BAA/4/A

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Stansted Airport Generation 1 Inquiry

PROOF OF EVIDENCE BY

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BSc, EurChem, CChem, CEnv, FRSC, FIEMA

Air Quality Volume 1 - Text

April 2007

BAA London Stansted

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Proof of Evidence

Air Quality Volume 1 - Text

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Entec UK Limited

Report for

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Document Revisions

No.	Details	Date
1	Draft Report	16.03.07
1	Final Report	25.04.07

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1. Qualifications Experience and Terms of Reference

1.1 My name is Malcolm Pratt I hold a degree of Bachelor of Science (1st Class Hons) in Industrial Chemistry. I am a European Chemist, Chartered Chemist, Chartered Environmentalist, Fellow of the Royal Society of Chemistry and Fellow of the Institute of Environmental Management and Assessment. I am also a member of the United Kingdom Environmental Law Association and the National Society for Clean Air.

1.2 I am a Technical Director at Entec UK Limited and have been employed by the company (and its predecessors) since 1974. Since joining the company I have undertaken many environmental projects, ranging from the assessment of the impact of new developments (chemical, nuclear reprocessing plants, waste disposal sites, mining operations, transportation etc) to be established on Greenfield sites to the reclamation of derelict land for industrial, commercial, residential and recreational purposes. In addition to this work I have also undertaken a number of projects relating to the measurement and assessment of air quality changes and odour and dust nuisance from a variety of industries (chemical, waste disposal, paper coating, animal rendering, intensive farming, mineral processing and transportation). In these projects I have used a number of atmospheric models developed to examine changes in air quality from both stationary and mobile emission sources. I have given evidence at a number of public inquiries including Manchester Second Runway and Heathrow Terminal 5. I prepared (or assisted in the preparation of) the air quality sections for the environmental statements for Manchester Runway Two, Stansted 15+ and Stansted G1.

1.3 Entec UK Limited was instructed by BAA plc (BAA) in November 2004 to assist in the preparation of the air quality section of the environmental statement for G1. These instructions were subsequently extended to undertake investigations into odours around airports (August 2005) and climate change issues (September 2005).

1.4 Prior to the engagement of Entec UK Limited, AEA had been commissioned to undertake the detailed modelling work to support the environmental statement. AEA also undertook the model/monitoring comparison study and the carbon dioxide emission calculations.

2. Purpose and Scope of Evidence

2.1.1 The air quality evidence comprises three volumes as detailed below

Volume 1 - Text	BAA/4A;
Volume 2 - Summary	BAA/4B and
Volume 3 - Tables, Figures and appendices	BAA/4C.

2.1.2 The purpose of my evidence is:

(a) To identify those air quality matters that were covered in Volume 3 of the Environmental Statement (ES –CD/6) and the Regulation 19 Response (CD/22) but which are not an issue between Uttlesford District Council (UDC) and BAA;

(b) To deal with the issue of nitrogen deposition which forms the basis of the single reason for refusal that is derived from the air quality assessment; and

(c) To comment on a number of issues that have been raised including some that question the robustness of the assessment in the ES and the context against which the results should be judged. These issues include:

(i) Monitoring;

(ii) Model verification;

(iii) Modelling (business as usual, up-to-date model, roadside modelling and emission reductions);

(iv) Applicability of standards and objectives; and

(v) Emissions of carbon dioxide.

2.1.3 Section 3 of my evidence identifies those Air Quality issues covered in the G1 Environmental Statement which are not the subject of any reason for refusal.

2.1.4 In Section 4, I identify the single Air Quality reason for refusal and explain the very small increase in N deposition at Hatfield Forest and Eastend Wood that would result from the G1 development.

2.1.5 In Section 5, I will address the main concerns raised by other parties that question the robustness of the assessment presented in the ES.

3. Air Quality issues examined in the Environmental Statement

3.1.1 Volume 3 (CD/6) of the ES addressed the subject of air quality. This work was summarised in Volume 1 Section 10.2 (CD/3). The ES was based on the original scoping report (CD/23) but extended to include some of the issues raised in the scoping opinion. Without repeating the entire content of the ES, I would summarise the key subject areas contained within Volume 3 as:

(a) Identification of the relevant pollutants as nitrogen oxides (NOx; the sum of nitric oxide (NO) and nitrogen dioxide (NO_2)), particulate matter (PM_{10} and $PM_{2.5}$) sulphur dioxide (SO_2) benzene and 1,3 butadiene and their sources;

(b) Identification of the statutory air quality objectives and limit values for the relevant pollutants against which their concentrations should be assessed. Where no statutory standards existed, non-statutory standards for pollutants (e.g. $PM_{2.5}$) were identified;

(c) Explanation of the methodology for quantification of emissions of relevant pollutants from the airport and road transport;

(d) Explanation of the methodology for the assessment of background concentrations, defined as those concentrations that were not derived from the explicit modelling of the emissions identified in (c) above;

(e) Explanation of the methodology for the calculation of concentrations from the emissions identified in (c) above;

(f) Identification of the existing (2005) baseline air quality environment including information of the review and assessments undertaken by UDC and East Hertfordshire District Council (EHDC);

(g) Review of information on odours, oil droplets and fuel jettisoning around major airports;

(h) Presentation of the calculated emissions and resulting concentrations for the permitted development (25mppa case) and with the G1 development (35mppa case) in 2014;

(i) The modelled concentrations were compared with the relevant statutory, and where necessary non-statutory standard/objectives. This comparison (Table 17, CD/3) is reproduced as Table 3.1;

(j) Presentation of a number of sensitivity cases which recognise some of the uncertainties in forecast data and the modelling processes. The key sensitivity tests included:

- Different meteorological conditions (2001, 2002 and 2003),

- The effect on NOx to NO_2 conversion with changes to the primary NO_2 fraction and ozone concentration,
- The effect on concentration of increasing passenger numbers and changing the fleet mix.

(k) Assessment included the cumulative effects of any additional road traffic from other specified permitted developments.

