APPENDIX 8:
AIR QUALITY

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Appendix 8.1 Glossary

Table 8.1.1 Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQR	Air Quality England (Amendment) Regulations
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
CLP	Construction Logistics Plan
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO2 in the air
DMP	Dust Management Plan
EA	Environment Agency
EC	European Commission
EEA	European Environment Agency

Abbreviations	Meaning
EU	European Union
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Heavy Goods Vehicles and buses
HE	Highways England
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LEZ	Low Emission Zone; ; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Light Goods Vehicles, cars and motorcycles
LDV	Light Duty Vehicle
MRT	Mass Rapid Transit
NAEI	National Atmospheric Emission Inventory
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO_2	Nitrogen Dioxide
NO_x	Oxides of nitrogen generally considered to be nitric oxide and NO_2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
PC	Process Contribution
PEC	Predicted Environmental Concentration

Abbreviations	Meaning
$PM_{10}/PM_{2.5}$	Small airborne particles less than 10/2.5 µm in diameter
PPG	Planning Practice Guidance
RBC	Reading Borough Council
Receptor	A location where the effects of pollution may occur
RMSE	Root Mean Square Error
SPG	Supplementary Planning Guidance
TPC	Travel Plan Coordinator
ULEV	Ultra-low Emission Vehicle
UNECE	United Nations Economic Commission for Europe
WHO	World Health Organisation

Appendix 8.2 IAQM Dust Guidance (2014) Approach

Table 8.2.1 Dust Emission Magnitude Classification

Activity	Dust Emission Magnitude		
	Large	**Medium**	**Small**
Demolition	Total building volume of >50,000 m^3, potentially dusty construction material, on-site crushing and screening, demolition activities >20 m above ground	Total building volume of 20,000 – 50,000 m3, potentially dusty construction material, demolition activities 10 – 20 m above ground level	Total building volume of <20,000 m^3, construction material with low potential for dust release, demolition activities <10 m above ground, demolition during wetter months
Earthworks	Total site area of >10,000 m^2, potentially dusty soil type, >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area of 2,500 - 10,000 m^2, moderately dusty soil type, 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 - 8 m in height, total material moved 20,000 - 100,000 tonnes	Total site area of <2,500 m^2, soil type with large grain size, <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes. Earthworks during wetter months
Construction	Total building volume >100,000 m^2, on-site concrete batching, sandblasting	Total building volume 25,000 - 100,000 m^2, potentially dusty construction material, on-site concrete batching	Total building volume <25,000 m^2, construction material with low potential for dust release
Trackout	>50 HDV outwards movements in any one day, potentially dusty surface material, unpaved road length >100 m	10 - 50 HDV outwards movements in any one day, moderately dusty surface material, unpaved road length 50 - 100 m	<10 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length <50 m

Table 8.2.2 Receptor Sensitivity

Receptor Sensitivity	Impact		
	High	**Medium**	**Low**
High	An area where: • Users can reasonably expect enjoyment of a high level of amenity; • The appearance, aesthetics of value of their property would be diminished by soiling; • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples include dwellings, museums and other culturally important collections, medium and long-term car showrooms.	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations with an international or national designation and the designated features may be affected by dust soiling; OR Locations where there is a community of particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain. Indicative examples include a SAC designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.

Medium	An area where: • Users would expect to enjoy of a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; • The appearance, aesthetics of value of their property could be diminished by soiling; • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods, as part of the normal pattern of use of the land. Examples include parks and places of work.	Locations where people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more per day. Examples include office and shop workers, but will generally not include workers occupationally exposed to for PM_{10}, as protection is covered by Health and Safety at Work legislation.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; OR Locations with a national designation where the features may be affected by dust deposition. Indicative example is a SSSI with dust sensitive features.
Low	An area where: • The enjoyment of amenity would not reasonably be expected; • Property would not reasonably be expected to be diminished I appearance, aesthetics or value by soiling; • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples include playing fields, farmland (unless commercially sensitive horticultural), footpaths, short-term car parks and roads.	Locations where human exposure is transient. Examples include public footpaths, playing fields, parks and shopping streets.	Locations with a local designation where the features may be affected by dust deposition. Indicative example is a LNR with dust sensitive features.

