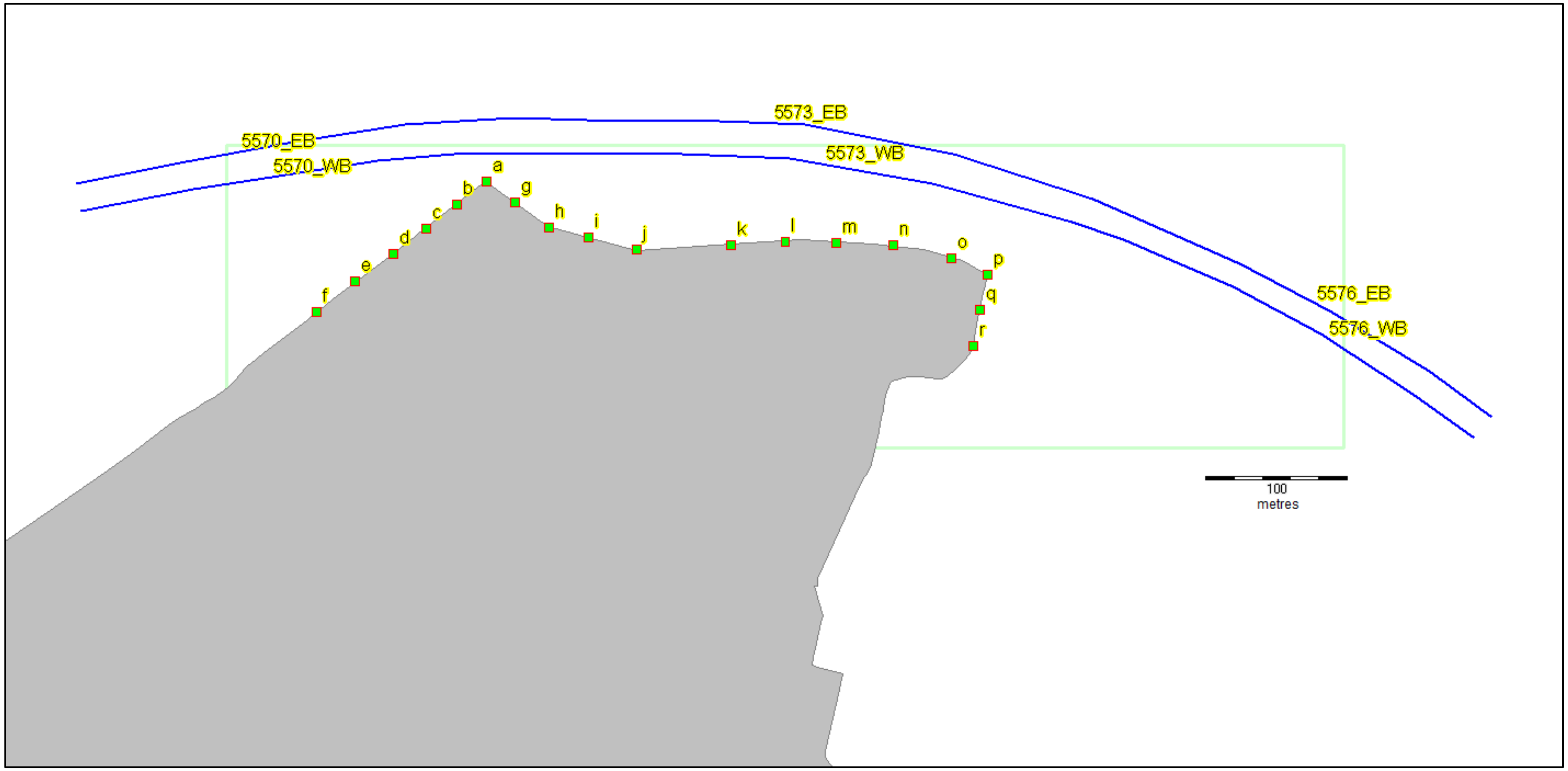
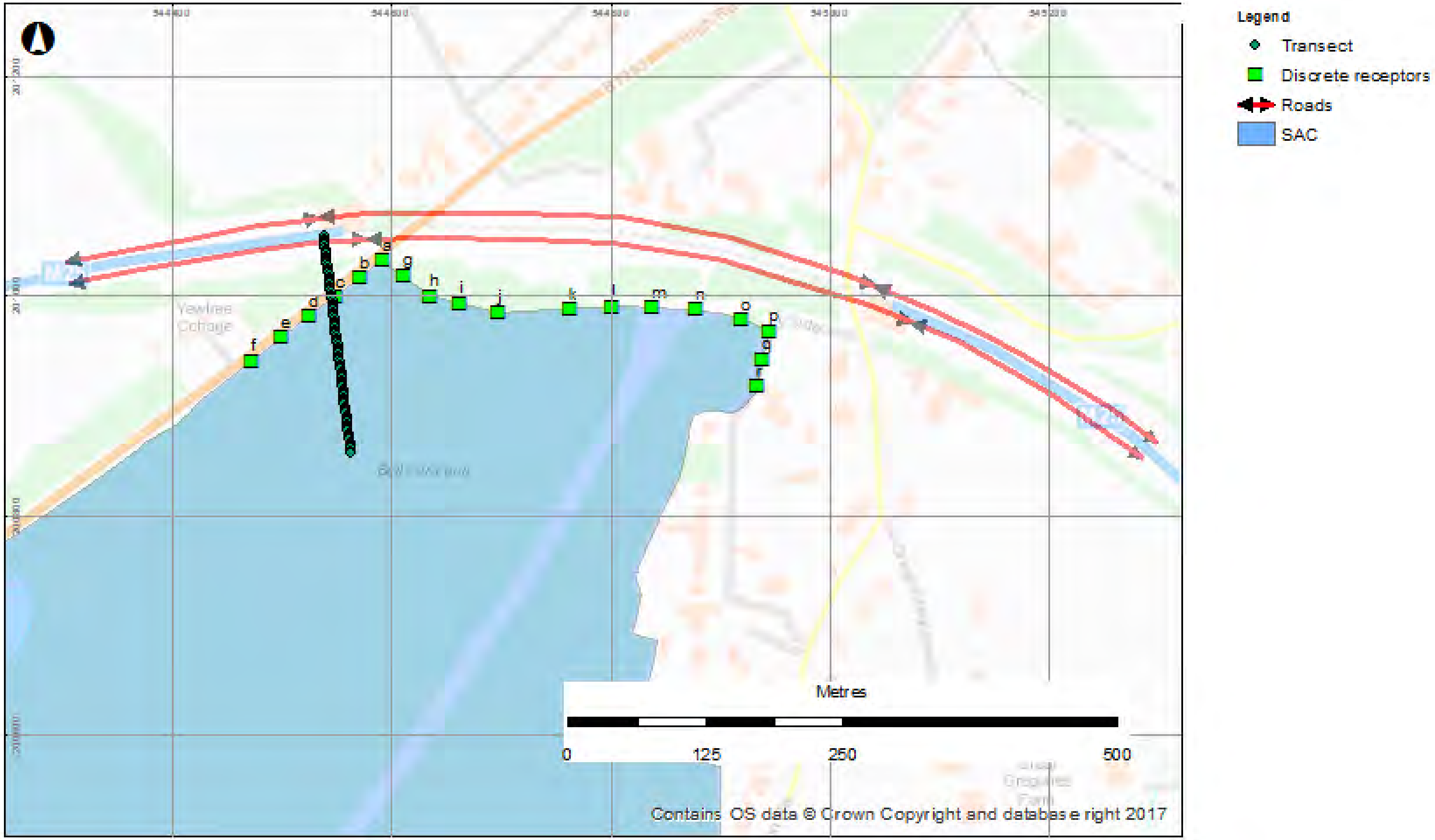


