



Stansted Airport Limited
Enterprise House
Bassingbourn Road
Essex
CM24 1QW

AEA
Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire OX11 0QR

Tel: +44 (0)870 190 6571
E-mail: brian.stacey@aeat.co.uk
www.aeat.com

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Diffusion Tube Transect study results summary

Dear Stansted Airport,

Following the completion of this study, we provide a letter summary of the results for you.

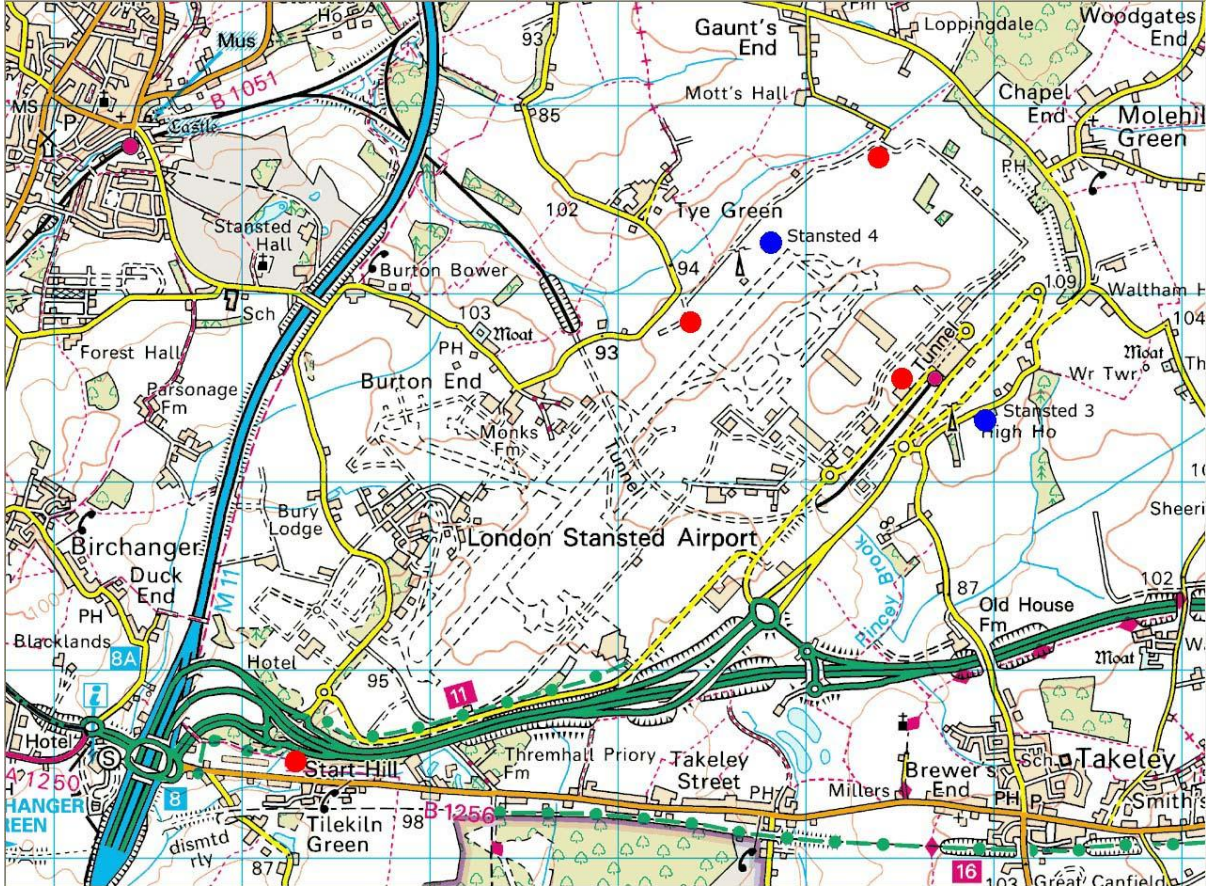
Introduction

AEA has undertaken a short diffusion tube study on behalf of Stansted Airport Limited (STAL), to evaluate how average concentrations of nitrogen dioxide (NO₂) change with distance from the airport. The study was designed specifically to assess the potential impact of the airport on the ancient Hatfield Forest located, at its closest point, less than a kilometre from the south-west airport perimeter.