Table 8.2.3 Sensitivity of an Area to Dust Soiling Effects

Receptor Sensitivity	Number of Receptors	Distance from Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10 – 100	High	Medium	Low	Low
	1 – 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 8.2.4 Sensitivity of an Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m3	>100	High	High	High	Medium	Low
		10 – 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32 µg/m3	>100	High	High	Medium	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28 µg/m3	>100	High	Medium	Low	Low	Low
		10 – 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	<24 µg/m3	>100	Medium	Low	Low	Low	Low
		10 – 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	>32 µg/m3	>10	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	28 - 32 µg/m3	>10	Medium	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	24 - 28 µg/m3	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
	<24 µg/m3	>10	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table 8.2.5 Risk of Dust Impacts Calculation Matrix

Sensitivity of Area		Dust Emission Magnitude		
		Large	Medium	Small
Demolition	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible Risk
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible Risk
Trackout	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible Risk
	Low	Low Risk	Low Risk	Negligible Risk

Appendix 8.3 EPUK IAQM Guidance (2017) Screening Criteria

Table 8.3.1 EPUK / IAQM Screening Criteria (2017)

The Development Will:	Indicative Criteria to Proceed to an Air Quality Assessment
Cause a significant change in LDV traffic flows on local roads with relevant receptors.	A change of LDV flow of: >100 AADT within or adjacent to an AQMA; and >500 AADT elsewhere.
Cause a significant change in HDV flows on local roads with relevant receptors.	A change of HDV flow of: >25 AADT within or adjacent to an AQMA; and >100 AADT elsewhere.
Realign roads i.e. changing the proximity of receptors to traffic lanes.	Where the change is 5 m or more and the road is within an AQMA.
Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle acceleration / deceleration, e.g. traffic lights, or roundabouts.
Introduce or change a bus station.	A change of bus flows of: >25 AADT within or adjacent to an AQMA; and >100 AADT elsewhere.
Have an underground car park with extraction system.	The ventilation extract for the car park will be located within 20 m of a relevant receptor; and The car park will have >100 movements per day (total in and out).

The screening criteria presented is amended from Table 6.2 of the EPUK / IAQM guidance (EPUK / IAQM, 2017). Only the screening criteria relevant to changes in transport (including both traffic and the transport network) are outlined.