3.1.2 The conclusions at the end of Section 10.2 Volume 1 (CD/3) were:

> "10.2.72 - *The effects of the proposed Generation 1 development have been assessed using an atmospheric dispersion model to predict pollutant concentrations for the 25 mppa and 35 mppa cases. The model has been used in a number of similar airport studies and modelling/monitoring comparison studies were undertaken to demonstrate that the model is suitable for assessing the impacts of airport developments.*
>
> 10.2.73 - *Air quality is predicted to be similar in the 35 mppa case to that which would arise in the 25 mppa case, although as would be expected, concentrations of all pollutants are marginally higher in the 35 mppa case, due primarily to the increase in ATMs and road traffic. In both cases the Government's annual mean NO_2, particulate matter, benzene and 1,3-butadiene objectives would not be exceeded beyond the airfield and apron areas. Shorter time period concentrations for NO_2, particulate matter and SO_2 are also predicted to be below their relevant objectives away from the airfield and apron areas. There is no air quality objective for $PM_{2.5}$ in the UK, however, predicted concentrations of this pollutant fall well below the concentration cap in a proposed EU directive beyond the airfield and apron areas. Although the annual mean EU limit values for vegetation protection (NOx) and protection of ecosystems (SO_2) do not strictly apply within areas five kilometres from a motorway, these concentrations are not exceeded within Hatfield Forest or Eastend Wood."*

3.1.3 The air quality volume (CD/6) and its associated reports (Underwood 2005, Underwood 2006) were reviewed by UDC and its advisors. This resulted in the Regulation 19 request for further information. In the context of air quality this additional information related to:

(a) Point 10 - odour survey concluded by Stansted Airport;

(b) Point 11 - NOx/NO_2 conversion factor;

(c) Point 12.1 - additional information on model verification;

(d) Point 12.2 - comparison of Stansted Airport and other airports;

(e) Point 13 - implication of NOx on vegetation.

3.1.4 This additional information was provided in the Regulation 19 Response (CD/22).

3.1.5 It is evident from the Bureau Veritas reports (CD/144, CD/145) that they had some reservations about the model verification information in the original report (CD/6) and the Regulation 19 response (CD/22). There were a number of detailed criticisms in the

CD/144 and CD/145, reports and although these were reflected in the UDC officers report (27 September – CD/32), few were mentioned in the 29 November report (CD/33).

3.1.6 UDC's advisors (Bureau Veritas – para 176) advice was:

> *"that the ES Volume 3 Air Quality report is thorough overall. Further clarification was sought on some issues. The verification of emission dispersion model remains uncertain because of a lack of adequate and robust monitoring data. However despite the concerns regarding model verification it is not considered likely that the increased use of the runway would cause any exceedances of the health based air quality objectives based on the predictions in the ES and experience at other major UK airports".*

3.1.7 The officer's report (CD/33) concluded that the effects (of the development) on air quality would not breach statutory health based objectives but considered that there are more significant issues with regard to nature conservation.

3.1.8 In this section of my evidence I have summarised the scope of the air quality work that was presented in the ES (CD/6) and the conclusion reached on this work by UDC and its advisors. Further details on the common ground between UDC and BAA is set out in the Statement of Common Ground (CD/?)

3.1.9 Hence from all the matters discussed in the air quality volume of the ES and its associated reports the effect of nitrogen oxides on nature conservation interests remains the only air quality issue between BAA and UDC. I deal with this issue in Section 4 below.

3.1.10 I acknowledge there are other issues connected with air quality that remain between BAA and other parties (NT, SSE etc) but they have not been adopted by the local planning authority as reasons for refusal. I will address some of these issues later in Section 5 and Appendices I, II, and III (Volume 3).

4. Nitrogen Deposition

Reason for refusal

4.1.1 The UDC reason for refusal that relates to air quality states that:

R.90C Air Quality

"Increased pollution arising from the consequences of the proposed development could give rise to an increased risk of vegetation damage in Hatfield Forest and East End Wood. Insufficient real data is available to ensure an accurate assessment. As a consequence, inadequate contingency measures for mitigation and/or compensation measures have been made, to the detriment of biodiversity and contrary to policies NR5, NR6, NR7 and BIW9 of the Essex and Southend-on-Sea Structure Plan and ENV7of the Uttlesford Local Plan."

4.1.2 It can be seen, therefore, that this reason for refusal is very narrow indeed. It is not suggested that 'increased pollution' arising from the G1 development *would* cause damage to vegetation in Hatfield Forest and Eastend Wood, but merely that there *"could"* be an *"increased risk"* of such damage. Furthermore, the concern expressed in the reason for refusal relates to the inadequacy of contingency measures for mitigation and/or compensation.

Introduction

4.1.3 Nitrogen compounds arise from a wide variety of sources due to fuel combustion and microbiological processes. The nitrogen is first emitted to the atmosphere as nitric oxide (NO), nitrogen dioxide (NO_2) and ammonia (NH_3). These compounds can be transformed to other compounds in the atmosphere (e.g. nitrates or ammonium ions) and be removed from the atmosphere and transferred to the ground or other surfaces through either wet[1] or dry[2] deposition processes. These nitrogen compounds remain in the atmosphere for considerable periods of time. The mean residence time in the atmosphere for reduced nitrogen (e.g. NH_3) is about 5 hours whereas for oxidised nitrogen (e.g. NO_2) it is about 30 hours. This gives approximate travel distances (on the wind) of about 150km and 1000km respectively.

4.1.4 The sources of nitrogen oxides include all combustion processes, electricity production, transportation and space heating in industrial, commercial and domestic premises. Most ammonia emissions (90%) are emitted from agricultural sources and, since the introduction of three way catalysts into petrol vehicles, road transport contributes about 4% of emissions. The remainder arise from waste treatment sources. Nitrogen compounds can also be emitted directly by industrial processes.

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1 Wet deposition is the removal of pollutants (gases and particulates) by from the atmosphere by precipitation (rain etc).

2 Dry deposition is the removal of pollutants (gases and aerosols) directly on the earth's surface

4.1.5 Before setting out the possible contribution to nitrogen deposition from the airport and related road traffic, there is some terminology ("critical level" and "critical load") that needs to be explained.

4.1.6 A "critical level" is a pollutant concentration (mass per unit volume; typically $\mu g/m^3$) in the atmosphere above which direct adverse effects on receptors (e.g. people, vegetation, ecosystems) may occur, according to present knowledge. A "critical load" (mass per unit area per unit time; typically kg/ha/year) is a quantitative estimate of one or more pollutants deposited on to receptors (e.g. vegetation, ecosystems) below which significant harmful effects do not occur according to the present state of knowledge.

4.1.7 As the concentration of nitrogen compounds increases, deposition can increase which adds more nitrogen onto the ground and/or plant surfaces. This deposition will be washed into the ground and provide nutrients to plants. In some cases this increase in nutrient level is beneficial as it provides for improved growth (the extreme example of this is the use of nitrogen based fertilizer on farmland and gardens). In other circumstances this nutrient addition leads to a loss of biodiversity as the more dominant species grow rapidly and "crowd out" the less vigorous species.

