APPENDIX 7.6

ROAD MODEL VERIFICATION

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Nitrogen Dioxide

Most nitrogen dioxide is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the 2015 annual mean road-NO_x contribution at three monitoring locations (identified in Table 7.13). Concentrations have been modelled at a height of 1.5 m for Hillingdon Hays, 2.5 m for HD55 and 2 m for HD214.

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was calculated from the measured NO_2 concentrations and the adjusted background NO_2 concentrations within the NO_x from NO_2 calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure 7.6.1). This factor was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO_2 concentration within the NO_x from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (Figure 7.6.2).

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary adjustment factor: 1.4313

Secondary adjustment factor: 0.9989

The results imply that overall, the model was under-predicting the road-NO_x contribution. This is a common experience with this and most other models.

Figure 7.6.3 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line.

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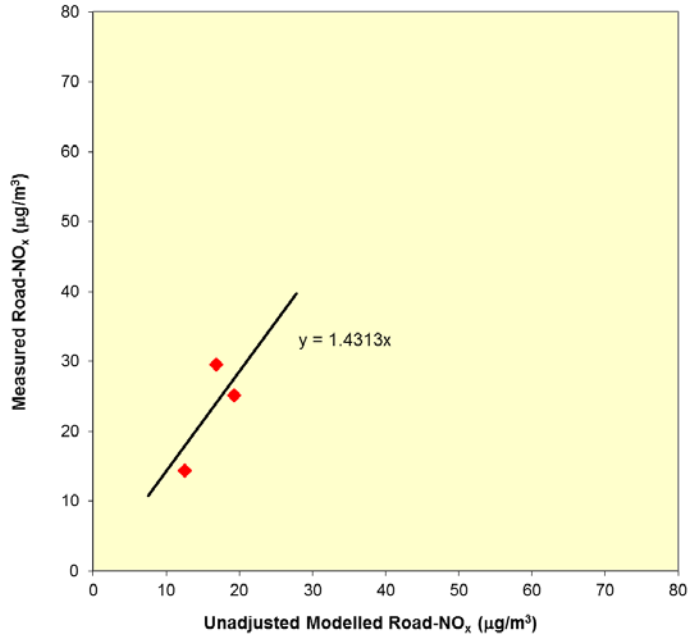

Figure 7.6.1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NOx Concentrations

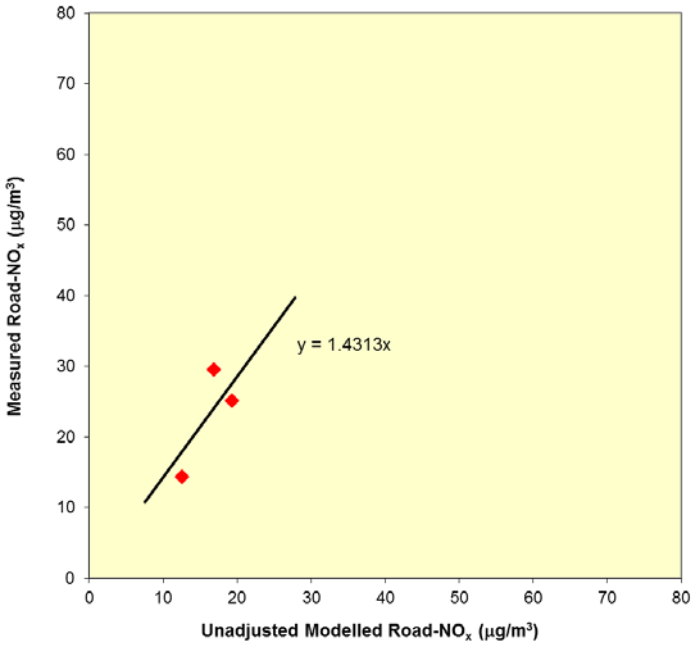

Figure 7.6.2: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 Concentrations

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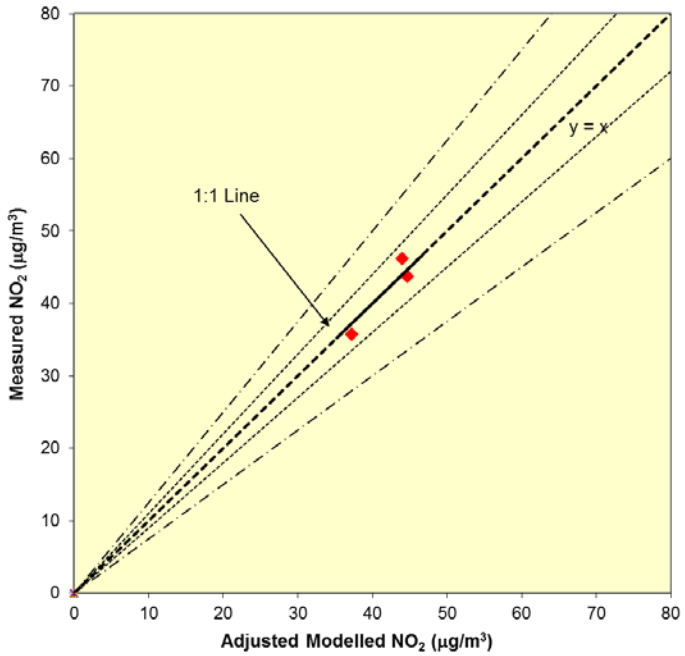

Figure 7.6.3: Comparison of Measured NO_2 with Fully Adjusted Modelled NO_2 Concentrations

Particle (PM_{10} and $PM_{2.5}$)

The Hillingdon Hayes Automatic monitoring station has been used to calculate a verification factor for PM_{10} following a similar methodology as that used for nitrogen dioxide.

Road PM_{10} (calculated from Measured PM_{10} at the Hillingdon Hays monitoring site and adjusted background PM_{10} for the appropriate grid-square) is divided by the modelled road PM_{10} to produce a factor which can be applied to PM_{10} model outputs.

Measured PM_{10} (28 µg/m^3) - Adjusted background PM_{10} (19.8 µg/m^3) = Measured Road PM_{10} (8.2 µg/m^3)

Measured Road PM_{10} / Modelled Road PM_{10} (1.03 µg/m^3) = PM_{10} verification factor (7.906).

No monitoring of $PM_{2.5}$ is carried out in proximity to the development site. The primary adjustment factor calculated for PM_{10} concentrations has therefore been applied to the modelled road $PM_{2.5}$ particles concentrations.

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It should be noted that the measured road PM_{10} is considerably higher than the modelled concentrations and therefore the high verification factor. The model may not take into account local factors that are likely to affect the measured concentration such as local industries with dust generating activities.

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