Appendix 8.4 Model Inputs and Results Processing

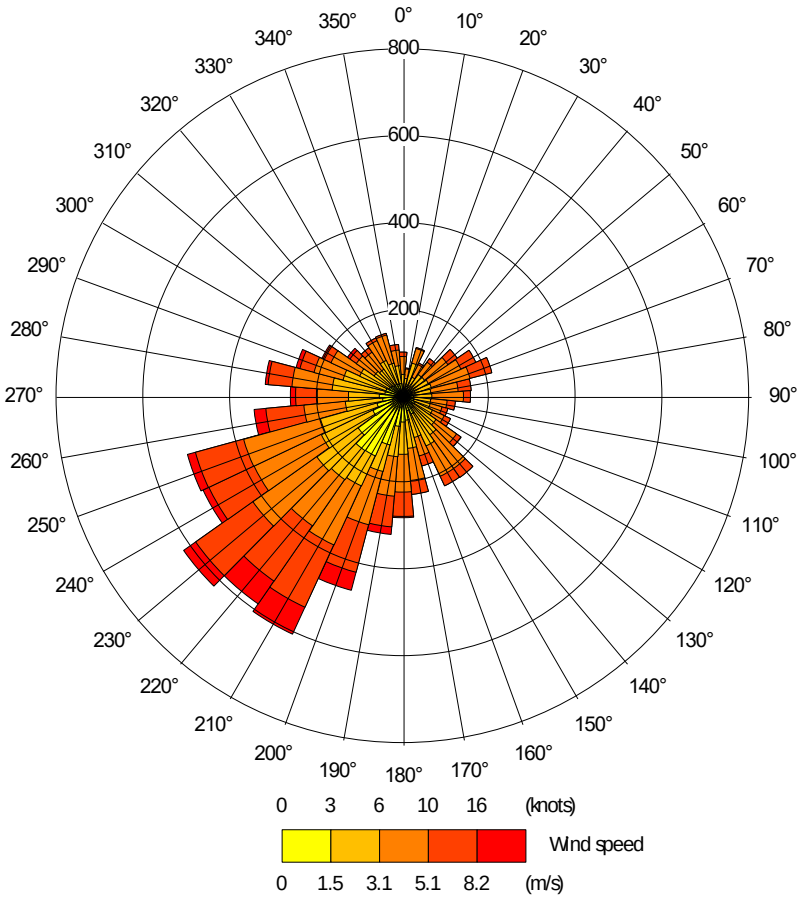
Table 8.4.1 Summary of Model Inputs

Meteorological Data	2019 hourly meteorological data from Farnborough station has been used in the model. The wind rose is shown in Figure 8.4.1.
ADMS	Version 5.0.1
Time Varying Emission Factors	Based on Department for Transport statistics. Table TRA0307. Motor vehicle traffic distribution by time of day and day of the week on all roads, Great Britain: 2019.
Latitude	51°
Minimum Monin-Obukhov length	A value of 30 for 'cities and large towns' was used to represent the modelled area. A value of 30 for 'cities and large towns' was used to represent the meteorological station site.
Street Canyon	ADMS Advanced Street Canyon module was used to represent the effect of trapping and recirculating pollutants. The canyons included are shown in Appendix D. Building heights were assumed to be 3 m per floor.
Emission Factor Toolkit (EFT)	V10.1, April 2020.
NOx to NO_2 Conversion	NOx to NO2 calculator version 8.1, April 2020
Background Maps	2018 reference year background maps

Table 8.4.2 Summary of Modelled Traffic Data

Location	2019 Baseline		2022 Without Development		2022 With Development	
	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
Kidmore End Road N	926	6%	973	6%	1060	5%
Kidmore End Road S	2451	6%	2574	6%	3547	5%
Peppard Road N	11329	6%	11861	6%	11907	6%
Kiln Road	2502	6%	2628	6%	2754	5%
Caversham Park Road	5651	5%	5935	5%	6138	5%
Peppard Road Central	11897	6%	12456	6%	12791	6%
Buckingham Drive	16373	5%	17142	5%	17755	5%
Peppard Road S	13988	5%	14645	5%	15231	5%
Henley Road	9359	8%	9829	8%	9829	8%
Prospect Street	14889	6%	15588	6%	15925	6%