4.1.8 Critical levels and critical loads for a given pollutant are obviously related but for NOx the relationship is complex. Nitrogen compounds (NOx, the sum of nitric oxide (NO) and nitrogen dioxide (NO_2), nitrate (NO_3^-), ammonia (NH_3)) are removed from the atmosphere by both wet and dry deposition mechanisms. As nitrogen deposition can comprise contributions from several nitrogen compounds the deposition rates are reported as nitrogen (N) equivalents. Deposition rates are normally reported in the units of kilogramme Nitrogen per hectare per year (kgN/ha/y).

4.1.9 The amount of each nitrogen based compound is deposited on the ground or vegetation surface is determined by its concentration, the time over which this concentration is maintained and the deposition velocity (distance per unit time; typically m/s). These factors combine to give the annual deposition rate per unit area. It is this deposition rate that can be compared with the critical load.

4.1.10 The term critical load does not appear directly (as far as I am aware) in any UK legislation on air quality. The early use of the terminology appears in the series of protocols arising from the 1979 Convention on Long-range Transboundary Air Pollution, for example, in the 1988 (Sofia) Protocol on Control of Nitrogen Oxides. The term is also used in several European Directives, for example 1999/32/EC which amends the sulphur content of certain liquid fuels and 2001/81/EC on national emission ceilings on certain atmospheric pollutants (including NOx).

4.1.11 Again (as far as I am aware) there are no numerical critical loads set in these directives. The quantification of critical loads has been reviewed at the international level a number of times the most recent of which was at a Workshop in Berne (Achermann et al (2003))[3] in 2002. The critical loads are not single values but ranges which vary by habitat type (for example the range set for deciduous forests is 10 to 15kgN/ha/year).

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3 Extracts from Achermann et al (2003) Empirical critical loads for nitrogen are provided in Appendix V (Volume 3)

As noted in para 4.1.14, the draft Air Quality Strategy (Defra (2006) CD/186) does not propose in introduction of any new objectives or targets for the critical loads.

4.1.12 In the consultation draft of the Air Quality Strategy (Defra (2006) CD/186) the Government notes that exceedances of critical loads leads to a loss in biodiversity. It goes on to say that these unwelcome effects are significant and have been addressed in this draft Air Quality Strategy for the first time in a substantive way.

4.1.13 The Government does not currently have a target for critical load exceedance. The 6th Environmental Action Programme of the EC 2002-2012 sets as a target the development of a thematic strategy (adopted in 2005) to strengthen a coherent and integrated policy on air pollution with a view to reaching a long term objective of no-exceedance of critical loads and levels.

4.1.14 In the draft Air Quality Strategy (CD/186) there is much discussion on critical loads and the policy measures for their reduction. That said, the Government proposes *"that the medium term objective towards our long term aspiration is to achieve the nitrogen oxides objective at 99% of all sites by area in 2010"* (p112 para 73)[4]. It should be noted that this is a critical level aspiration not one for critical loads. At page 129 (para 144) of the draft Strategy there is recognition that the critical load concept is important in terms of ecological impacts although the Government says it will be considered further in subsequent reviews of the Strategy. Moreover the Government does not intend to adopt any additional objectives or targets for critical loads at this juncture. The draft Air Quality Strategy goes on to say (page 129 para 149)

> *"Considering these developments[5], the UK Government and the devolved administrations consider it premature to set targets for the reduction of critical load exceedences at this time. The UK Government and the devolved administrations will continue to support policies aimed at reducing critical load exceedence at UK, European and UNECE levels, and will work with our international partners to reduce emissions of SO_2 and NOx and NH_3".*

4.1.15 The NOx concentration contours given in the ES (CD/6) show the location of the 30µg/m^3 contour for the 25mppa and 35mppa cases. The location of this contour, for the 35mppa case, is also shown in Figure 4.1 (Volume 3) of this evidence. I draw attention to the location of this contour because it represents the vegetation objective (or limit value) for this pollutant. This concentration also represents the critical level for this NOx.

Nitrogen Deposition Rates in the UK

4.1.16 Before looking at the possible contribution from the airport to nitrogen deposition at Hatfield Forest and Eastend Wood, it is important to understand the magnitude of nitrogen deposition across the East of England and nationally in the context of the

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4 Extracts from Defra (2006) the draft Air Quality Strategy are provided in Appendix VI (Volume 3)

5 These developments are set out in paragraph 148 and relate to other measures to reduce emissions of sulphur, ammonia and nitrogen oxides emissions within the strategy or through other initiatives

critical loads for deciduous forests. Maps of nitrogen deposition rates are available on the Air Pollution Information System (APIS) website (www.apis.ac.uk). The deposition map for deciduous forests from this source is shown in Figure 4.1. Examination of this figure shows that the critical load for deciduous forests (10-15kgN/ha/y) is exceeded over all of the region and most of England. It should be noted that nitrogen rates vary with the vegetation cover as this affects the deposition velocity. The deposition rates shown in Figure 4.1 assume the vegetation type is deciduous forest across the UK. Clearly in areas where there is no deciduous forest the deposition rates would be different and probably lower than shown. The deposition rates are made up of all UK (and European) nitrogen emissions that are carried across the country and removed from the atmosphere by the wet and dry deposition mechanisms. Exceedance of nitrogen deposition critical loads is not therefore unique to the deciduous woodlands in the Stansted area but affects woodlands throughout much of the country as illustrated below:

Site name	Grid reference	Total N deposition (1999-2001) (kgN/ha/y)
Epping Forest SSSI	TL475035/TQ405865	40.6/50.0
New Forest SSSI	SU298081	24.2
Cannock Chase SSSI	SJ990180	36.0

4.1.17 The location of Hatfield Forest and Eastend Wood are shown in Figure 4.2. This figure which is taken from Volume 3 of the ES (Figure 8 – CD/6) also shows the NOx contours derived from the G1 development at 35mppa in 2014.

4.1.18 If Ordnance Survey grid references for selected receptors (shown on Figure 4.2) just to the north of Hatfield Forest (553200,221300) and just to the south of Eastend Wood (555800,225000) are entered in the APIS website the nitrogen deposition rates are given as 36.5kgN/ha/y and 38.8kgN/ha/y respectively. These receptors were selected as they will be exposed to the highest nitrogen oxide concentrations from the airport and/or the G1 development.