STAL already undertake monitoring at a number of locations around the airport: automatic monitoring of NO_x at two locations, measurement of PM₁₀ particles at one location and NO₂ diffusion tube measurements at 5 locations. These site locations are presented in the following plot:



Figure 1 – Long term monitoring at Stansted



NOTE: Automatic monitoring stations are marked in blue, diffusion tube sites in red.

NOTE: The Stansted 3 automatic site also measures NO₂ with triplicate diffusion tubes.

This monitoring was augmented in two stages to further understand the spatial distribution of NO₂ around the airport as follows:

- An additional 8 tubes positioned strategically around the airport, to examine concentration gradients north-south, east-west and close to the A120 Takeley bypass. This monitoring was conducted between 31 November 2011 and 30 May 2012.
- 5 tubes located within Hatfield Forest, to examine the relationship between concentrations around the airport and concentrations in the forest. This supplemental monitoring was conducted between 29 February and 30 May 2012.

A single diffusion tube was deployed at each site, except for the one long term site, where triplicate measurements are made to quantify the repeatability and reliability of the analysis. Tubes were exposed for approximately one month, before being changed and sent for analysis.

Results

The table below presents the results of the diffusion tube survey.

Table 1 – Diffusion tube results

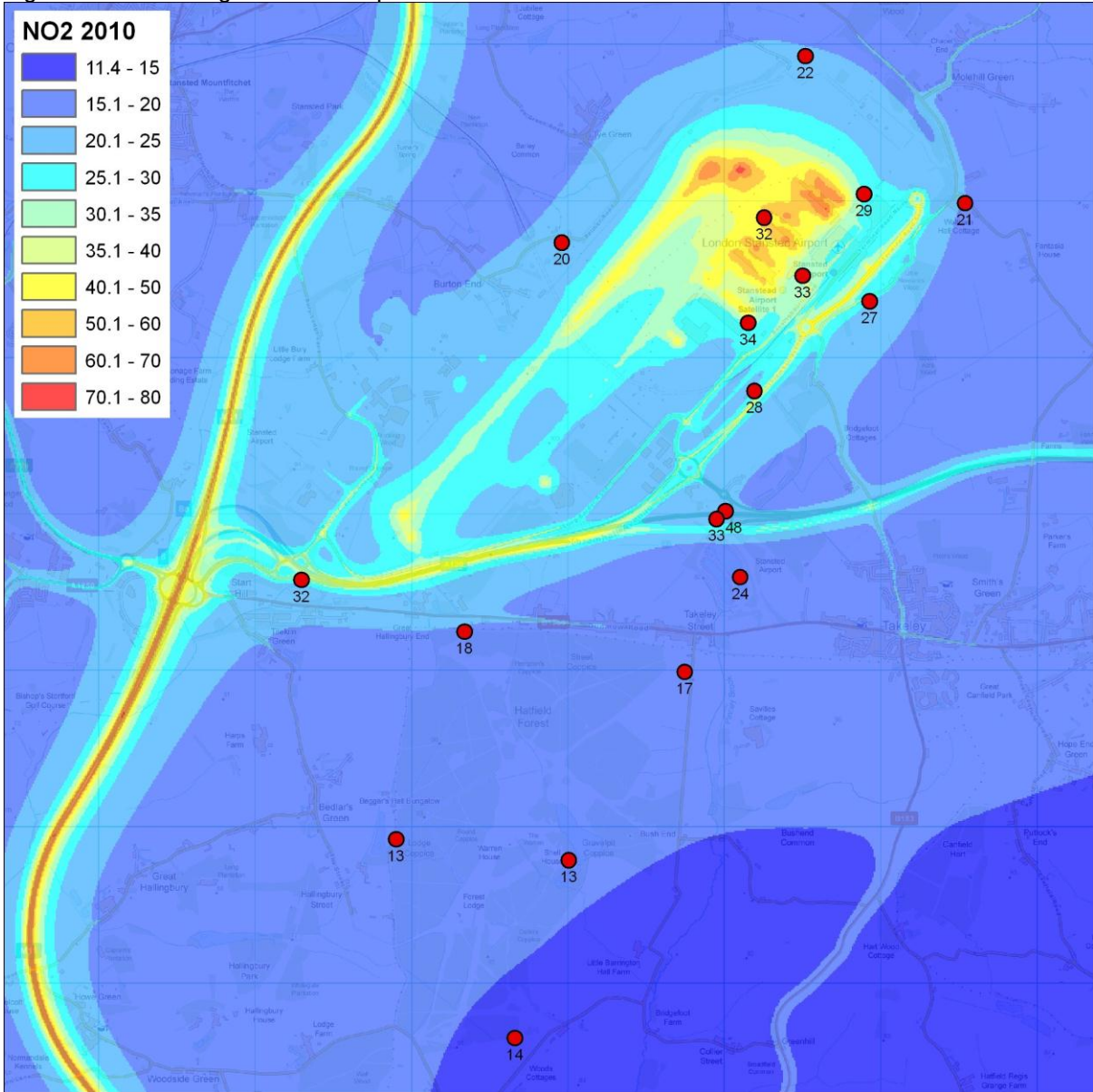
Site location	31/11 - 4/1	4/1 - 1/2	1/2 - 29/2	29/2 - 28/3	28/3 - 25/4	25/4 - 30/5	Average	Forest average
22 Approach	27.1	25.5	27.5	24.5	15	12.2	22.0	17.2
Satellite 2	34.4	37.3	38.1	33.8	24.6	21.1	31.6	26.5
Stand Alpha 1	34.4	40.9	43.3	33.3	27.6	23.9	33.9	28.3
Car Rental	28.7	31.4	33.1	30.3	22.4	20.8	27.8	24.5
Starbucks (A120 north side)	64.6	57.9	52	41.8	39	34.1	48.2	38.3
A120 south side	27.3	40.7	38.5	33.5	26	32.2	33.0	30.6
Balancing Ponds	21.2	29.3	30	27.6	18.8	17.1	24.0	21.2
NATS Radar	21.8	24.2	23.2	22.2	15.5	12.7	19.9	16.8
Radisson Hotel	34.9	39.1	32.2	29.5	24	17.1	29.5	23.5
Waltham Hall	24.1	27.9	25.8	23.2	16.7	10.5	21.4	16.8
High House	27.2	31.2	32.6	28.4	21.3	19.3	26.7	23.0
Pond B	31.7	38.6	39.6	32	25	24.5	31.9	27.2
Enterprise House	37.9	39.9	41	33.3	24.6	21.7	33.1	26.5
Forest North	n/a	n/a	n/a	24.8	16	12.2	n/a	17.7
Forest East	n/a	n/a	n/a	25.8	13.7	11.1	n/a	16.9
Forest South	n/a	n/a	n/a	20.4	12.1	8.5	n/a	13.7
Forest West	n/a	n/a	n/a	19	10.6	8.8	n/a	12.8
Forest Central	n/a	n/a	n/a	19.8	11.4	9	n/a	13.4