Figure 8.4.1 2019 Windrose for Farnborough



Appendix 8.5 Model Verification

NO_2

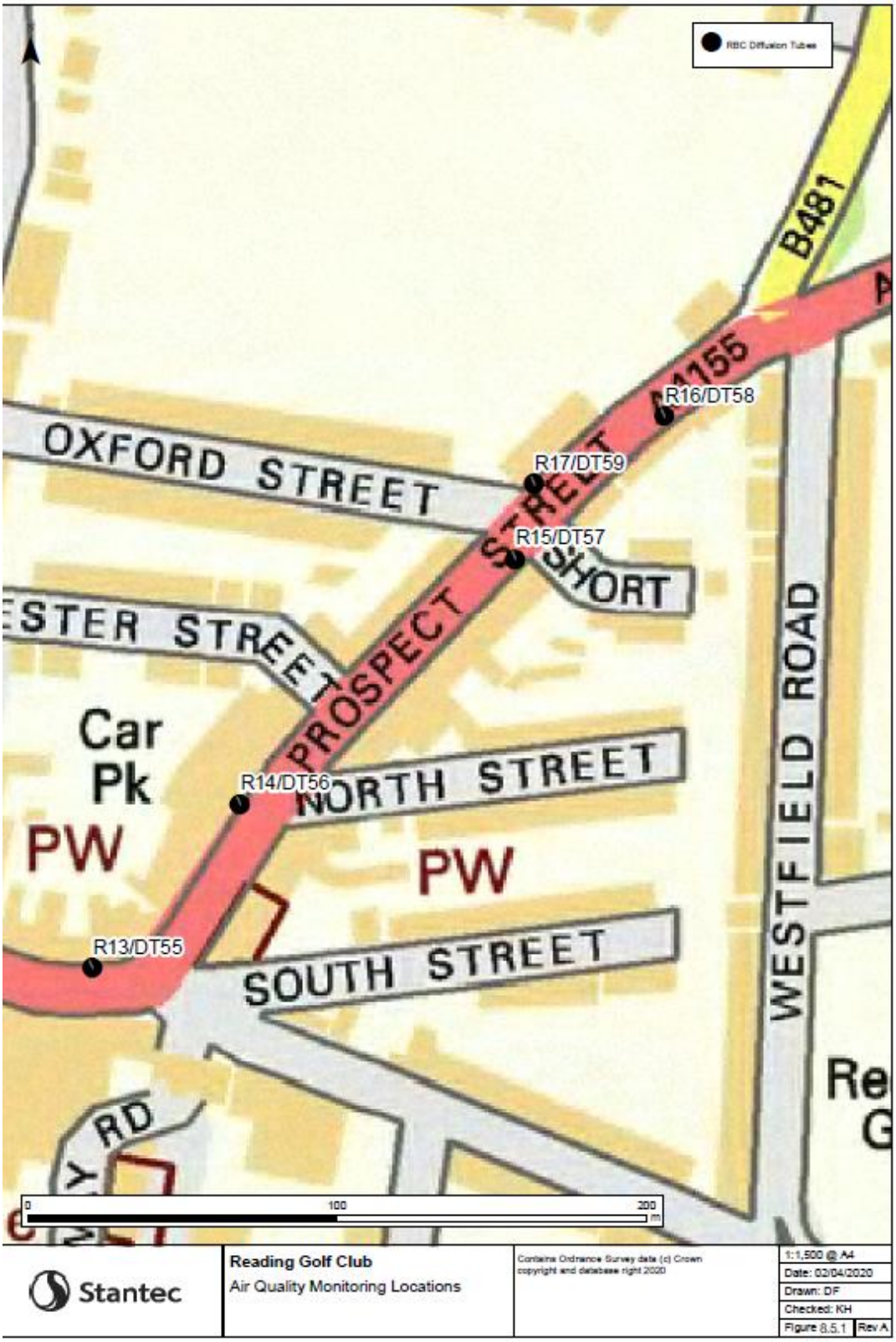
Most NO_2 is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the 2019 annual mean road-NO_x contribution at five diffusion tube monitoring locations (identified in **Figure 8.5.1**). Concentrations have been modelled at a height of 2.5 m for all, as described in RBC's latest Annual Status Report (ASR).

A primary adjustment factor of **0.83** is determined as the slope of the best fit line between the modelled road NO_x contribution and the 'measured' road-NO_x (which is calculated from the measured and background NO_2 concentrations within DEFRA's NO_x from NO_2 calculator, forced through zero (**Figure 8.5.2**). This factor is then applied to the raw modelled road-NO_x concentration to provide adjusted modelled road-NO_x concentrations.

The total NO_2 concentrations are then determined by combining the adjusted modelled road-NO_x concentrations with the background NO_2 concentration within DEFRA's NO_x from NO_2 calculator. A secondary adjustment factor of **0.99** is then calculated as the slope of the best fit line applied to the adjusted data and forced through zero (**Figure 8.5.3**).

Figure 8.5.4 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_x and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line. The calculated Root Mean Square Error (RMSE) for this verification (2.4 µg/m^3) lies within the range considered to be good by DEFRA (DEFRA, 2016) (i.e. 0 - 4).

