

# Riverside Energy Park

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## Environmental Statement

### Appendix C.1 Traffic Modelling

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Planning Act 2008 | Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

## C.1.1 Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ADMS	Air Dispersion Modelling System
AQAP	Air Quality Action Plan
AQA	Air Quality Assessment
AQMA	Air Quality Management Area
BEB	Building Emission Benchmark
CAZ	Central Activity Zone
CHP	Combined Heat and Power
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO <sub>2</sub> in the air
EC	European Commission
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
GIA	Gross Internal Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
LGV	Light Good Vehicle
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations

Abbreviations	Meaning
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen oxides, generally considered to be nitric oxide and NO <sub>2</sub> . Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
NRMM	Non-road mobile machinery
PM <sub>10</sub>	Small airborne particles less than 10 µm in diameter
PBA	Peter Brett Associates LLP
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
SPG	Supplementary Planning Guidance
SQM	Square Metres
TEB	Transport Emission Benchmark

## C.1.2 Background Concentrations

### 1.2.1 Introduction

DEFRA publish details of estimated background concentrations of pollutants for each 1km grid square across the country. The London Borough of Barking and Dagenham and London Borough of Bexley run suburban/urban background monitoring sites within approximately 5 km from Riverside Energy Park. In order to more accurately reflect background concentrations across the study area, DEFRA mapped background concentrations have been compared against concentrations measured in 2017 to produce a calibration factor which is applied to background concentrations across the study area.

#### Nitrogen Dioxide

Location	Measured NO <sub>2</sub> (µg/m <sup>3</sup> )	Defra Background (µg/m <sup>3</sup> )	Calibration Factor
BX2 Belvedere Primary School	28.20	19.70	1.43
BX1 Slade Green	24.53	18.37	1.34
BQ7 Bexley Business Academy	21.06	17.82	1.18
Average	-	-	<b>1.316</b>

#### PM<sub>10</sub>

Location	Measured PM <sub>10</sub> (µg/m <sup>3</sup> )	Defra Background (µg/m <sup>3</sup> )	Calibration Factor
BX2 Belvedere Primary School	16.60	15.59	1.07
BX1 Slade Green	16.85	15.93	1.06
BQ7 Bexley Business Academy	14.75	15.18	0.97
Average	-	-	<b>1.031</b>

#### PM<sub>2.5</sub>

Location	Measured PM <sub>10</sub> (µg/m <sup>3</sup> )	Defra Background (µg/m <sup>3</sup> )	Calibration Factor
BX2 Belvedere Primary School	7.96	9.75	0.82
BX1 Slade Green	10.82	9.93	1.09
BQ7 Bexley Business Academy	7.85	9.50	0.83
Average	-	-	<b>0.911</b>

## C.1.3 Model Inputs and Results Processing Tools

Table C.1.3.1: Model Inputs

Meteorological Data	Hourly meteorological data for London City for 2017 has been used in the model. The wind-rose is shown in figure 1.3.1.
ADMS	Version 4.1.1
Latitude	51°
Surface Roughness	A value of 0.5 for Parkland and Open Suburbia was used to represent the modelled area. A value of 1 for Cities and Woodlands was used to represent the meteorological station site.
Minimum Monin-Obukhov length	A value of 100 for Large Conurbations was used to represent the modelled area and meteorological station site.
Street Canyon	ADMS Urban Canopy module was used to represent the effect of the urban area on wind speeds and dispersion.
Emission Factor Toolkit (EFT)	V8.0, November 2017.
NO <sub>x</sub> to NO <sub>2</sub> Conversion	NO <sub>x</sub> to NO <sub>2</sub> calculator version 6.1, 17 October 2017
Background Maps	2015 reference year background maps