Figure 4: Road links, discrete receptors and transect

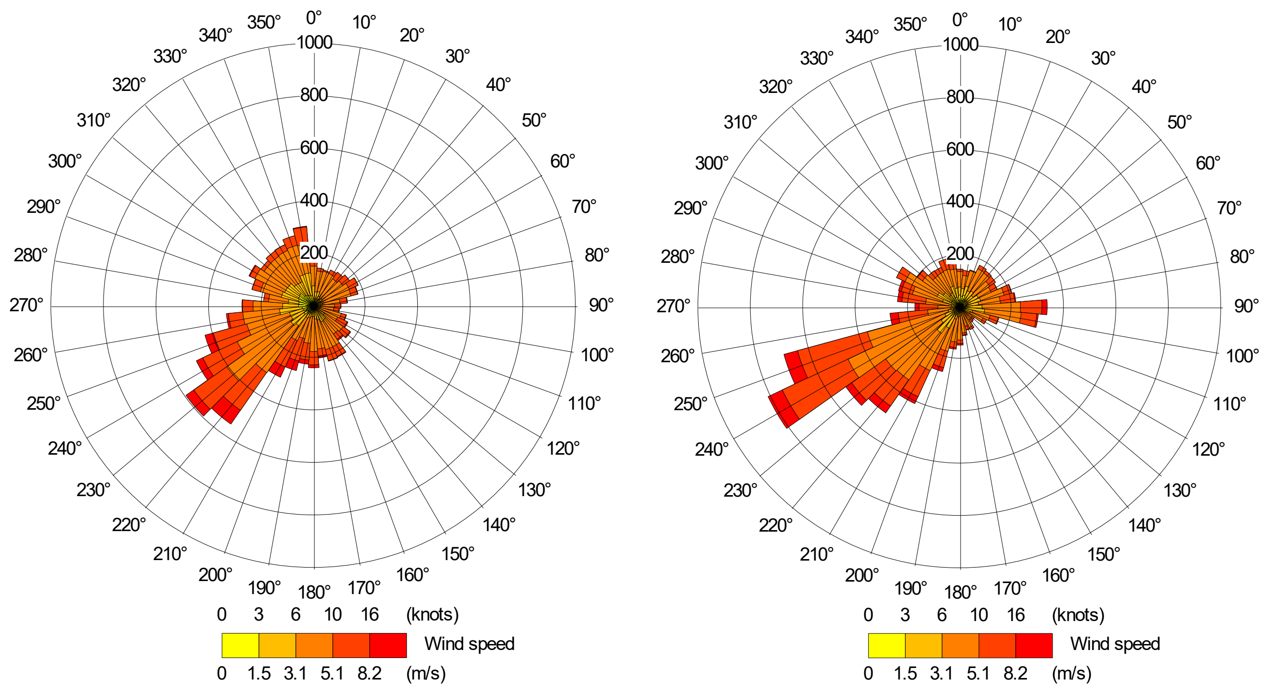


A1.4 Meteorological Data

Figure 5 presents the windrose of the meteorological data used, from Stansted Airport, 2016. The prevailing wind directions are south-westerly. Data from London City Airport, also shown in Figure 5, has been used to test the sensitivity of the results to the choice of meteorological data station.