4.1.19 Total nitrogen deposition rates are forecast to fall in the future in response to national and international commitments to reduce emissions of nitrogen compounds. Based on modelling (by NEGTAP[6]) interim guidance produced by the Highways Agency (Highways Agency (2005)[7]) suggests a 2% per year reduction in nitrogen deposition. This is an approximate average value for the country as a whole for the period 1997 to 2010 and there is no guarantee that the rate will continue to be the same in later years (although continuing reductions are expected). The APIS data deposition rates shown in Figure 4.1 or set out in Table 4.1 have been calculated as the average over a 3-year period (1999 to 2001). If these deposition rates are taken to apply to the year 2000, the NEGTAP modelling would give a 28% reduction in nitrogen deposition by 2014. The

6 National Expert Group on Transboundary Air Pollution

7 Extracts from Highways Agency (2005) Interim Advice Note 61/05 are provided in Appendix VII (Volume 3)

projected fall in deposition rates for 2000 and 2014 together with the critical loads for deciduous forests are summarised in Table 4.1. Based on a representative critical load value (12kgN/ha/y)[8], it is evident that the percentage exceedance of the critical load is expected to fall (by 10.2kgN/ha) at the Hatfield Forest receptor from 204% to 119% of the critical load in 2000 and 2014 respectively, with an equivalent fall (10.7kgN/ha) at Eastend Wood from 223% to 133%. The average annual fall in deposition is approximately 0.7kgN/ha/y and 0.8kgN/ha/y at Hatfield Forest and Eastend Wood respectively

4.1.20 The deposition rates given in Table 4.1 will already include a contribution from the nitrogen compounds that originate from the existing airport activities, as the emissions from the airport are included in the dataset used in the modelling of the deposition rates. It would not be safe to assume that future emissions from the G1 development are included in the 2014 deposition rates, however, as the future estimate of background nitrogen deposition has been calculated by linear interpolation.

Contribution of G1 to Nitrogen Deposition at Hatfield Forest and Eastend Wood

4.1.21 I have already indicated that atmospheric concentrations of nitrogen compounds are transferred to the ground or other surfaces through both dry and wet deposition mechanisms. To calculate the contribution from the atmospheric emissions from the G1 development to deposition rates at locations relatively close to the airport it is necessary to understand the timescales over which deposition can occur, and the compounds which are present in the emissions from the airport that can contribute to nitrogen deposition.

4.1.22 The nitrogen emissions from the additional aircraft and vehicles resulting from the G1 development are essentially nitrogen oxides. There are also very small emissions of ammonia from petrol engine vehicles both on and off the airport. The wet and dry deposition of nitric oxides need not be considered in these calculations as the distance scale is short. Nitric oxide is poorly soluble in water and hence its contribution to nitrogen deposition by wet deposition is extremely small and it is generally ignored in long range modelling. Soil is often a source of nitric oxide (through micro biological activity) rather than a sink and so the contribution from dry deposition of nitric oxide to nitrogen deposition is also extremely small and is also generally ignored. On an annual mean basis the contribution from wet deposition of nitrogen dioxide compared to dry deposition is extremely small, as it is only moderately soluble in water with a low washout[9] coefficient, so again can be ignored (NEGTAP 2001 p50 and p53-55 (CD/188) and Tsyro (2001)[10]). Hence the contribution to nitrogen deposition from the G1 development can be described in terms of dry deposition of nitrogen dioxide only.

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8 Value adopted by CEH (2007) UK National Focus Centre for critical loads modelling and mapping (see Appendix VIII)

9 Washout coefficient describes the fraction of a pollutant that is removed from the atmosphere by rain (precipitation). This coefficient is affected by the size distribution of rain drops as well as by the properties of the diffusing material.

10 No deposition velocity given for NO and neither NO nor NO_2 are wet scavenged (Extracts NEGTAP (2001) and Tsyro (2001) are provided in Appendix V, Volume 3)

4.1.23 Annual mean dry deposition velocities for nitrogen dioxide fall in the range 0.001 to 0.003m/s. Values for woodland however fall in the narrow range of 0.001 to 0.002m/s. The higher value in this range (0.002m/s) was selected for the nitrogen deposition calculations I have undertaken. This deposition rate was also used in the calculations reported in the Addendum to the 15+ ES (i.e. the ES for the 2003 planning permission - CD/29). In recent Highways Agency (2005) advice a smaller value of 0.001m/s is recommended. The use of the higher value (0.002m/s) in this evidence will therefore produce deposition rates that double those calculated if I followed the Highways Agency's advice.

4.1.24 The final piece of information required to calculate the airport related nitrogen deposition is the concentration of nitrogen dioxide that is derived from the airport emissions. From information in the ES Volume 3 (page 40 and 59 – CD/6) we know the model contribution from different sources (background, non-airport roads and total airport related[11]) and total concentration of nitrogen oxides and the equivalent total nitrogen dioxide concentration.

4.1.25 Nitrogen dioxide is essentially a secondary pollutant[12], that is to say it is produced by chemical reactions in the atmosphere. As a result of this the fraction that arises from the airport related nitrogen oxides cannot be determined. To set boundaries to this fraction two approaches were considered:

(a) Assume the nitrogen dioxide fraction is equal to the fraction of nitrogen oxide which is attributable to airport related sources.

(b) Assume the nitrogen dioxide fraction is the difference between the values calculated with and without the airport related sources in place.

The nitrogen dioxide fraction calculated by assumption (a) is higher than for (b) due to the non linearity of the nitrogen oxide/nitrogen dioxide relationship. For the purpose of these deposition calculations I have applied the higher fraction of nitrogen dioxide.

4.1.26 In the remainder of this section, I will set out the nitrogen deposition rates arising from the ES assessment[13] for the 25mppa and 35mppa cases. As the advisors to UDC expressed concern (CD/144) that the primary NO_2 fraction had been set too low in Volume 3 of the ES (CD/6) a sensitivity test was undertaken and the change in concentrations was reported in the Regulation 19 Response (CD/22). As this sensitivity test would also increase nitrogen deposition rates I have also included the nitrogen deposition rates that would occur if the prescribed conditions for the Regulation 19 sensitivity test[14] were in place.

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11 Total airport related fraction includes all airport sources and landside airport related road traffic.