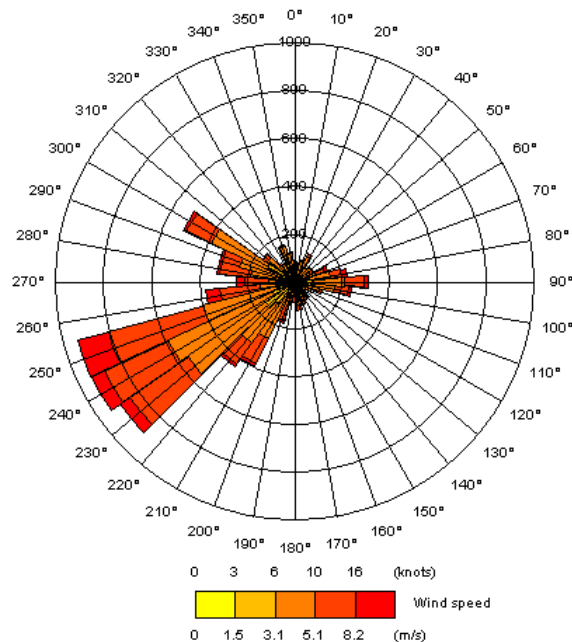


Figure C.1.3.1: London City 2017 windrose

## C.1.4 Model Verification

### 1.4.1 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 ( $\text{NO}_x = \text{NO} + \text{NO}_2$ ). The model has been run to predict the 2017 annual mean road- $\text{NO}_x$  contribution at the HV1 roadside automatic monitor, located within the London Borough of Havering and within our study area. This is considered to be the most appropriate given its location and distance from significant sources. Concentrations have been modelled at the height of the monitoring location.

The model output of road- $\text{NO}_x$  has been compared with the 'measured' road- $\text{NO}_x$ , which was calculated from the measured  $\text{NO}_2$  concentrations and the adjusted background  $\text{NO}_2$  concentrations within the  $\text{NO}_x$  from  $\text{NO}_2$  calculator.

An adjustment factor was determined as follows:

Measured  $\text{NO}_2$ :  $34.3 \mu\text{g}/\text{m}^3$

Measured road- $\text{NO}_x$ :  $26.29 \mu\text{g}/\text{m}^3$

Modelled road- $\text{NO}_x$ :  $9.13 \mu\text{g}/\text{m}^3$

Road- $\text{NO}_x$  adjustment factor:  $26.29/9.13 = 2.8781$

This factor implies that overall, the model was under-predicting the road- $\text{NO}_x$  contribution. This is a common experience with this and most other models.

For the PEIR, the model verification (for 2016) was undertaken with HAV50 in addition to HV1. The data capture for HAV50 in 2017 was only 50% and so it was excluded from the model verification process. If it were included, the verification factor would have been slightly lower than 2.8781 used herein. In terms of the other monitoring sites that could have been used; HAV3 is a background site, HAV49 is a roadside site but close to a very quiet residential road and so not suitable for verification and it only had 42% data capture, HAV56 is located next to a busy bus stop and only had 25% data capture and therefore not suitable, and HAV 46 had 33% data capture.

### PM<sub>10</sub>

The HV1 Automatic monitoring station is the only roadside location within the study area that monitors PM<sub>10</sub>. This has therefore been used to calculate a verification factor for PM<sub>10</sub> following a similar methodology as that used for nitrogen dioxide.

Road PM<sub>10</sub> (calculated from Measured PM<sub>10</sub> at the HV1 monitoring site and calibrated background PM<sub>10</sub> for the appropriate grid-square) is divided by the modelled road PM<sub>10</sub> to produce a factor which can be applied to PM<sub>10</sub> model outputs.

Measured PM<sub>10</sub> ( $18.0 \mu\text{g}/\text{m}^3$ ) - Calibrated background PM<sub>10</sub> ( $15.7 \mu\text{g}/\text{m}^3$ ) = Measured Road PM<sub>10</sub> ( $2.28 \mu\text{g}/\text{m}^3$ )

Measured Road PM<sub>10</sub> / Modelled Road PM<sub>10</sub> ( $0.558 \mu\text{g}/\text{m}^3$ ) = PM<sub>10</sub> verification factor (4.082).

### PM<sub>2.5</sub>

The HV1 Automatic monitoring station is the only roadside location within the study area that monitors PM<sub>2.5</sub>. This has therefore been used to calculate a verification factor for PM<sub>2.5</sub> following a similar methodology as that used for nitrogen dioxide.

Road PM<sub>2.5</sub> (calculated from Measured PM<sub>2.5</sub> at the HV1 monitoring site and calibrated background PM<sub>2.5</sub> for the appropriate grid-square) is divided by the modelled road PM<sub>2.5</sub> to produce a factor which can be applied to PM<sub>2.5</sub> model outputs.

Measured PM<sub>2.5</sub> (12.0 µg/m<sup>3</sup>) - Calibrated background PM<sub>2.5</sub> (9.2 µg/m<sup>3</sup>) = Measured Road PM<sub>2.5</sub> (2.84 µg/m<sup>3</sup>)

Measured Road PM<sub>2.5</sub> / Modelled Road PM<sub>2.5</sub> (0.346 µg/m<sup>3</sup>) = PM<sub>2.5</sub> verification factor (8.21).