A surface roughness of 0.2m was used at the meteorological site and 1.0m at the dispersion site. A minimum Monin-Obukhov length of 10m was used at the meteorological site and 30m at the dispersion site.

Figure 5: Stansted Airport 2016 windrose (left); London City Airport 2016 windrose (right)



A1.5 Terrain and Variable Surface Roughness

Terrain data was obtained from the Environment Agency 2m resolution LIDAR data[5]. In order to achieve a large enough domain of terrain data to enable contour plots over a sufficient extent, and yet retain the high resolution features and meet the limit on file size (66,000 points of data), a terrain file was created with 7m resolution. Figure 7 shows the terrain data used.

To represent the greater surface roughness in the forest compared with the fields to the north of the forest, a variable surface roughness file was created covering the same domain as the terrain data. A value of 1.0m was used to represent surface roughness in the forest and 0.3m to represent the fields to the north of the forest[6].

[5] https://data.gov.uk/dataset/002d24f0-0056-4176-b55e-171ba7f0e0d5/lidar-composite-dtm-2m Supplied by RPS, June 2018

[6] ADMS-Roads version 4.0 User Guide, Table 3.9

The details of the flow and dispersion through the forest has not been modelled as it is beyond the capability of the ADMS-Roads model, and indeed may not be well handled even by a computational fluid dynamics (CFD) model, a more complex and computationally intensive numerical model. However, as the maximum impact will be at the trees closest to the modelled road links, the details of flow further from the road links will not affect the conclusions.

A1.6 Noise Barrier

The solid fence at the top of the cutting was modelled as a noise barrier along either side of the road links emerging from the eastern and western portals: road link 5570 (5570_EB, 5570_WB) and 5576 (5576_EB, 5576_WB) for all of their lengths.

In the flat terrain scenario a noise barrier 12m in height above the road surface and 15m from the centreline of each road link was modelled using the ADMS-Roads additional input file, Noise barriers option. In the model runs with terrain the height of the noise barrier was specified as 2m, corresponding to the height at the top of the fence above the local terrain.

A1.7 Tunnel Portal

The tunnel portals were modelled using the following parameters:

- Bore depth: 6m
- Portal Base Elevation: 10m
- Outflow width: 15m
- Outflow Wall: yes

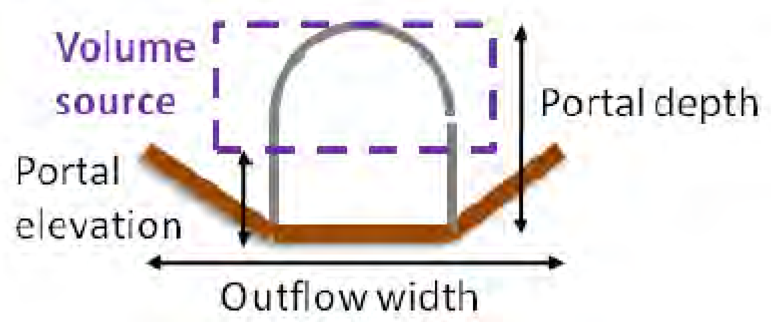


Figure 6: Taken from the ADMS-Roads User Guide

The portals were modelled using the ADMS-Roads additional input file, Road tunnels option.

A1.8 Critical Load, Background Deposition Rate and Background Concentration

The nutrient nitrogen critical load for three of the interest features of the SAC[7] (Atlantic acidophilous beech forests with Ilex, Northern Atlantic wet heaths with Erica tetralix, and European dry heaths) is **10-20kgN/ha/yr**. The fourth interest feature, stag beetle, is not sensitive to nitrogen.

The background concentration of NOx at the assessed receptors[7] is 22.66μg/m^3 at receptors a and b, and 25.05μg/m^3 at the remaining receptors. These background concentrations are below the critical level and air quality objective for ecological receptors of 30μg/m^3. However, the critical level does not apply to locations more than 20km from towns with more than 250,000 inhabitants, or more than

[7] Air Pollution Information System (APIS) http://www.apis.ac.uk/srcl/select-a-feature?site=UK0012720&SiteType=SAC&submit=Next accessed June 2018

5km from other built-up areas, industrial installations or motorways[8]. This air quality objective does not therefore apply at the assessed receptors.

The background nutrient nitrogen deposition rate at the receptors[7] assessed is **26.88kg/ha/yr**, which is above both the minimum and maximum critical loads for the site.

A1.9 Calculation of NO_2 Concentration

The dispersion model predicts NOx concentrations which comprise nitric oxide (NO) and nitrogen dioxide (NO_2). The deposition rate of NO is negligible and therefore the amount of NO_2 at each receptor was calculated.

The Local Air Quality Management Technical Guidance (LAQM.TG16)[9] details an approach for calculating the roadside conversion of NOx to NO_2. This approach takes into account the NOx generated by the road traffic, ambient NOx and/or NO_2, the concentration of ozone and the different proportions of primary NO_2 emissions in different years. This approach is available as a spreadsheet calculator, and the most up-to-date version, version 6.1[10], has been used.

The background NO_2 concentration for 2016 has been obtained from Defra's 1km^2 resolution background maps[11]. The values are 18.88µg/m^3 at receptors a and b, and 17.23µg/m^3 at the remaining receptors. The highest value of 18.88µg/m^3 was used in the NOx to NO_2 converter for all receptors as a conservative assumption.