12 There is a small primary fraction of nitrogen dioxide emitted during the combustion process

13 In the ES assessment, the primary nitrogen dioxide fraction was 9.3% with a background ozone concentration of 32.4μg/m^3.

14 In the Regulation 19 sensitivity test, the primary nitrogen dioxide fraction was increased to 20% with a background ozone concentration of 37.4μg/m^3.

4.1.27 The nitrogen oxides and nitrogen dioxide concentrations for the selected receptors[15] have been extracted from the modelling data used to prepare Tables 23 and 32 Volume 3 of the ES (CD/6) and Table 27 of the Regulation 19 Response (CD/22). These concentrations for Hatfield Forest and Eastend Wood are shown in Table 4.2 (columns 3 and 4). The equivalent nitrogen dioxide concentration is given in columns 6 (ES assessment) and 7 (Regulation 19 sensitivity test).

4.1.28 The nitrogen deposition rate arising from the nitrogen dioxide concentration of 18.9µg/m^3 for the 25mppa case (Table 4.2 (column 6)) is given by:

Deposition rate (kgN/ha/y) = Concentration (µg/m^3) x deposition (m/s)

x Conversion factor (315.26 - to convert NO_2µg/m^2/s to NO_2 kg/ha/year)

x Conversion factor (14/46 - to convert nitrogen dioxide to nitrogen)

hence

Deposition rate = 18.9 x 0.002 x 315.26 x 0.30 (kgN/ha/y)

= 3.6kgN/ha/y.

4.1.29 This figure (3.6kgN/ha/y) given in Table 4.3 (column 3) represents the dry deposition rate from all sources of nitrogen oxides considered in the modelling work at a receptor just to the north of Hatfield Forest. The fraction of this deposition that could be attributed to the airport is calculated from the ratio of airport related nitrogen oxides to the total concentration which for this example is 0.31 (column 5) Table 4.2. Multiplying the deposition rate 3.6kgN/ha/y by this ratio (0.31) gives the airport fraction of dry deposition as 1.1kgN/ha/y (Table 4.3 column 4). If this calculation is repeated for the 35mppa case using the appropriate values from (Table 4.2 column 6 – 19.7, and column 5 – 0.35) the dry deposition rate becomes 1.3kgN/ha/y (Table 4.3 column 4).

4.1.30 The deposition rate at each receptor location for the ES assessment and Regulation 19 sensitivity test is given in Tables 4.3 and 4.4 respectively. The 25mppa case and 35mppa case related deposition is shown as a percentage of the total nitrogen deposition in 2014 in column 5 of both Table 4.3 (ES assessment) and Table 4.4 (Regulation 19 sensitivity test). The incremental change due to the development is shown in the 'difference' row in each table.

4.1.31 It is evident from Table 4.3 (ES assessment) that the incremental change in nitrogen deposition at Hatfield Forest due to the G1 development is just 0.2kgN/ha/y. At Eastend Wood the equivalent increment is 0.3kgN/ha/y. These increments represent a fractional increase in the total nitrogen deposition of 0.8% and 1.2% respectively. The increases are slightly higher at Eastend Wood as the selected receptor experiences a higher nitrogen oxides concentration from airport related sources.

15 These receptors are closest to the airport and therefore will be subject to the highest NOx contribution from the airport. This contribution will fall as distance increases from the airport.

4.1.32 Table 4.4 provides the deposition rates for the same receptors but applying the higher primary NO_2 fraction and ozone concentration from the Regulation 19 sensitivity test. In this case the increment due to the G1 development is 0.3kgN/ha/y and 0.4kgN/ha/y at Hatfield Forest and Eastend Wood respectively. These increments represent a fractional increase in the total nitrogen deposition of 1.0% and 1.4% at Hatfield Forest and Eastend Wood respectively.

4.1.33 When calculating total exceedance of the critical load it would be safer (i.e. pessimistic) to assume that the projected total nitrogen deposition in 2014 did not take into account the case-specific increase in deposition arising from the increased throughput at the airport. In this case percentage increase in the exceedance of the critical load in 2014 would increase by about 2% from 119% (Table 4.1) to 121% at Hatfield Forest and from 133% (Table 4.1) to 135% at Eastend Wood.

4.1.34 There will be a small contribution to nitrogen deposition from ammonia derived from airport related petrol vehicles. This has not been included in the calculation described in paras 4.1.26 to 4.1.33 above as it is estimated to make a contribution in the region of 5% of the airport related nitrogen deposition from NOx at Hatfield Forest and considerably less at Eastend Wood.

4.1.35 If assumption (b) in paragraph 4.1.25 had been applied the airport related fraction of nitrogen deposition would be about 30% lower than the values given in Table 4.3 and 4.4. Hence the increment of 0.2kgN/ha/y and 0.3kgN/ha/y (Table 4.3) could be an overestimate. Similarly if the deposition rate (0.001m/s) recommended by the Highways Agency was adopted the deposition rates given in Tables 4.3 and 4.4 would be halved.

4.1.36 The calculated airport-related nitrogen deposition rates presented here are substantially smaller than those presented in equivalent calculations for the 15+ development (CD/29) even for broadly similar cases. Although there are many contributors to this difference, the principal cause is the revisions to the emissions and dispersion-modelling methodologies, as explained in detail in documents supporting the G1 ES (Underwood et al 2005 – CD/189[16]).

Mitigation and Compensation

4.1.37 The scope of the reason for refusal, as set out at para 3.1.9 is relatively narrow. No actual harm is alleged to either Hatfield Forest or East End Wood; rather, the reason for refusal states that increased pollution *could give rise to an increased risk of vegetation damage.* It goes onto assert that *insufficient real data is available to ensure an accurate assessment* and that *as a consequence inadequate contingency measures for mitigation and/or compensation have been made*.

4.1.38 At a meeting with BAA on 5 April 2007 UDC informed BAA that it had asked that the National Trust to provide an unequivocal letter on its position in relation to nature conservation, but that so far as UDC was concerned it wished BAA to roll forward Part 8 of the existing 15+ s. 106 Agreement (Mitigation Meeting of 5 April 2007 paragraphs 5.2 and 10.1).

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16 This is a methodological report and has been provided in full as a core document (CD/189)

4.1.39 Part 8 obliged BAA to submit to UDC for approval a proposal for a base line study of the condition of flora and fauna within Hatfield Forest, East End Wood and the Fen site within the airport boundary. Proposals for the baseline study, required under Part 8 were drawn up by BAA's consultant ecologist and agreed by UDC, National Trust and English Nature in May 2004.