## C.1.5 Traffic Data

Location	2017 Baseline		2024 Baseline		2024 With Development	
	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
A13	41209	11.6	43206	10.9	43206	10.9
A13 Ripple Road	78002	9.9	81908	9.3	81908	9.3
A2016 Bronze Age Way (south of Horse Roundabout)	23983	21.3	28130	21.3	28421	22.0
A2016 Eastern Way (west of Yarnton Way)	21483	18.0	25133	18.0	25587	19.3
A2016 Picardy Manorway (between Norman Road and Eastern Way)	30380	18.5	35342	18.5	36095	20.0
A2016 Picardy Manorway (east of Norman Road)	27714	18.3	32495	18.3	33247	20.0
A206 Bob Dunn Way (east of Marsh Street N)	11310	13.8	14159	13.8	14290	14.4
A206 Bob Dunn Way (east of Marsh Street N) Eastbound	10281	12.8	13536	12.8	13667	13.4
A206 Bob Dunn Way (east of Marsh Street N) Westbound	11310	13.8	14159	13.8	14290	14.4
A206 Bob Dunn Way (north of A2026 Burnham Road Roundabout) Eastbound	13636	12.8	17279	12.8	17410	13.4
A206 Bob Dunn Way (north of A2026 Burnham Road Roundabout) Westbound	13750	13.8	16882	13.8	17013	14.4
A206 Northend Road (north of A2000 Perry Street) Southbound	15370	19.4	19047	19.4	19186	19.9
A206 Northend Road (north of A2000 Perry Street) Northbound	16429	26.1	19781	26.1	19919	26.5
B253 Picardy Manorway (south of Horse Roundabout)	10340	11.0	11634	11.0	11671	11.0
Broadway	38524	7.0	39513	6.7	39513	6.7
Cherry tree lane	6156	7.7	6321	7.5	6321	7.5
Ferry Lane	7768	14.9	7936	14.3	7936	14.3
Heathway	14708	8.6	15312	8.3	15312	8.3
Lamb's Lane South	6479	9.6	6634	9.2	6634	9.2
New Road (east of Rainham Road)	20918	5.2	21474	5.0	21474	5.0
New Road (east of Cherry tree lane)	17863	8.4	18318	8.1	18318	8.1
New Road (east of Marsh Way)	17768	7.9	18222	7.6	18222	7.6
New Road (west of Marsh Way)	18033	9.3	18489	9.0	18489	9.0
New Road (east of Heathway)	13851	13.0	14382	12.4	14382	12.4
Marsh way	19118	8.7	21043	8.7	21043	8.7
Ripple Road	38592	9.9	40095	9.4	40095	9.4



Location	2017 Baseline		2024 Baseline		2024 With Development	
	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
Ripple Road	24231	7.4	25229	7.0	25229	7.0
Upminster Road North	1981	26.4	2022	25.8	2022	25.8
Upminster Road South	1981	26.4	2022	25.8	2022	25.8
Wennington Road (East of Lamb's Lane South)	2333	7.4	2397	7.2	2397	7.2
Wennington Road (West of Lamb's Lane South)	18383	9.3	18835	8.9	18835	8.9
Yarnton Way (south of A2016 Eastern Way)	10643	18.0	12012	18.0	12019	18.1