A1.10 Calculation of Nutrient Nitrogen Deposition

The predicted NO_2 concentrations were multiplied by a deposition velocity of 0.003m/s, the value recommended by the Environment Agency for deposition of NO_2 to forest[12], to give the deposition rate of NO_2 in µg/m^2/s. The deposition rate values in µg/m^2/s were then multiplied by 96 to convert to units of kgN/ha/yr, which are the units of the nutrient nitrogen deposition critical load.

A1.11 Sensitivity of Results to Complex Model Options

The options used in the modelling (terrain, noise barrier, road tunnel) are advanced model options and validation of the options alone or in combination is limited. A sensitivity analysis was undertaken to assess the importance of these advanced options in determining the magnitude of the final result. Table 5 shows the predicted deposition flux at the specified receptors. The results show the expected, physically reasonable, trends:

- Use of the tunnel option reduced concentrations at receptors close to the road links in the tunnel (5573_EB and 5573_WB), receptors a and g-r, and increases it at receptors close to the tunnel portal, receptors b to f; and

[8] 2010 No.100, Environmental Protection, The Air Quality Standards Regulations 2010, 11 June 2010
[9] Defra (2016) Local Air Quality Management Technical Guidance.TG16
[10] Defra NOx to NO2 calculator (version 6.1), https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc [Accessed: June 2018].
[11] https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html [Accessed June 2018]
[12] AQTAG 06 "Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, 20/04/10

- Use of the noise barrier options reduces concentrations at receptors close to the noise barrier (in this case that is all the receptors).

In addition:

- Use of terrain with the complex options of noise barrier and tunnel portal generally increased the maximum concentration;
- Use of variable surface roughness as well as terrain reduced the maximum concentration slightly and increased the minimum concentrations slightly.

The difference between the minimum value at receptor a and the maximum value is 55%. The concentration and deposition results presented in the sections 1 and 2 are therefore those for case:

- Complex terrain + variable surface roughness + tunnel + noise barrier (Stansted meteorological data).

A1.12 Sensitivity of Results to Meteorological Data Station

To test the sensitivity of model results to the choice of meteorological data station, a comparison has been made between NOx concentrations calculated using data from Stansted Airport and from London City Airport (City) for 2016. The results are shown in Table 5.

Use of data meteorological data from London City Airport reduced the maximum concentration and increased the minimum concentrations. Stansted Airport meteorological data has therefore been used to generate the results presented in sections 1 and 2 as it is judged to be the more representative of the modelled area. London City Airport is on the Thames estuary where more easterly winds are recorded (Figure 5) than would be expected at the study area.