4.1.40 Baseline sampling and survey work of various types commenced in August 2004 and continued into 2005.

4.1.41 The baseline data were published[17] in September 2006. Work on the follow up impact studies is currently in progress and it is intended that this will be completed for publication in 2007.

4.1.42 In its mitigation package put to UDC on 9 November 2006 BAA had not proposed continuing with Part 8 given the position that had been reached during the preparation of the ES and reported at paragraph 3.1.4, (Volume 3 CD/6) as:

> "*At a workshop held with the National Trust (who also represented the views of English Nature) and other national experts it was agreed while nitrogen deposition which causes eutrophication is a matter of concern, this is not directly affected by key emissions from the Airport. Deposition levels in the area of the Airport, like elsewhere in the UK are all above critical values. In view of this; and work already completed for the 15+ application assessment and its addendum, it was agreed that the NOx concentrations in the air at Hatfield Forest and Eastend Wood would be a more appropriate metric for assessing the impact of the Airport than nitrogen deposition rates.*"

4.1.43 This position, which suggested that the additional nitrogen deposition attributable to the G1 application would be very small, is supported by the calculations presented on this evidence.

4.1.44 However, in response to the request made by UDC at the mitigation meeting held on 5 April 2007 BAA is proposing the following obligation for inclusion in a s. 106 Agreement:

> *"STAL shall undertake a further study on the flora and fauna in Hatfield Forest at 230,000 PATMs, and a proposal for that study to be provided to UDC within 12 months of the date of grant of planning permission."*

4.1.45 I understand that it is intended that this further study of the condition of the flora and fauna in Hatfield Forest, East End Wood and the Fen site would allow an assessment to be made of the changing condition at those sites over time.

Conclusions

4.1.46 Stansted contributes to nitrogen deposition in the local area principally through dry deposition of nitrogen dioxide arising from nitrogen oxide emissions.

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17 The Baseline Report on the Current Condition of a Variety of Habitats - A Report in Fulfilment of Section 1.3 of a S106 Agreement Related to Planning Permission for the 25 mppa Scheme at Stansted Airport'

4.1.47 The incremental contribution in the ES assessment to annual mean nitrogen deposition in 2014 from the G1 development is 0.2kgN/ha/y and 0.3kgN/ha/y at Hatfield Forest and Eastend Wood respectively. The deposition rates would be reduced by about 30% if the nitrogen dioxide fraction is calculated by difference with and without the airport sources being present rather than assuming the nitrogen dioxide fraction is the same as that of nitrogen oxide emissions from airport related sources. The deposition rates would be halved if the deposition rate recommended by the Highways Agency had been adopted.

4.1.48 In the Regulation 19 sensitivity test the nitrogen deposition increment from G1 development increases to 0.3kgN/ha/y and 0.4kgN/ha/y for Hatfield Forest and Eastend Wood respectively.

4.1.49 Total nitrogen deposition rates are forecast to fall by about 28% (or about 10kgN/ha) between now and 2014 due to national and international commitments to reduce emissions of nitrogen compounds. Irrespective of the proposed G1 development this would have the effect of reducing exceedance of the critical load by about 100% from 300% to 200%. Against this falling background the proposed G1 development would add a very small increment (0.2/0.3kgN/ha/y). At the annual average rate in the reduction of nitrogen deposition (0.7kgN/ha) the increment from the G1 development is equivalent to delaying the reduction by about 3 months. Even with the proposed G1 development the nitrogen deposition rates would be significantly lower than they are at present.

5. Other Issues

5.1 Introduction

5.1.1 In this section I set out a number of issues that have been raised by other parties at this inquiry. I will summarise my opinion on each of these issues below (Section 5.2) but more detail on each matter is provided in Appendix I to III (Volume 3).

5.1.2 I have reviewed the following documents:

- UDC 27th September officers report (p24 to 26 – CD/32).
- UDC 29th November officers report (pages 4, 7, 44-49 – CD/33).
- Bureau Veritas comments on Environmental Statement, Regulation 19 Response and Health Impact Assessment (CD/144, 145 and 150).
- NT Presentation to UDC 5th July (NT/1).
- NT Letter commenting on the Application UTT/0717/06/FUL 31st July (NT/2).
- SSE representations to UDC Volumes 1, 2 and 3 (CD/201, 202 and 203).
- Statements of Case UDC, NT, SSE; FoE.

5.1.3 From this review it was evident that there are concerns about the robustness of the assessment presented in the ES. There are, in my opinion, some common themes running through these concerns that I would categorise as follows:

(a) meteorological and airport activity data;

(b) monitoring;

(c) model verification;

(d) general modelling (business as usual, up-to-date model roadside modelling);

(e) applicability of standards and objectives; and

(f) carbon dioxide emissions.

5.1.4 There are a number of concerns that relate to the use of data in the modelling methodology or the interpretation of the modelled concentrations that I address in Appendix I (Volume 3).

5.1.5 As the monitoring, model verification and general modelling issues are related I deal with these subjects in Appendix II. The applicability of standards and objectives is covered in Appendix III. The calculation of carbon dioxide emissions is set out below in Section 5.3.

5.1.6 There are also a significant number of very detailed points in these documents that even if mentioned would not in my opinion result in a significant change to the assessment contained within the ES or the conclusions reached on the assessment by UDC and its advisors. For that reason, I have not attempted to address each and every of these points in this evidence.

5.2 Summary of other issues

Meteorological data

5.2.1 In SSE's representations (CD/202 – section 3 page 13 Box A) it is suggested that the modelled concentrations are under-estimating measured concentrations in 2003. This is not correct because there are no modelled concentrations in 2003. Modelling for 2003 concentrations would have required an emission inventory for that year which is not available. This observation was also made in the Bureau Veritas report (CD/144 page 22).

Forecast data used in the model

5.2.2 Forecasting air quality is subject to constraints and uncertainty. This was recognised in the ES (CD/6 page 11) in the limitation, constraints and assumptions section. This section notes the reliance placed on forecast data by BAA, Halcrow and QinetiQ. These sources were used because, in my opinion, they were the best available. In the ES (CD/6) we tested the sensitivity of the assessment to changes in forecast data and assumptions. I am satisfied that the ES assessment is robust and provides a good basis for the likely effects from the proposed G1 development.

Airport activity data

5.2.3 I am satisfied that the assessment is robust and provides our best estimate of future concentrations. Variations in forecasts, operational data or assumptions will inevitably increase or decrease future concentrations but not to an extent that would cause the health based objectives to be breached.