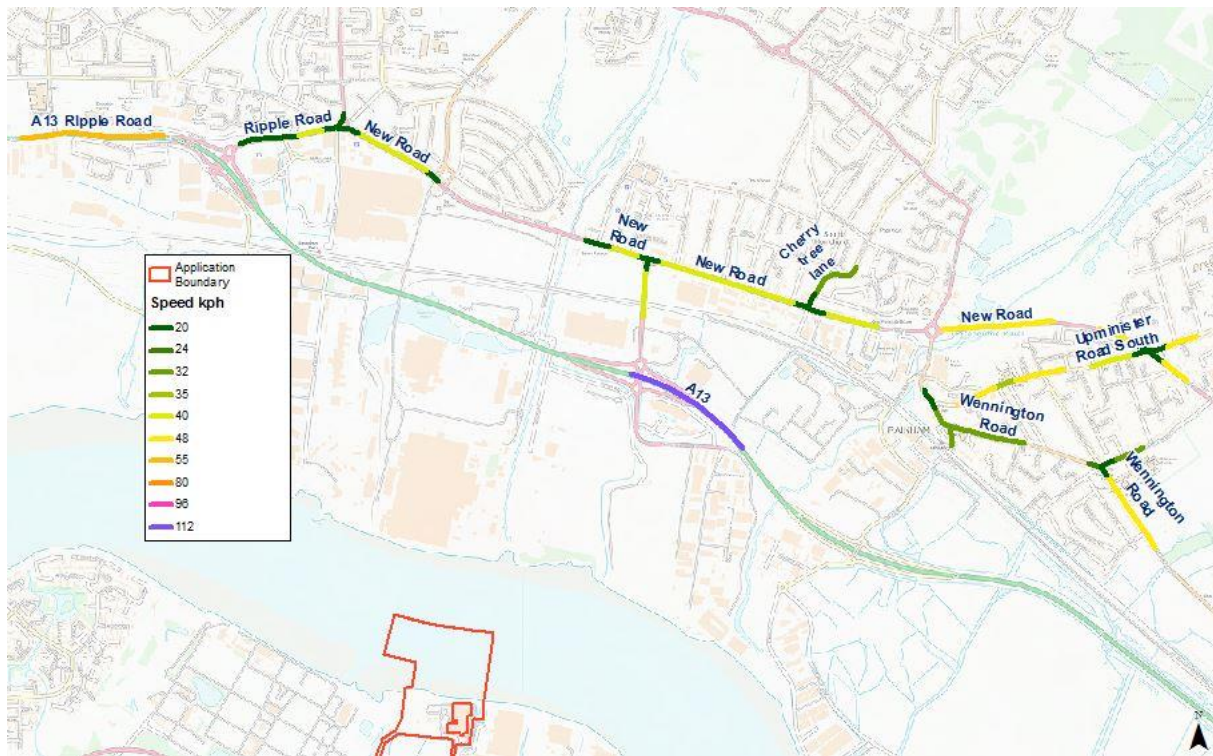


Figure C.1.5.1: Modelled Road Network Sources (North of the site)