Figure 7: Terrain data used

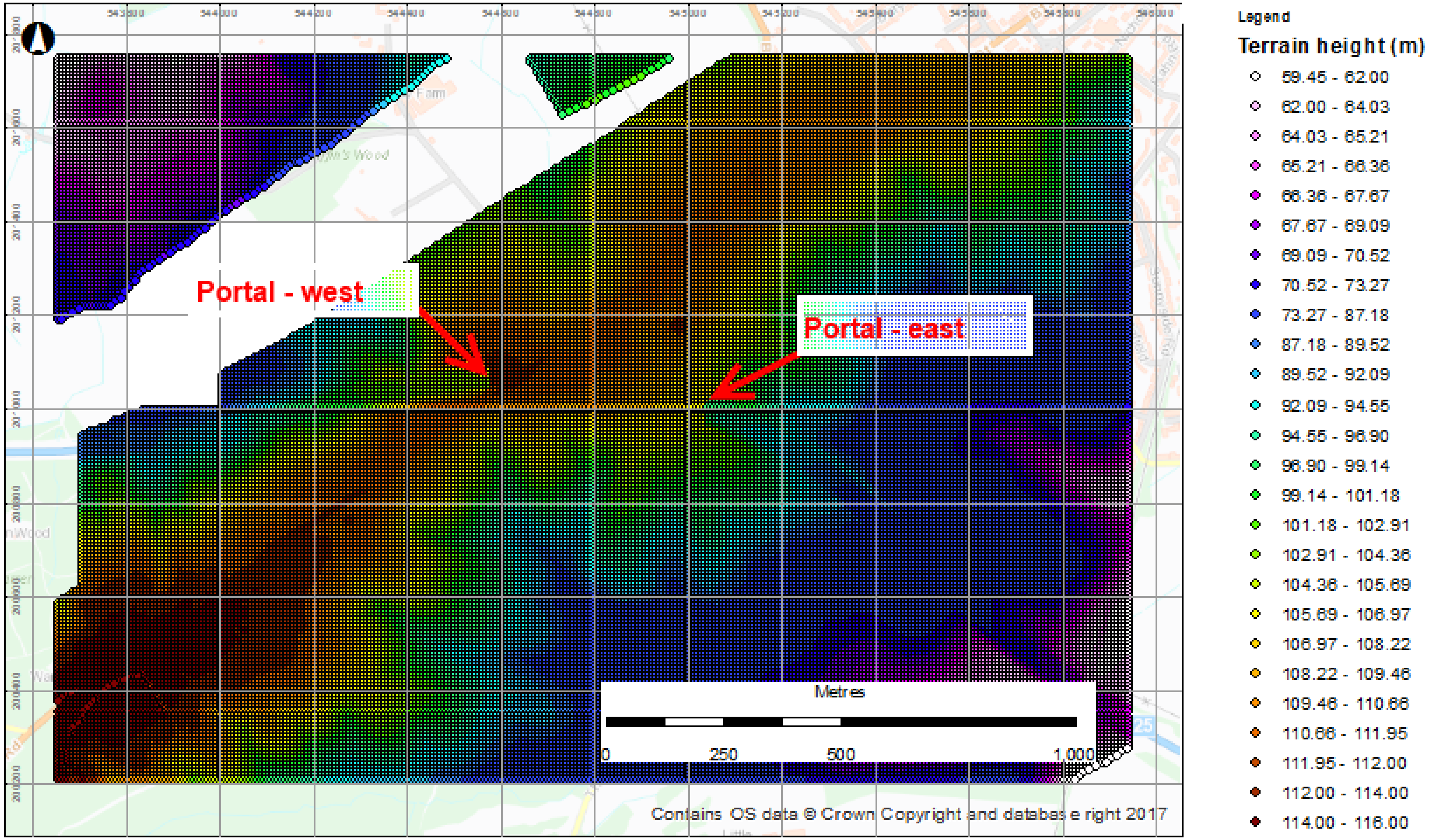
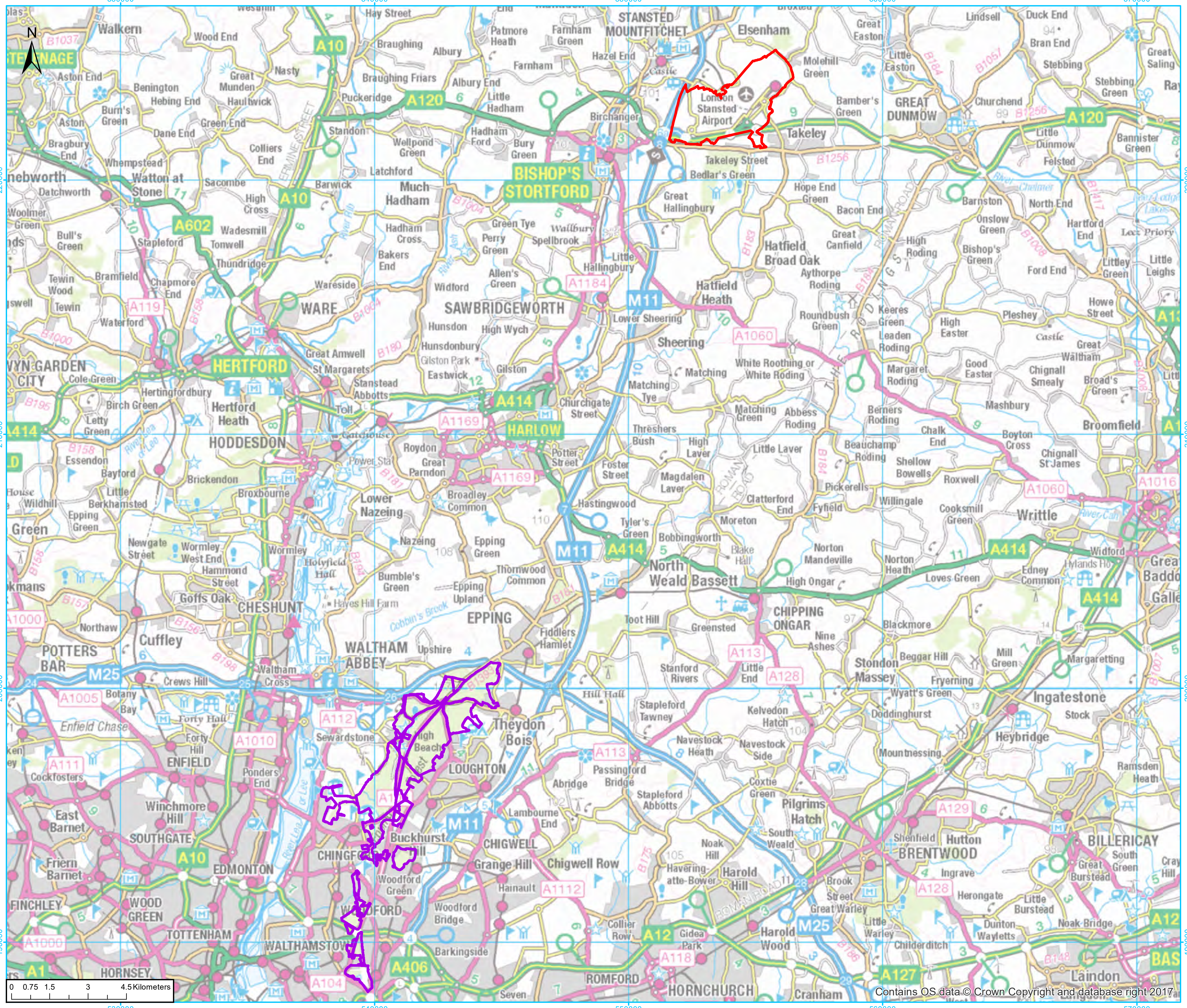


Table 5: Nutrient nitrogen deposition at specified receptors (kg/ha/yr) using different advanced model options