The calculated adjustment factors imply that overall, the model has slightly over-predicted the road-NO_x contribution. As such, the model has not been adjusted when processing the final results in order to provide worst-case (i.e. higher) predicted concentrations, thus ensuring a conservative approach.


RBC Diffusion Tubes
B481
A1155
R16/DT58
OXFORD STREET
R17/DT59
PROSPECT STREET
R15/DT57
SHORT
ESTER STREET
Car
Pk
PW
R14/DT56
NORTH STREET
PW
WESTFIELD ROAD
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Air Quality Monitoring Locations
Contains Ordnance Survey data (c) Crown copyright and database right 2020
1:1,500 @ A4
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Drawn: DF
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Figure 8.5.1
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Figure 8.5.1 Measured and Unadjusted Road-NO_x Comparison

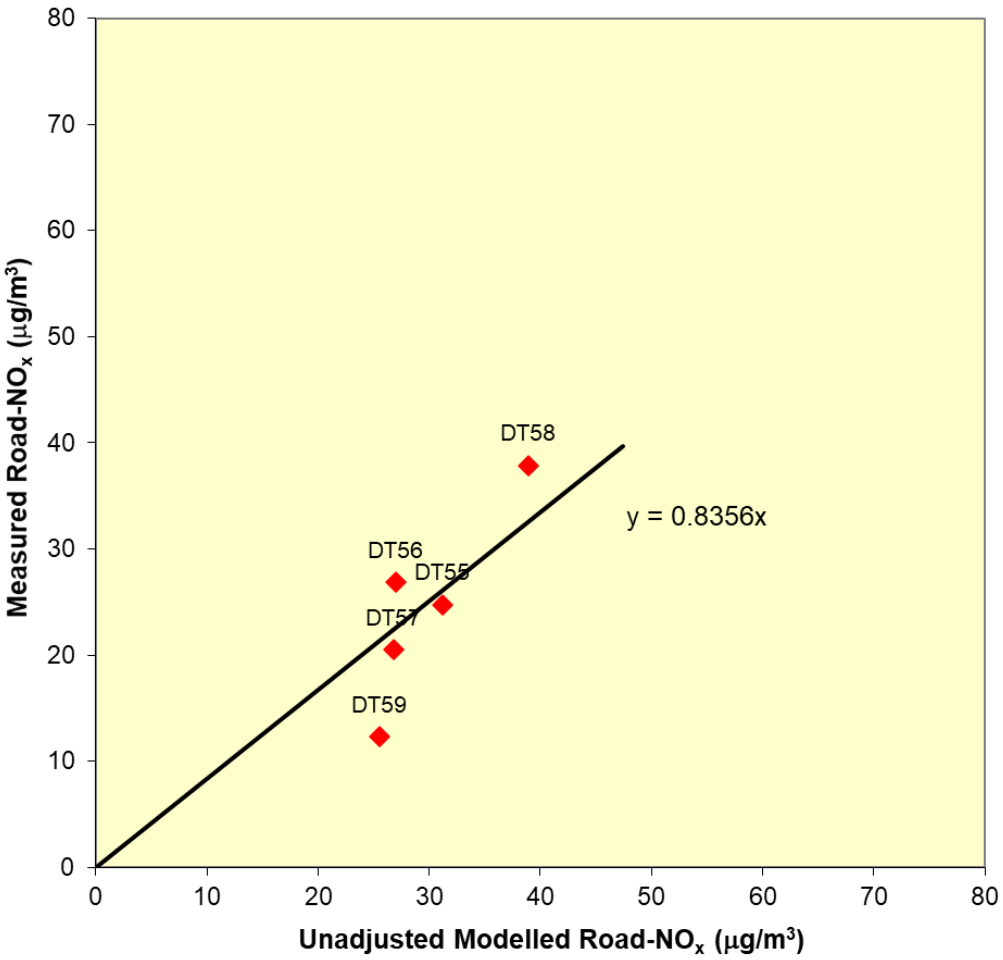


Figure 8.5.2 Measured and Primary Adjusted Modelled NO_2 Comparison

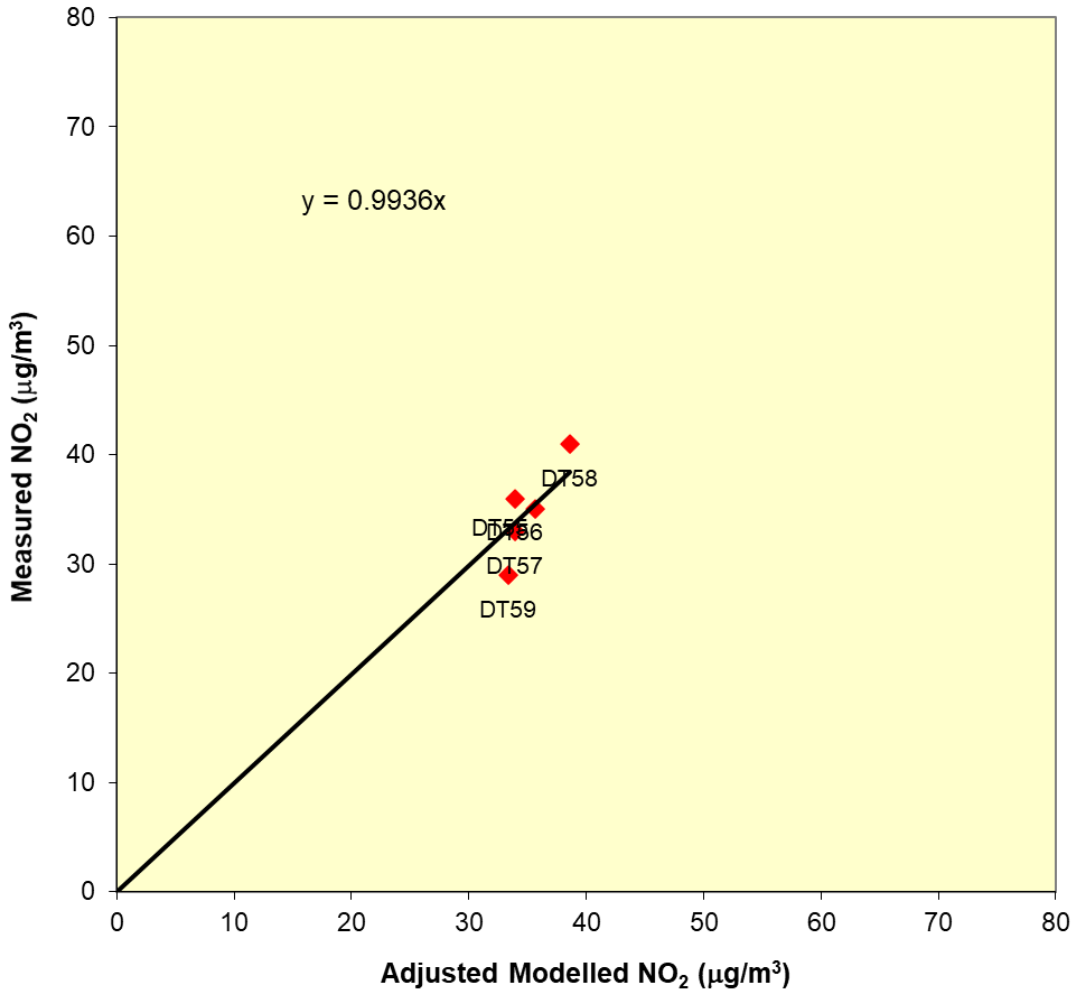
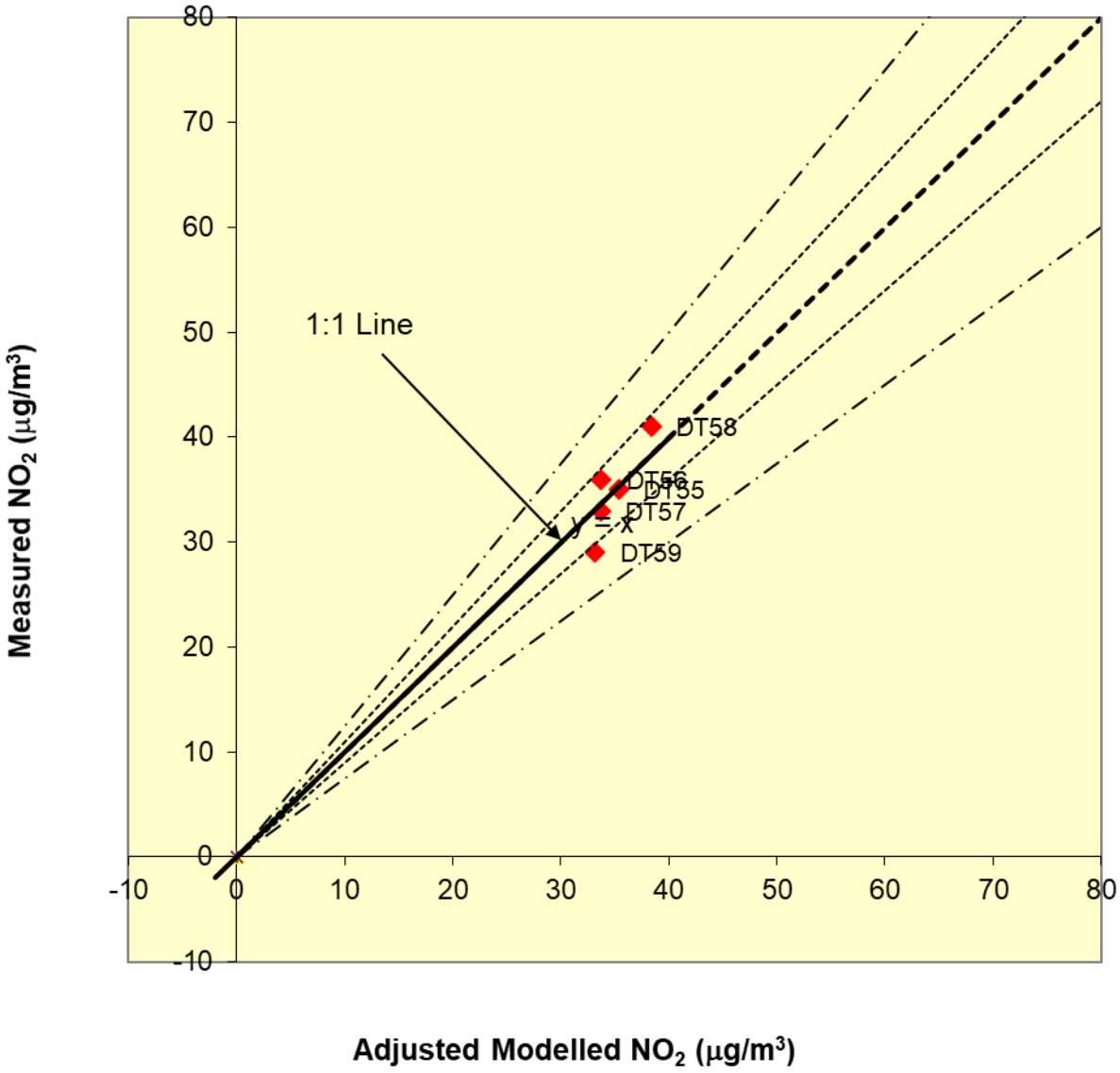


Figure 8.5.3 Measured and Final Adjusted Modelled NO_2 Comparison



PM_{10} and $PM_{2.5}$

The closest monitoring site to the Proposed Development Site that measures PM_{10} and $PM_{2.5}$ is the Reading Automatic Urban and Rural Monitoring (AURN) site. However, as this monitoring location is not considered to be representative of the identified worst-case receptors within the study area (as it is not a roadside site), it has not been used for model verification. As such, it has not been possible to calculate a specific adjustment factor for PM_{10} and $PM_{2.5}$ and, therefore, the results have not been adjusted.