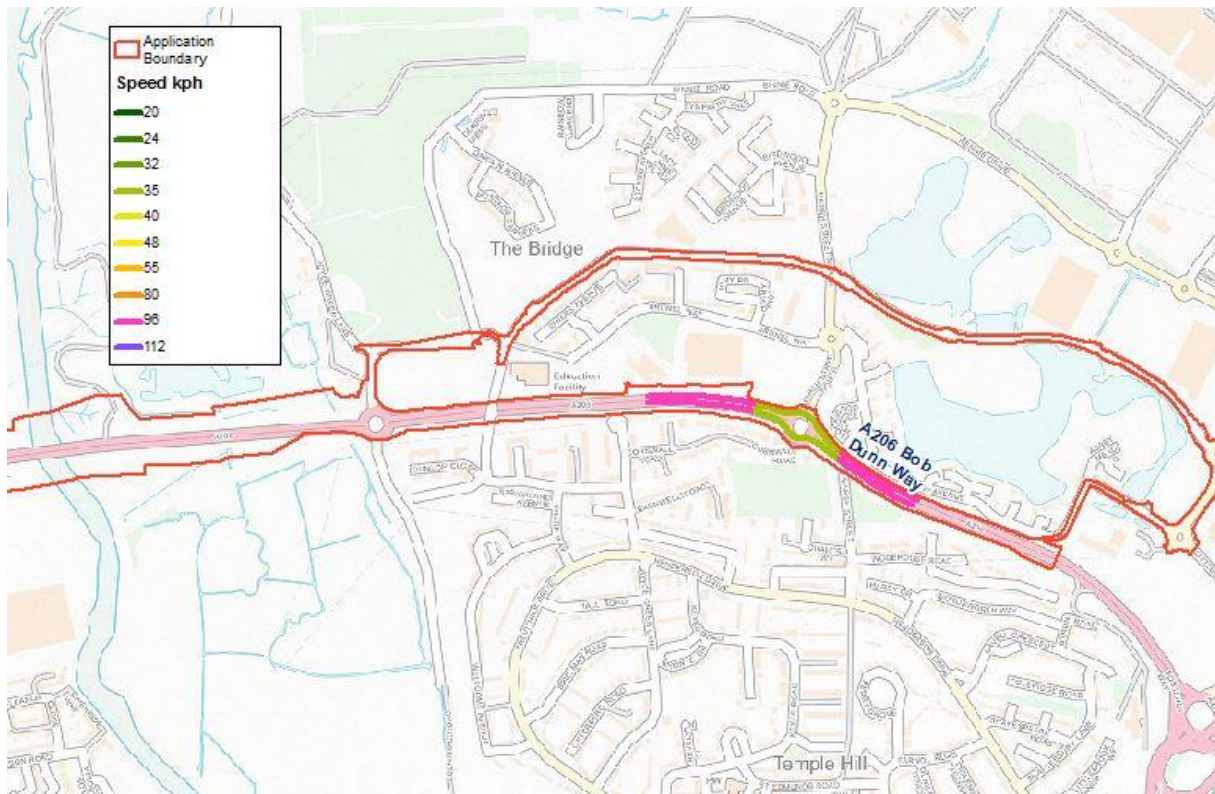


Figure C.1.5.2: Modelled Road Network Sources (South East of the site)

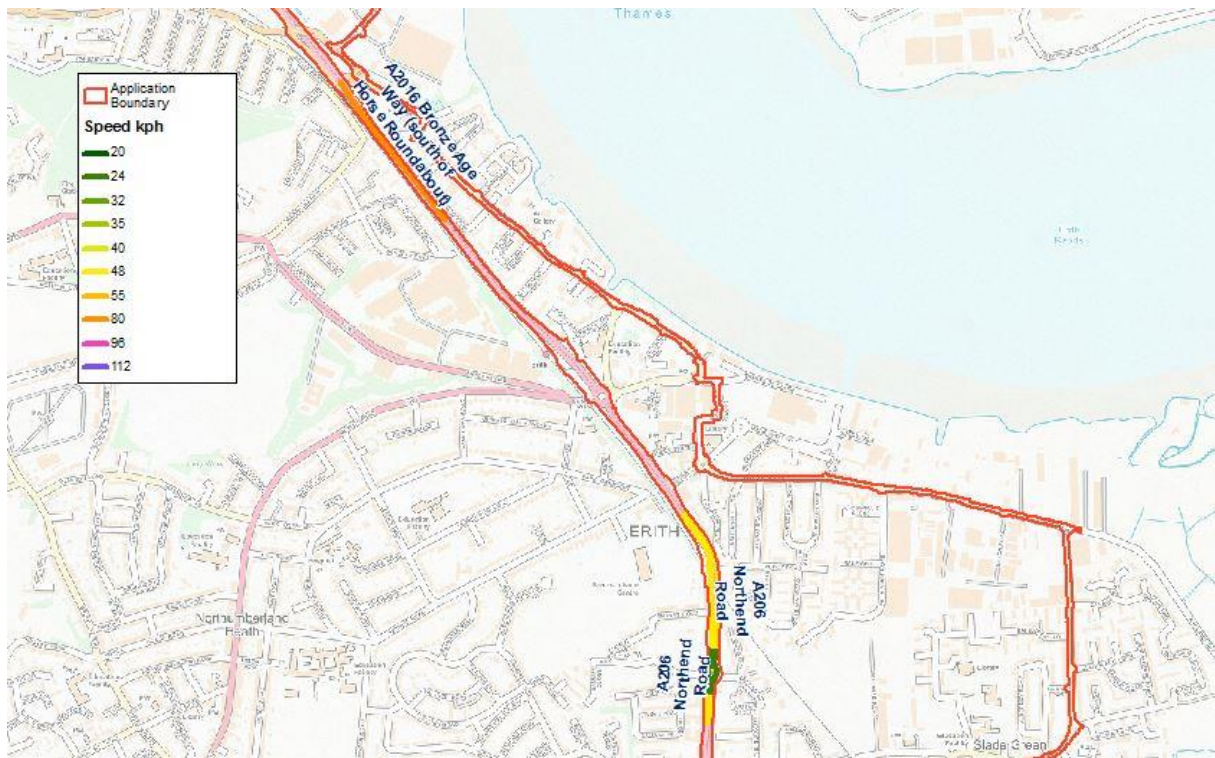


Figure C.1.5.3: Modelled Road Network Sources (South East of the site)