ID	Easting	Northing	Flat terrain				Complex terrain					
			None	Tunnel	Noise barrier	Tunnel + Noise barrier	None	Tunnel	Noise barrier	Tunnel + Noise barrier	Variable roughness + Tunnel + Noise barrier	Variable roughness + Tunnel + Noise barrier**
a	544591	201032	11.8	10.1	9.3	7.6	11.3	10.3	10.6	10.7	10.3	8.2
b	544570	201016	7.4	5.9	9.5	7.9	6.7	5.8	10.8	10.9	10.7	8.0
c	544548	200999	5.4	4.4	7.5	6.6	5.4	4.5	8.6	8.5	8.0	6.3
d	544525	200981	4.1	3.5	5.8	5.2	4.3	3.5	6.3	6.1	5.8	4.8
e	544499	200962	3.3	2.8	4.4	3.9	3.3	2.8	4.4	4.3	4.2	3.6
f	544471	200941	2.6	2.3	3.3	3.0	2.3	2.1	2.9	2.9	3.0	2.7
g	544611	201017	7.6	7.1	5.2	4.7	7.3	7.0	5.2	5.2	5.2	4.2
h	544635	201000	5.3	5.1	3.2	3.0	4.9	4.8	3.0	3.0	3.0	2.6
i	544662	200993	4.8	4.7	2.3	2.2	4.4	4.4	2.0	2.1	2.0	1.9
j	544696	200984	4.3	4.2	1.7	1.6	4.0	4.0	1.4	1.4	1.4	1.4
k	544762	200988	4.6	4.6	1.2	1.1	4.6	4.5	0.9	0.9	0.9	1.1
l	544801	200990	4.9	4.9	1.0	1.0	5.0	5.0	0.8	0.8	0.8	1.0
m	544837	200989	5.2	5.2	1.0	0.9	5.2	5.2	0.8	0.8	0.8	1.1
n	544878	200987	5.7	5.7	1.0	1.0	5.4	5.4	0.8	0.8	0.8	1.3
o	544918	200978	5.7	5.7	1.2	1.1	5.2	5.2	1.0	1.0	1.0	1.6
p	544944	200967	5.3	5.2	1.4	1.4	4.7	4.7	1.2	1.2	1.3	2.0
q	544938	200942	3.7	3.7	1.3	1.3	3.3	3.3	1.2	1.2	1.3	1.9
r	544933	200917	2.8	2.8	1.2	1.2	2.6	2.6	1.2	1.2	1.3	1.7

FIGURE 1

Epping Forest SAC Location Plan



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Legend

- Airport boundary
- Epping Forest SAC

Rev	Description	Date	Initial	Checked

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Client RPS London

Project Stansted expansion

Title Location of Stansted airport and Epping Forest SAC

Status	Drawn By	PM/Checked By
Draft	KM	MB
Job Ref	**Scale @ A3**	**Date**
OXF10603	1:149,145	MAY 18
Drawing Number		**Rev**
Figure 1.1		A

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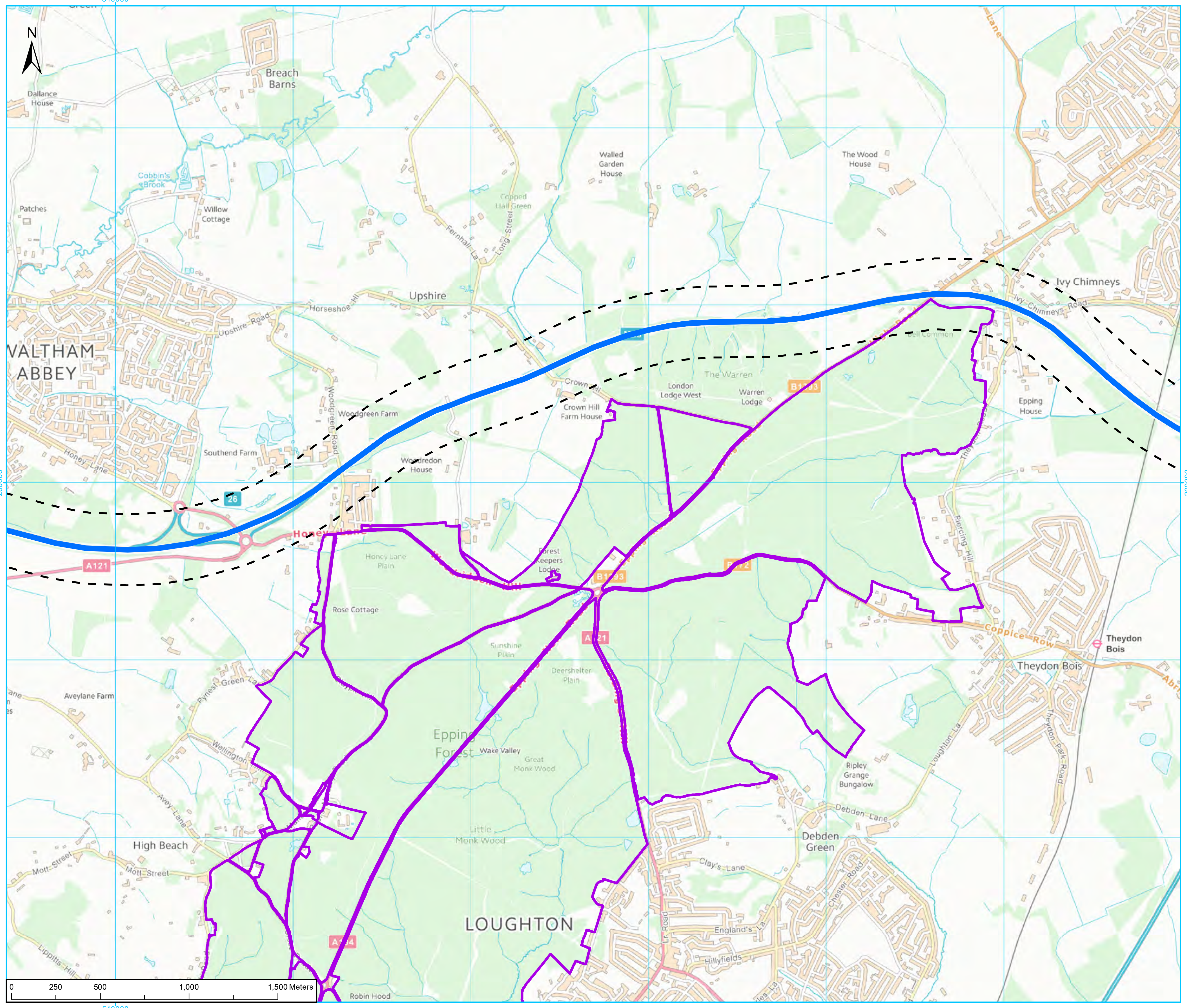
Document: C:_GIS temp\OXF10603_Stansted Expansion\OXF10603_EppingForest_Location.mxd

