CALDECOTE FARM

NEWPORT PAGNELL · MILTON KEYNES

APPENDIX 10

ENVIRONMENTAL STATEMENT

AIR QUALITY

APPENDIX 10.4
VERIFICATION

newlands developments

APPENDIX 10.4 VERIFICATION

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM.TG(16).

According to TG(16), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations, but ideally within 10%.

Model verification can only be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. TG(16) recommends that a combination of automatic and diffusion tube monitoring data is used; although this may be limited by data availability. One diffusion tube site (S1, S2 and S3 triplicate site and Roadbox 1 on Wolverton Road) near to the site with appropriate traffic data was selected.

Table 10.4.1 compares monitored and modelled NO_2 concentrations at the monitoring location.

Table 10.4.1: Monitored and Modelled Road Contributions of NO_2 at Roadside Monitoring Site

Site ID	Type	Concentrations (µg.m^{-3})		
		Monitored	Modelled	% Difference
H1 & H2	Diffusion Tube	23.1	18.92	-18.1
TT1 & TT2	Diffusion Tube	26.5	19.52	-26.3
S1, S2 & S3	Diffusion Tube	26.8	25.50	-4.9
Roadbox 1	Automatic Monitor	27.1	26.28	-3.0

The data in Table 10.4.1 shows that the model is under-predicting NO_2 concentrations. This is not unusual and is likely to be the result of local dispersion conditions. As the difference for some of the modelled values is more than 10%, an average adjustment factor has been derived for this assessment.

As it is primary NO_x rather than secondary NO_2 emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x. A ratio of the modelled versus monitored NO_x concentrations using the least squares statistical method has been undertaken to derive an adjustment factor, as set out in Table 10.4.2.

Table 10.4.2: Deriving the Adjustment Factor

Site	Monitored Road NO_x	Modelled Road NO_x	Ratio
H1 & H2	16.23	8.19	1.343
TT1 & TT2	23.00	9.32	
S1, S2 & S3	19.49	16.89	
Roadbox 1	20.09	18.45	

Table 10.4.3 compares monitored and modelled NO_2 concentrations at the monitoring location after the adjustment factor has been applied.

Table 10.4.3: Monitored and Adjusted Modelled NO_2 concentrations at Roadside Monitoring Site

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
H1 & H2	Diffusion Tube	23.1	20.4	-11.7
TT1 & TT2	Diffusion Tube	26.5	21.2	-20.0
S1, S2 & S3	Diffusion Tube	26.8	28.4	5.9
Roadbox 1	Automatic Monitor	27.1	29.4	8.5

The data in Table 10.4.3 shows that NO_2 concentrations in the model are now all within 25% of the monitored concentration, indicating that the model is performing acceptably.

As there are no appropriate PM_{10} or $PM_{2.5}$ monitoring locations within the study area, the predicted road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the road EFT NO_x factor before adding the appropriate background concentration.

A Root Mean Square Error (RMSE) has been calculated in Table 10.4.4 to determine the error within the calculations after Road-NOx adjustment, based upon the following calculation:

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(Obs_i - Pred_i)^2}$$

Table 10.4.4: Root Mean Squared Error

Site	Observations	Predictions	Difference
H1 & H2	23.1	20.4	-2.7
TT1 & TT2	26.5	21.2	-5.3
S1, S2 & S3	26.8	28.4	1.3
Roadbox 1	27.1	29.4	2.3
		RMSE	2.0

The calculated RMSE is 2 $\mu g/m^3$, which correlates to a 5% error ratio. The RMSE means that modelled results could be under or over predicting pollution concentrations between +/- 2 $\mu g/m^3$. The RMSE means that modelled results are acceptable, as they are within the ideal 10% margin of error (as advised in TG(16)).