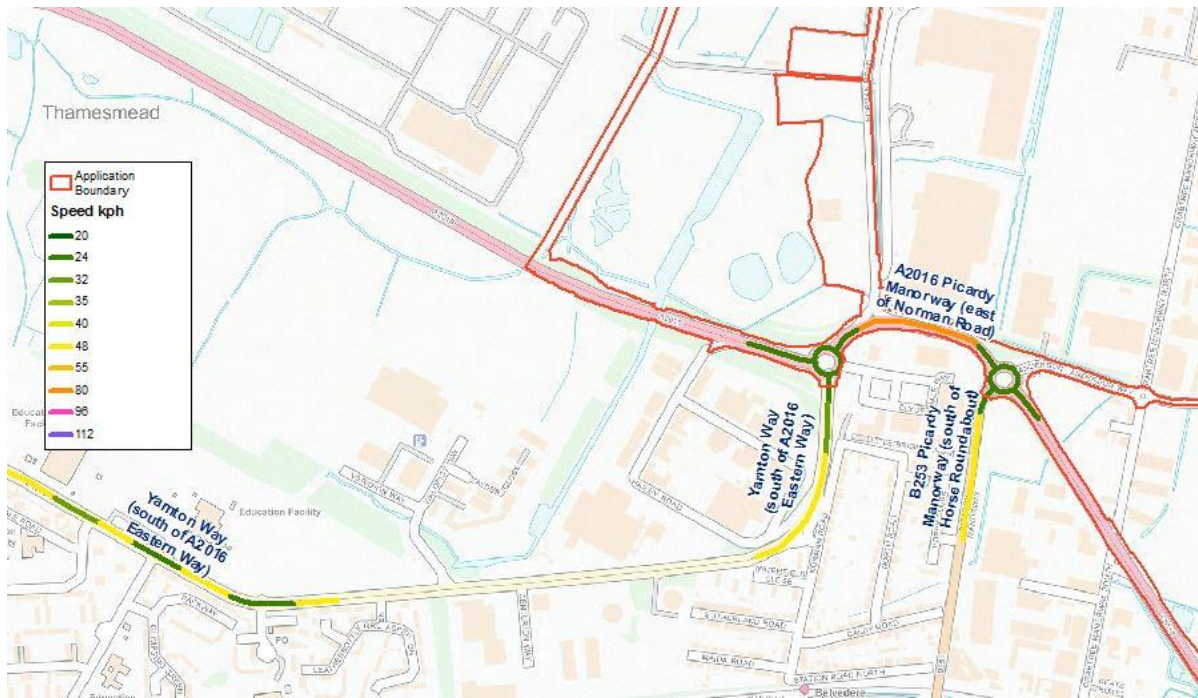


Figure C.1.5.4: Modelled Road Network Sources (South of the site)

## C.1.6 Traffic Emissions Predicted Concentrations

### 1.6.1 Human Health Receptors

Table C.1.6.1: Predicted Baseline Concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> at Existing Receptors

Receptor	Annual Mean (µg/m <sup>3</sup> )					
	2017 Baseline			2024 Future Baseline		
	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
R1	24.6	15.9	9.3	19.8	15.4	8.9
R2	31.3	17.2	10.7	24.4	16.6	10.1
R3	25.9	16.7	9.6	20.7	16.2	9.1
R4	26.4	17.3	10.2	20.8	16.7	9.7
R5	26.3	15.7	9.1	21.6	15.2	8.7
R6	22.5	16.2	9.6	18.2	15.7	9.1
R7	36.5	18.3	12.2	28.0	17.6	11.4
R8	34.6	18.1	10.8	26.6	17.4	10.2
R9	26.1	16.6	9.5	20.6	16.0	9.1
R10	23.7	16.3	9.4	18.9	15.8	9.0
R11	<b>42.3</b>	20.0	13.1	31.7	19.2	12.2
R12	33.3	18.5	10.6	25.1	17.8	10.1
R13	37.3	18.7	11.1	29.0	18.0	10.4
R14	<b>43.3</b>	20.2	12.9	31.7	19.5	12.0
R15	37.8	18.6	11.4	28.7	17.9	10.8
R16	24.3	15.8	9.3	19.7	15.4	8.9
R17	26.3	15.7	9.1	21.6	15.2	8.7
R18A 1st	29.0	16.7	10.2	23.1	16.1	9.6
R8B	37.5	18.8	11.7	28.6	18.1	10.9
R16B	27.5	16.5	10.0	21.7	16.0	9.6
R19A 1st	32.6	17.6	11.2	25.4	17.1	10.7
R19B 6th	27.9	16.4	9.8	22.2	15.9	9.3
R18B 4th	26.3	16.2	9.6	21.4	15.6	9.1
R20A GF	28.8	16.7	10.2	22.9	16.1	9.6
R20B 5th	25.9	16.1	9.5	21.2	15.6	9.0
R21	<b>45.2</b>	22.3	15.1	32.9	21.5	14.1
R23	33.0	18.7	12.5	25.3	18.4	12.2
R24	39.5	20.0	13.6	29.7	19.8	13.4
R25	<b>40.6</b>	20.2	13.9	30.7	20.1	13.7
R26	25.6	16.1	9.3	20.4	15.6	8.9
R27	33.1	18.9	11.6	25.6	18.5	11.2
R22	29.3	16.7	10.2	23.1	16.1	9.6
<b>Objectives</b>	<b>40</b>	<b>40</b>	<b>25</b>	<b>40</b>	<b>40</b>	<b>25</b>