FIGURE 2

Proximity of the M25 to Epping Forest SAC



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Legend

- M25 main carriageway
- 200m from M25
- Epping Forest SAC

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OXF10603	1:21,459	JUL 18
Drawing Number		Rev
Plan 2		B

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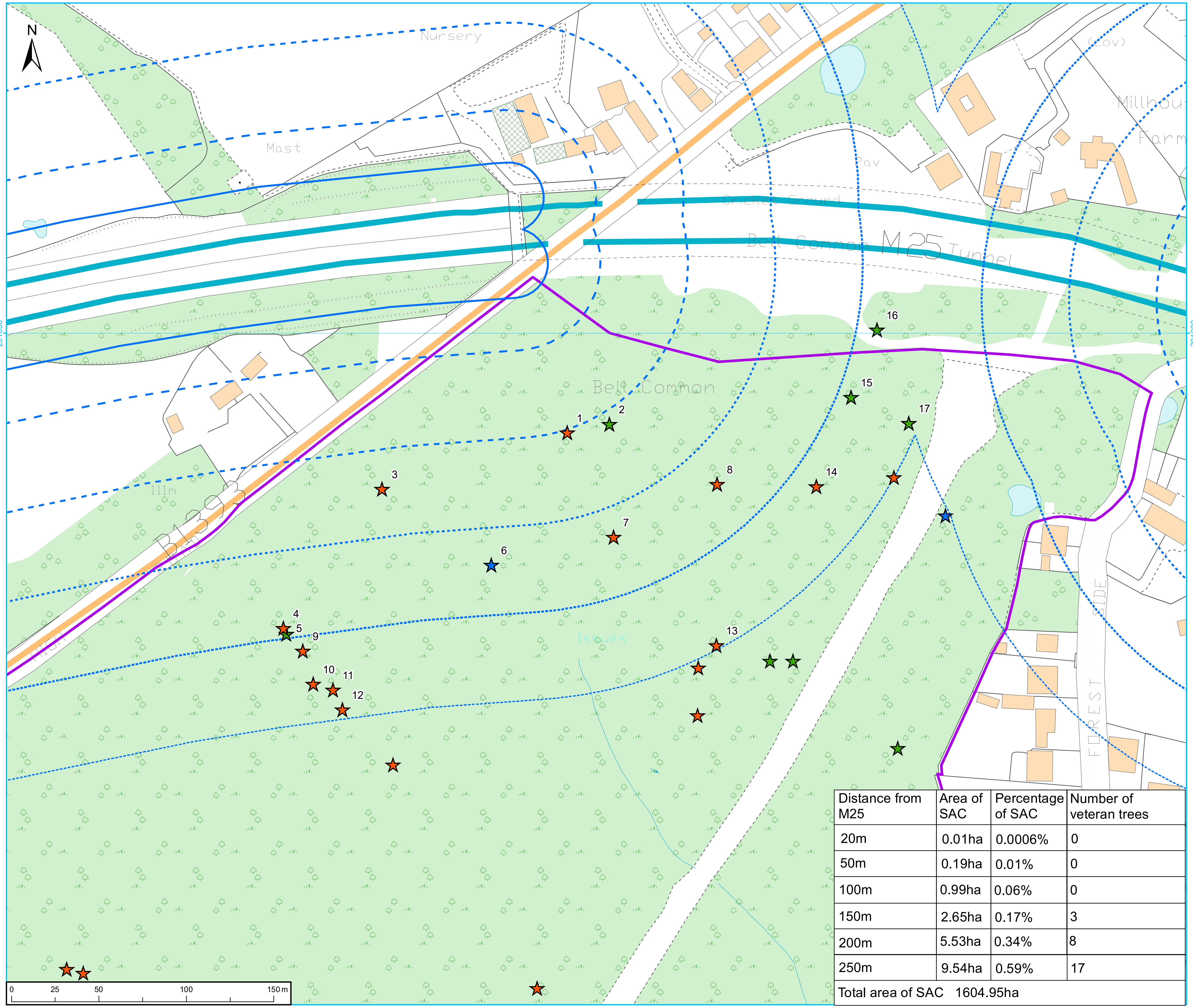
FIGURE 3

