Appendix 7.4: Model Verification

7.1.1 RPS is currently undertaking a six-month monitoring scheme monitoring roadside NO_2 concentrations passively using roadside diffusion tubes at six locations in the vicinity of the Application Site. The monitored data obtained in the initial three months of the study are provided in Table 7.4.1. The concentrations have been annualised and adjusted for bias.

Table 7.4.1 Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)

Monitoring Site	Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)
1	24.3
2	9.8
3	13.7
7	11.4
8	26.4
9	10.1

7.1.2 The monitored annual-mean NO_x road contributions have been derived from the monitored annual-mean NO_2 concentrations using the LAQM.TG22 calculator. The monitored annual-mean NO_X road contributions have then been compared with the modelled annual-mean NO_x road contributions. This comparison is provided in Table 7.4.2 below.

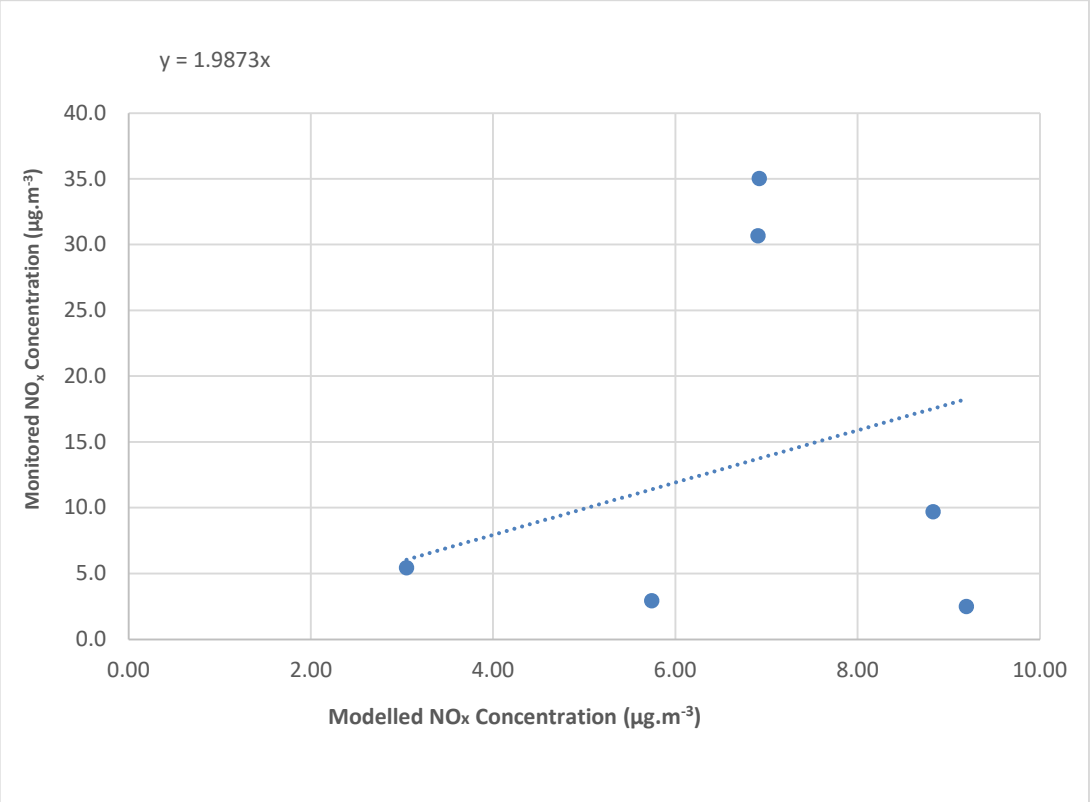
Table 7.4.2 Comparison of Monitored and Modelled Annual-mean Road NOx Contribution ($\mu g.m^{-3}$)

Monitoring Site	Annual-mean Road Nox Concentration ($\mu g.m^{-3}$)	
	Monitored	Modelled
1	30.7	6.9
2	2.5	9.2
3	9.7	8.8
7	5.5	3.0
8	35.0	6.9
9	2.9	5.7

7.1.3 It should be borne in mind that the monitored concentrations are themselves only estimates to the true concentrations at each point; the EU Directive on air quality [i] designates passive NO_2 samplers indicative measures with a potential uncertainty of +/-30 %. Ignoring any uncertainty errors in the monitoring results, the table above indicates that the model is under-predicting.