Table C.1.6.2: Predicted Concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> at Existing Receptors without (DM) and with (DS) the Proposed Development in Place.

Receptor	2024 Annual Mean (µg/m <sup>3</sup> )								
	NO <sub>2</sub>			PM <sub>10</sub>			PM <sub>2.5</sub>		
	DM	DS	Chang	DM	DS	Chang	DM	DS	Change
R1	19.8	19.8	0.00	15.4	15.4	0.00	8.9	8.9	0.00
R2	24.4	24.5	0.03	16.6	16.7	0.01	10.1	10.1	0.01
R3	20.7	20.7	0.00	16.2	16.2	0.00	9.1	9.1	0.00
R4	20.8	20.8	0.00	16.7	16.7	0.00	9.7	9.7	0.00
R5	21.6	21.6	0.00	15.2	15.2	0.00	8.7	8.7	0.00
R6	18.2	18.2	0.00	15.7	15.7	0.00	9.1	9.1	0.00
R7	28.0	28.0	0.00	17.6	17.6	0.00	11.4	11.4	0.00
R8	26.6	26.6	0.00	17.4	17.4	0.00	10.2	10.2	0.00
R9	20.6	20.6	0.00	16.0	16.0	0.00	9.1	9.1	0.00
R10	18.9	18.9	0.00	15.8	15.8	0.00	9.0	9.0	0.00
R11	31.7	31.7	0.00	19.2	19.2	0.00	12.2	12.2	0.00
R12	25.1	25.1	0.00	17.8	17.8	0.00	10.1	10.1	0.00
R13	29.0	29.0	0.00	18.0	18.0	0.00	10.4	10.4	0.00
R14	31.7	31.7	0.00	19.5	19.5	0.00	12.0	12.0	0.00
R15	28.7	28.7	0.00	17.9	17.9	0.00	10.8	10.8	0.00
R16	19.7	19.7	0.00	15.4	15.4	0.00	8.9	8.9	0.00
R17	21.6	21.6	0.00	15.2	15.2	0.00	8.7	8.7	0.00
R18A 1 <sup>st</sup>	23.1	23.1	0.01	16.1	16.1	0.00	9.6	9.6	0.00
R8B	28.6	28.6	0.00	18.1	18.1	0.00	10.9	10.9	0.00
R16B	21.7	21.7	0.00	16.0	16.0	0.00	9.6	9.6	0.00
R19A 1 <sup>st</sup>	25.4	25.6	0.19	17.1	17.2	0.08	10.7	10.8	0.08
R19B 6 <sup>th</sup>	22.2	22.3	0.06	15.9	15.9	0.01	9.3	9.3	0.01
R18B 4 <sup>th</sup>	21.4	21.4	0.00	15.6	15.6	0.00	9.1	9.1	0.00
R20A GF	22.9	22.9	0.00	16.1	16.1	0.00	9.6	9.6	0.00
R20B 5 <sup>th</sup>	21.2	21.2	0.00	15.6	15.6	0.00	9.0	9.0	0.00
R21	32.9	32.9	0.01	21.5	21.5	0.00	14.1	14.1	0.00
R23	25.3	25.4	0.10	18.4	18.5	0.06	12.2	12.2	0.07
R24	29.7	29.8	0.14	19.8	19.9	0.06	13.4	13.4	0.06
R25	30.7	30.8	0.16	20.1	20.2	0.06	13.7	13.8	0.07
R26	20.4	20.4	0.00	15.6	15.6	0.00	8.9	8.9	0.00
R27	25.6	25.7	0.08	18.5	18.6	0.03	11.2	11.2	0.03
R22	23.1	23.1	0.00	16.1	16.1	0.00	9.6	9.6	0.00
<b>Objectives</b>	<b>40</b>		<b>-</b>	<b>40</b>		<b>-</b>	<b>25</b>		<b>-</b>

## C.1.7 Future Year Emissions Calculations

### 1.7.1 Introduction

Atmospheric dispersion modelling is used to determine the effect of future development traffic on local air quality. The modelling utilises predictions of the composition and emissions profile of the vehicle fleet which are produced by DEFRA in the emissions factor toolkit (EFT). The composition and emissions profiles are provided on a year by year basis from 2013 to 2030, with the database being periodically updated.