Unit 105 Plan – Location of Veteran Trees



Distance from M25	Area of SAC	Percentage of SAC	Number of veteran trees
20m	0.01ha	0.0006%	0
50m	0.19ha	0.01%	0
100m	0.99ha	0.06%	0
150m	2.65ha	0.17%	3
200m	5.53ha	0.34%	8
250m	9.54ha	0.59%	17
Total area of SAC 1604.95ha			

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Legend

- Epping Forest SAC
- Veteran beech
- Veteran hornbeam
- Veteran oak
- 20m from M25
- 50m from M25
- 100m from M25
- 150m from M25
- 200m from M25
- 250m from M25

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Title Locations of veteran trees

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OXF10603	1:2,191	JUL 18
Drawing Number		Rev
Plan 3		I

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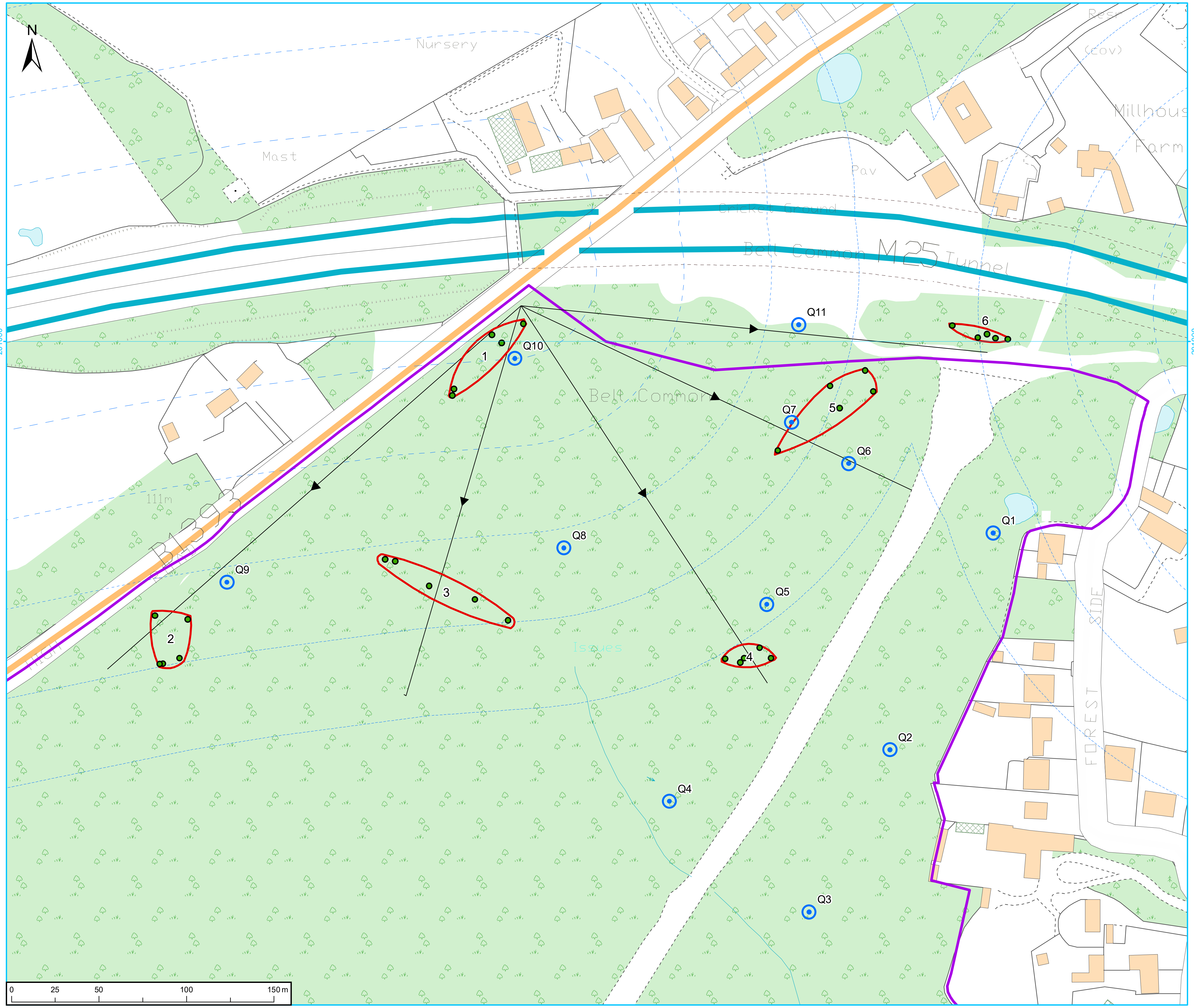
Document: C:_GIS temp\OXF10603, Stansted Expansion\OXF10603_EppingForest_Plan2_wholeM25.mxd

FIGURE 4

Unit 105 Plan – Transects, LIS and Quadrat Locations



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Legend

- Epping Forest SAC
- Location surveyed for LIS
- Oak tree surveyed for LIS
- Transect lines (July 2018)
- Quadrat locations (May 2018)
- 50m from M25
- 100m from M25
- 150m from M25
- 200m from M25
- 250m from M25

Rev	Description	Date	Initial	Checked

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Project Stansted expansion

Title Transects, LIS, and quadrat locations

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Job Ref	Scale @ A3	Date
OXF10603	1:2,191	JUL 18
Drawing Number		Rev
Plan 4		B

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