Monitoring

5.2.4 When I look at all the monitoring data around the airport I am satisfied there is sufficient information to make a judgement on the air quality in the Stansted area. Some diffusion tube concentrations do suggest that objective values might be approached or exceeded and this is addressed through the review and assessment process undertaken by, in this case, UDC. Monitoring has been undertaken where the objectives might apply but not elsewhere which is common practice. The location of monitoring sites required by the s.106 agreement has been agreed with UDC and the measured concentrations are made available to UDC routinely.

Model verification

5.2.5 The various studies summarised in Appendix II provide confidence that the model performs as expected (i.e. the agreement with monitoring data is within the recognised level of uncertainty). There is some evidence to show that the model overestimates concentrations close to major roads and close to airport sources.

5.2.6 What is important here is to understand whether there is any reason to believe the model as described in the ES and its associated reports will systematically underestimate future concentrations either with or without the proposed G1 development. Using the supporting information, which I have briefly summarised in this evidence I believe the model performs well and the predicted concentrations provide a robust assessment of the likely effects arising from the proposed G1 development.

5.2.7 Bureau Veritas suggest that:

> "*there is some evidence that the model is under predicting" (CD/144 p10).*

In their conclusions to the Regulation 19 Response (CD/145 p8), however Bureau Veritas say

> "*Despite the concerns regarding model verification, based on the predictions presented by BAAS, and our experience at other major UK airports it is not considered likely that the G1 expansion would cause any exceedance of health based air quality objectives".*

5.2.8 The view that Bureau Veritas expresses reflects my own. Irrespective of whether the model under or overestimates future concentrations it is unlikely that any of the health based objectives would be exceeded as a result of the G1 development.

General modelling

5.2.9 The EIA regulations require the examination of a without development case and this was defined by BAA based on the permitted passenger throughput 25mppa and 216,000 movements. I am satisfied that the assessment of this, and the with development case (35mppa), was undertaken using the best model that was available. No specific verification of the model was undertaken for near road receptors as there was evidence to suggest that the modelling approach misses out some processes (vehicle induced turbulence) that would tend to lower near roads concentrations. The emission reductions between the 15+ assessment (CD/28) and the G1 assessment was explained in some detail (Underwood 2006 – CD/190[18]) and reflects the evolution of the methodology. None of these matters impact on the robustness of the assessment presented in the air quality assessment (CD/6).

Applicability of Air Quality Standards

5.2.10 The various air quality objectives and limit values are set out in Appendix IV. There is no dispute that the correct standards are identified but there are suggestions that my interpretation on their applicability is not correct. The applicability of the objectives is given in the Defra (2003 p1-8 to 1-10)[19] the salient points of which are set out in Appendix III (Box III.1). I believe the comments I have made are consistent with that advice. The indicative PM_{10} limit value is correctly described (Appendix III) and while the UK Government's position remains unclear on the status of its objective; the EU in a proposed directive favours its replacement by a concentration cap for $PM_{2.5.}$ Similarly the applicability of the vegetation protection limit value is subject to some interpretation

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18 This is a methodological report and has been provided in full as a core document (CD/190)

19 Extracts from Defra 2003 Technical Guidance LAQM TG(03) are provided in Appendix IX (Volume 3)

and became clear from the monitoring criteria (Annex IV of the Directive 1999/30[20]) for compliance with the limit value. My interpretation is also consistent with that given by others (draft Air Quality Strategy para 126, page 58 (Defra 2006) CD/186). Against this background I have not misrepresented the applicability of the air quality standards. The methodology to demonstrating compliance with air quality objectives and limit values is based on a prescriptive measurement method and/or relevant exposure criteria. It is not simply a matter of exceeding a measured concentration of a pollutant, at any location, using any measurement technique.

5.3 Carbon Dioxide Emissions

Introduction

5.3.1 In its Regulation 19 Response (CD/22), BAA noted that UK aviation contributes some 0.1% of global carbon dioxide and the additional aircraft movements resulting from consent for G1 would be a small proportion of total UK aircraft movements in 2014.

5.3.2 In this section of my evidence I provide an estimate of the carbon dioxide emissions from the proposed G1 development and set these emissions in a national, European and world context. They demonstrate that increased CO_2 emissions that would arise from G1 would, when taken in a global context, be very small. The estimates I have prepared, which are not dissimilar to those made by SSE and NT, support the assertions made in the Regulation 19 Response and, the approach taken on climate change in the G1 ES (CD/3).

5.3.3 As noted in paragraph 5.3.15, in order to compare my estimates of CO_2 emissions with those of SSE and NT on an equivalent basis I have removed from my calculations the radiative forcing effects. I explain radiative forcing and the care that needs to be taken when comparing emissions of CO_2 and greenhouse gases as they have very similar units in Volume 3 (Appendix IV) of this evidence. Although radiative forcing is very important in the assessment of climate change it is not directly relevant to the calculation of CO_2 emissions in this section.

5.3.4 Mr Rhodes will address climate change in a policy context further in his evidence.

National Reporting

5.3.5 The UK Government is required to submit estimates of greenhouse gases (which include carbon dioxide) to the United Nations Framework Convention on Climate Change (UNFCCC) following ratification of the convention in 1993. The most recent submission (2006 Baggot et al - CD/185)[21] contained emissions from 1990 to 2004. The European Environment Agency submits the equivalent greenhouse gas inventory

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20 Extracts from Directive 1999/30 are provided in Appendix X (Volume 3)

21 As there are small differences between the UK and EU submissions I have relied on the latter for consistency in my evidence. I have referred to the UK submission to show that reporting of these emissions is required at the national level. As this document is a methodological report and has also been provided in full as a core document (CD/185)

data (EEA 2006 – CD/187)[22] for all EU member states. To provide some context for the examination of emissions I set out in Table 5.1 the magnitude of carbon dioxide emissions in a national and international context. All the data in Table 5.1 are shown in kilotonne (kt). In this table, I show all UK and EU15 and EU25 member states' emissions in a World context for 2000 (the most recent data available) and a more detailed breakdown for EU15 member states and UK emissions by key sectors and sub-sectors for 2004.

5.3.6 Within the reporting structure for carbon dioxide emissions, domestic aviation fits within the transport sector which in turn fits within the energy sector. This relationship occurs because all the emissions are calculated from fuel burnt.