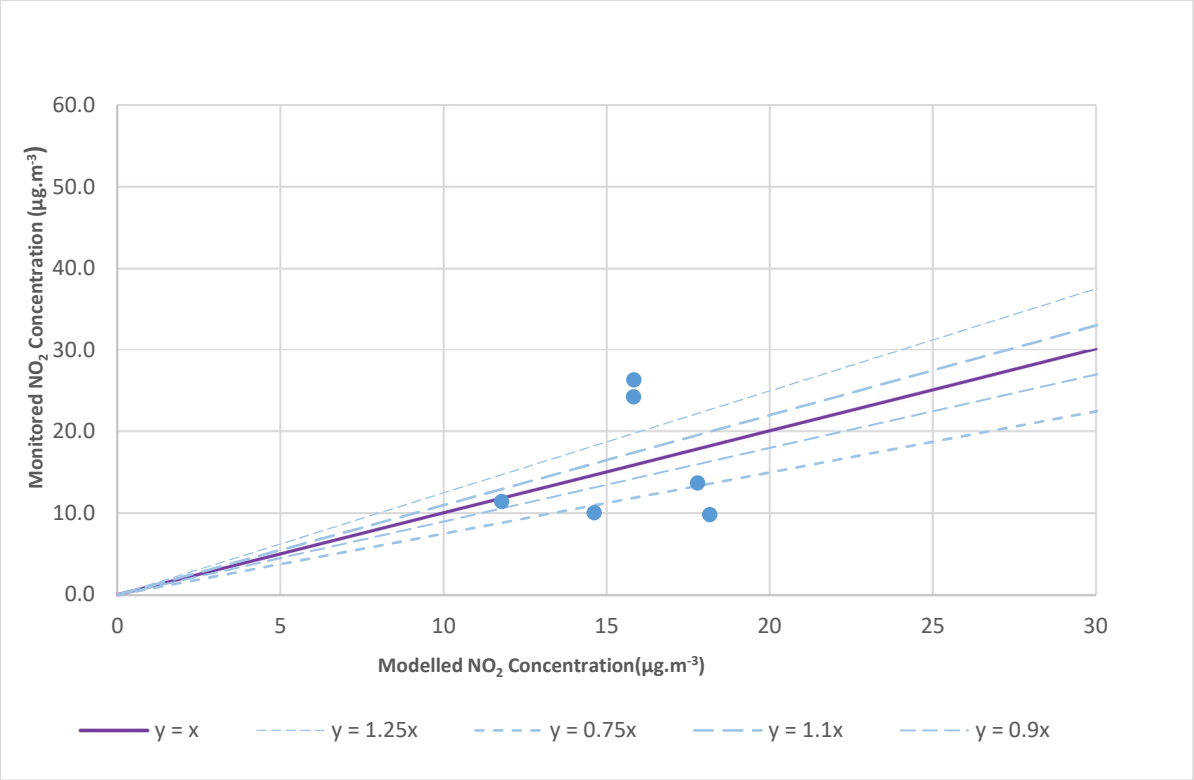
7.1.4 The modelled annual-mean NO_x road contributions have been plotted against the monitored annual-mean NO_x road contributions in Figure 7.4.1.

Figure 7.4.1 Monitored Annual-Mean NOx Road Concentrations



7.1.5 The modelled NO_x contributions have been multiplied by the gradient of the trend line (1.99) to determine the corrected NO_x contributions. Modelled annual-mean NO_2 concentrations have been derived from the corrected modelled annual-mean NO_x road contributions. The corrected modelled annual-mean NO_2 concentrations have been plotted against the monitored annual-mean NO_2 concentrations in Figure 7.4.2.

Figure 7.4.2 Corrected NO_2 Concentrations



7.1.6 The fractional bias can be used to determine whether the corrected model has a tendency to over or under-predict. The fractional bias is calculated as:

(Average Monitored NOx Concentration – Average Predicted NOx Concentration) / 0.5 x (Average Monitored NOx + Average Predicted NOx Concentration)

7.1.7 Fractional bias values vary between +2 and -2 and has an ideal value of zero. A negative value suggests a model over-prediction and a positive value suggests a model under-prediction.

7.1.8 Table 7.2.3 sets out the average monitored concentration and the average predicted concentration.

Table 7.2.3 Comparison of Monitored and Adjusted Modelled Annual-mean Road NO_X Contribution ($\mu g.m^{-3}$)

Monitoring Site	Annual-mean Road NOx Concentration ($\mu g.m^{-3}$)	
	Monitored	13.7
1	30.7	18.3
2	2.5	17.5
3	9.7	6.1
7	5.5	13.8
8	35.0	11.4
9	2.9	13.7

7.1.9 The fractional bias for this study is therefore (14.39 – 13.46) / (0.5 x (13.46 + 14.39)) = 0.07. The fractional bias is, therefore, close to zero.

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i Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe