



APPENDIX 8.1

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
Exceedence	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO₂	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O₃	Ozone.
Percentile	The percentage of results below a given value.
PM₁₀	Particulate matter with an aerodynamic diameter of less than 10 micrometres.



Term	Definition
ppb parts per billion	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppb means that for every billion (10^9) units of air, there is one unit of pollutant present.
ppm parts per million	The concentration of a pollutant in the air in terms of volume ratio. A concentration of 1 ppm means that for every billion (10^6) units of air, there is one unit of pollutant present.
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
$\mu\text{g}/\text{m}^3$ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu\text{g}/\text{m}^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
UKAS	United Kingdom Accreditation Service.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.
USA	Updating and Screening Assessment.
Validation (modelling)	Refers to the general comparison of modelled results against monitoring data carried out by model developers.
Validation (monitoring)	Screening monitoring data by visual examination to check for spurious and unusual measurements (see also ratification).
Verification (modelling)	Comparison of modelled results versus any local monitoring data at relevant locations.



APPENDIX 8.2 – SUMMARY OF TRAFFIC DATA

Table 8.2.1: Traffic Data used in Modelling

Description	Average Speed (kph)		2024 Verification Study		2031 Future Base plus committed devs		2031 With Development	
	Freeflow	Congestion/ Junction	Total Vehicle Flow (24hr AADT)	% HDV	Total Vehicle Flow (24hr AADT)	% HDV	Total Vehicle Flow (24hr AADT)	% HDV
A363 WHBP	80	30	9,853	2.0	11,025	1.9	12,335	1.8
B3097 North of HRBP	80	30	13,347	6.0	15,358	5.4	17,962	5.1
B3097 Philips Way	80	30	8,324	5.6	9,533	5.1	11,153	4.7
Mill Lane/Site Access	48	30	183	0.0	191	0.0	2,696	0.0
B3097 South of HRBP	80	30	7,358	2.2	9,100	1.8	11,746	1.6
Link Road (WWTE)	48	30	6,173	13.8	6,451	13.8	6,528	13.6
Station Road (North)	48	30	11,506	2.9	13,213	2.6	15,577	2.4
A350 Haynes Road	30	15	12,698	5.0	13,790	4.8	14,719	4.7
A350 Warminster Road	30	15	16,505	5.0	17,732	4.9	18,469	4.8



APPENDIX 8.3 – VERIFICATION AND ADJUSTMENT OF MODELLED CONCENTRATIONS

Nitrogen Dioxide (NO₂)

Most nitrogen dioxide (NO₂) is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions. Verification of concentrations predicted by the ADMS model has followed the methodology presented in LAQM.TG(22).

The model has been run to predict annual mean road-NO_x concentrations at two diffusion tube sites.

The model output of road-NO_x (i.e. the component of total NO_x coming from road traffic) has been compared to the 'measured' road-NO_x (Figure 8.3.1). The 'measured' road NO_x has been calculated from the measured NO₂ concentrations by using the Defra NO_x from NO₂ calculator available on the UK-AIR website.

Table 8.3.1: Comparison of Modelled and Monitored NO_x concentrations

Monitoring Location	Total Monitored NO ₂	Background NO ₂	Monitored Road NO _x	Modelled Road NO _x	Ratio
21	23.5	6.7	38.3	11.7	3.28
22	29.9	5.6	59.1	12.8	4.62

Figure 8.3.1: Comparison of Modelled Road NO_x with measured Road NO_x

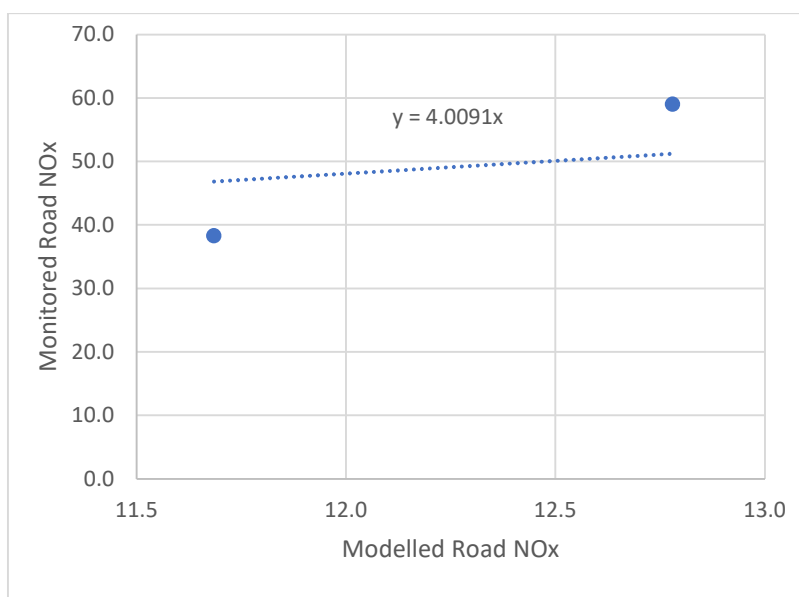


Figure 8.3.1 shows that the ADMS model under-predicted the road NO_x concentrations at the selected monitoring sites. An adjustment factor was therefore determined as the ratio between the measured road-NO_x contribution and the modelled road-NO_x contribution, forced through zero (4.01). This factor has then been applied to the modelled road-NO_x concentration for each location to provide an adjusted modelled road-NO_x concentration.

The annual mean road-NO₂ concentration was determined using the Defra NO_x:NO₂ spreadsheet calculation tool and added to the background NO₂ concentration to produce a total adjusted NO₂ concentration.

Particulate Matter (PM₁₀ and PM_{2.5})

There was insufficient roadside monitoring data available against which the modelling could be verified. Consequently, the verification factor determined above for adjusting the road-NO_x contribution has been applied to the predicted road-PM₁₀ and road-PM_{2.5} contributions, consistent with guidance provided in LAQM.TG(22).

Model Uncertainty

An evaluation of model performance has been undertaken to establish confidence in model results. LAQM.TG(22) identifies a number of statistical procedures that are appropriate to evaluate model performance and assess the uncertainty. These include root mean square error



(RMSE); fractional bias (FB) and correlation coefficient (CC). These parameters estimate how the model results agree or diverge from the observations. The simplest parameter to calculate and to interpret is the RMSE, which has therefore been used in this assessment to understand the model uncertainty.

The RMSE value calculated after verification was 2.9. Guidance provided in LAQM.TG(22) indicates that for RMSE values higher than 25% of the objective level, that the model should be revisited. Ideally an RMSE value should be within 10% of the air quality objective level. For annual mean NO₂, which has an objective level of 40µg/m³, this equates to 4µg/m³. The RMSE value calculated for this assessment is therefore considered to fall within the acceptable limits, therefore the final predictions can be considered to be robust.



APPENDIX 8.4 - AIR QUALITY ASSESSMENT LEVELS

Pollutant	Standard ($\mu\text{g}/\text{m}^3$)	Averaging Period	No. of Permitted Exceedances	Notes
NO ₂	200 (a)	1-Hour	18 per annum (99.8 th percentile)	
	40 (a)	Annual	-	
PM ₁₀	50 (a)	24-Hour	35 per annum (90.4 th percentile)	
	40 (a)	Annual	-	
PM _{2.5}	20 (a)	Annual	-	
	12 (b)	Annual	-	Interim Target to be achieved by end January 2028
	10 (c)	Annual	-	Target Level to be achieved by end December 2040
(a) Air Quality Standards Regulations (2010) and amendments (b) Environmental Improvement Plan 2023 (c) The Environmental Targets (Fine Particulate Matter) (England Regulations 2023)				