5.3.7 Examination of Table 5.1 shows that in 2000 all UK emissions were 16.3% of the EU15 member states and 2.3% of those from the World. At the European level in 2004, UK domestic aviation emissions are 9.4% of those from EU15 member states. These data can also be used to express UK domestic aviation as a fraction of UK transport (1.65%) or UK total emissions (0.38%).

Emissions from Aviation in Context

5.3.8 In the reporting of aviation emissions there is a distinction between domestic aviation and international flights (UK to first port of call outside the UK). The former must be reported to UNFCCC as part of the transport sector. The latter need not be reported but the UK and EU countries provide data on these emissions as a "memo" note to the main tables under the heading of International bunkers (which cover aviation and shipping albeit separately identified). While the UK Government reports domestic and international (one way) emissions separately to meet its reporting requirements, it is not unreasonable to say this is an artificial distinction. In Table 5.2 therefore I have combined the domestic and international aviation emissions and set them in context of the UK and EU15 totals. It is evident from Table 5.2 that 29.0% of these aviation bunker emissions occur from the UK. This table also shows that the UK emissions increase from 16% (Table 5.1 column 5) to 16.4% (Table 5.2 column 3) of EU15 emissions when aviation bunkers (one way international flights) are included. The total UK aviation emissions are 6.0% of the total UK emissions whereas they are just 1.0% of total EU15 emissions when international flights are included.

Calculation of CO_2 Emissions for the G1 Development

5.3.9 The methodology used for calculation of emissions from aviation (domestic and international) was revised in 2004 for the reporting of the 2002 inventory. The revised methodology (Watterson et al 2004 – CD/191[23]) provides an estimate of emissions from the number of aircraft movements broken down by type at each UK airport and therefore complies with the IPCC Tier 3 specification.

5.3.10 I have applied this methodology (Watterson et al 2004 – CD/191) for the calculation of the carbon dioxide emissions from the 25mppa case and the 35mppa case in 2014. A

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22 Extracts from EEA (2006) Annual European Greenhouse Gas Inventory (CD/187) are provided in Appendix XI (Volume 3)

23 This is a methodological report and has been provided in full as a core document (CD/191)

summary of the carbon dioxide emissions from these calculations are set out in Table 5.3. In the column 4 of Table 5.3 I have shown the incremental change in emissions arising from the proposed G1 development.

5.3.11 The emissions in Tables 5 1 and 5.2, although in the same units, apply to different years to Table 5.3 and so cannot be strictly compared. It is interesting to note, however, the order of magnitude of the emissions, say between those from Stansted (Table 5.3 column 4) and the UK and EU15 (Table 5.2 column 2).

5.3.12 To provide some context for the calculated emissions from the proposed G1 development in 2014, I have compared them with forecast emissions for the UK and for the transport sector in the same year. These forecast emissions[24] are based on interpolation of data from consultation paper on the Review of the UK Climate Change Programme (Defra 2004 - p27). These forecast data are set out in Table 5.4 together with emissions from the airport and the proposed G1 development.

5.3.13 Examination of Table 5.4 shows that in 2014 the total emissions from Stansted (domestic plus one way international) increase, as a result of the proposed G1 development, by 1,062kt (column 4). This increment represents a change in the transport sector and total UK emissions of just 0.74% (2.09% to 2.83%) and 0.20% (0.57% to 0.77%) in that year.

5.3.14 If the G1 development was not permitted and equivalent capacity provided elsewhere to meet the forecast demand, then the same increase in emissions would occur but at a different location.

National Trust and Stop Stansted Expansion's Emission Calculations

5.3.15 The NT and SSE have both made estimates of carbon dioxide emissions from the proposed development. The basis and assumptions for these calculations are not explained. The forecast emissions however are set out below. These data should not be summed as they are provided for comparison purposes only. The NT and SSE data have been converted into ktCO_2 for ease of comparison with my calculations in Table 5.3.

24 It should be noted that the units in Defra 2004 are mega tonnes carbon (MtC) whereas the units I have been using throughout the evidence are kt CO_2. To convert from MtC to kt CO_2 multiply the MtC by 1000x44/12 (i.e. 3666.67).

		2003/04 (20.9[25]mppa)	2014 (35mppa)
		$ktCO_2$	$ktCO_2$
NT[26]	Air passenger journeys by car	230.8	385.3
NT	490 flights to Geneva	2,247.3	3,256.0
SSE	Stansted[27] (air and ground transport[28]	2,592.6	4,444.4

5.3.16 These data can be compared with the emissions I have calculated which are given in Table 5.3 The relevant rows for this table are reproduced below:

	25mppa	35mppa
	$ktCO_2$	$ktCO_2$
Airport related landside roads (43km x 45km study area)	100.3	114.1
Domestic and international aviation (only)	2,859.5	3904.4
Stansted Total	2,974.1	4,036.3

5.3.17 It is evident from comparing the aircraft only (NT) or air and ground transport (SSE) CO_2 emissions with those I have calculated that there are differences, but they are not dissimilar in magnitude.

5.3.18 There is about a factor of two difference between the NT calculation and our own for traffic on the road network. I suspect that much of this difference relates to the size of the road network, and the assumptions made on the distance travelled and occupancy factors on which the calculations are based.

Conclusions

5.3.19 My quantification of the carbon dioxide emissions from the proposed G1 development is broadly consistent with those of NT and SSE when compared on an equivalent basis.

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25 Passenger numbers for 2004.

26 Letter 31st July 2006 page 4 (NT/2)

27 The SSE data (CD/203 page 14 para 3.2.5) are equivalent to 7 and 12 million tonnes CO_2 as these have been multiplied by a radiative forcing index of 2.7. Dividing 7 and 12 million tonnes by 2.7 and 1,000 provides the emission of carbon dioxide in kt CO_2.

28 SSE (CD/202, section 2, page 1) identifies the emissions arise from air and ground transport (CD/202

5.3.20 The comparisons I have set out show that the CO_2 emissions from the proposed G1 development are a very small fraction of those emanating from the UK. If the emissions from the proposed G1 development were expressed as a fraction of European and/or world emissions they would be extremely small.

5.3.21 It is worth noting also that in the UDC Officers' report (29 November 2006 p4 – CD/33) it is acknowledged that:

> "*no climate change effect directly linked to additional movements on the existing runway could be demonstrated ……*".

5.3.22 Mr Rhodes will be describing in his evidence UK Government policy to manage aviation's emissions within the context of national CO_2 targets to meet climate change objectives.

6. References

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