NOTE: All measurements are in $\mu\text{g}/\text{m}^3$

NOTE: Diffusion tube data are NOT bias corrected.

This data has been incorporated into the modelled 2010 NO_2 concentration study, undertaken by AEA for STAL, which utilised emission inventory data to predict spacial distribution of NO_2 around the airport. The results of this amalgamation are presented in the following plot:

Figure 2 – Monitoring results and updated modelled 2010 concentration contours



NOTE: The plot shows the diffusion tube site locations as red spots with survey average concentrations annotated underneath.

Based on this limited survey, the following observations can be made:

- Average concentrations from the survey show reasonable agreement with the updated 2010 modelled plot.
- Concentrations are highest around the aircraft stands and lowest at the forest locations.
- Measured airside concentrations are somewhat lower than the updated 2010 modelled concentrations.
- Measured concentrations at the northern edge of the forest are as predicted, but somewhat lower than the updated 2010 modelled concentrations at the remaining locations.



- Measured concentrations either side of the A120, and the site approximately 200m to the south of these locations are significantly higher than predicted in the updated 2010 model. The modelled trajectory of the A120 also appears to be slightly too far south at this location.

In summary, this short diffusion tube study provides a good validation of the 2010 model contours. Highest average concentrations are experienced closest to the major sources: Airport, M11 and A120, while average concentrations are seen to fall away dramatically as distance from these sources increases.

I hope that this summary report is helpful. Please contact me if you require any further information.

Best wishes,

A handwritten signature in black ink that reads "B. Stacey".

Brian Stacey
Technical Lead, Air Quality Monitoring