The main issue with regard to the modelling of future traffic impacts is the choice of emission factors to use given that there is a degree of uncertainty as to the accuracy of the emission factors, as well as uncertainty introduced by the modelling process and the traffic data on which the predictions are based. This has become more important in recent years as it has been realised that previous versions of the EFT were likely to have significantly underestimated the real world emissions of the vehicle fleet, as well as the more recent revelations concerning the use of 'defeat devices' on VW group vehicles.

This note therefore sets out PBAs approach to the choice of vehicle emission factors for future year assessments. The note has been revised following updating of the Defra Emissions Factor Toolkit in November 2017.

### 1.7.2 Modelling Methodology

As a prelude to the discussion of emission factors, it is useful to recap on the general methodology that is used for dispersion modelling of road traffic emissions:

- Traffic data are entered into the dispersion model to represent the baseline situation and the model is used to predict how NO<sub>x</sub> emissions are dispersed in the environment.
- The dispersion modelling predictions are compared to monitoring data to obtain a verification factor; the factor by which the predicted road traffic concentration must be multiplied by to agree with the monitored concentration.
- The modelling is repeated for the future year situation; with traffic data representing the situation without the development in place (the 'without' scheme scenario) and with the development in place ('with' scheme). In both cases, the verification factor obtained from the baseline modelling is used to multiply the model results by, in essence assuming that the model is equally as accurate in the future as it was for the baseline scenario.

The verification factor is one of the key elements in the discussion regarding vehicle emission factors. One element of uncertainty in the modelling is the degree to which the emission factors in the EFT are different to actual emissions of the vehicle fleet on the local road network. The use of the verification factor for the future year predictions essentially assumes that the difference between the EFT emission factors and real world emissions is the same in the future as it was in the baseline year. In other words, unless there is some reason to believe that the future year emission factors are less accurate than the baseline year emission factors, the degree to which the EFT emission factors and real world emission factors differ is taken into account in the modelling by the use of the verification factor. This is discussed further in the following sections.

### 1.7.3 Emission Factor Toolkit

The EFT contains estimates of the future composition of the vehicle fleet in terms of the age and type of vehicles. The composition of the vehicle fleet is primarily related to the age of the vehicles (in terms of their emissions class) and the fuel that they use (i.e. petrol or diesel). In general terms, the majority of new vehicles replace much older vehicles, and as the emissions performance of vehicles is generally taken to improve over time, both current and historical versions of the EFT predict very large reductions in NO<sub>x</sub> emissions in the future. It is also obvious that the further one looks into the future, the more

uncertain the predictions become as they depend on the rate of vehicle renewal and the size and fuel mix of the vehicles bought; which are all estimates.

The emissions performance of the vehicles is classified in terms of Euro type approval testing; Euro 1 to 6 concerning light duty vehicles and Euro I to VI heavy duty vehicles. Whilst the introduction of each Euro class has generally seen a tightening of emission standards, the standards up until now have been based on laboratory testing of vehicles. The emissions performance of the vehicles in real world driving conditions has been higher than the laboratory testing results, especially for diesel vehicles. This factor was not recognised in earlier versions of the EFT, and combined with the fact that diesel vehicles have much higher NO<sub>x</sub> emissions than petrol vehicles and there has been a very large increase in the number of diesel vehicles on the road, has meant that the NO<sub>x</sub> emissions and NO<sub>2</sub> concentrations have not reduced as previously predicted.

The trends in NO<sub>x</sub> emissions in the vehicle fleet, especially diesel vehicles and the accuracy of the current version of the EFT, is therefore critical in terms of the choice of emission factors in modelling.

#### **1.7.4 Trends in NO<sub>x</sub> emissions**

For light duty vehicles, the latest Euro standard is Euro 6, which was introduced from September 2015 (with a derogation in the UK for the registration of new vehicles until September 2016).

The emissions standards currently relate to a laboratory test whereby the average emission rate is calculated over an idealised drive cycle. The cycle used is the New European Drive Cycle (NEDC) and there has been extensive criticism that the drive cycle does not represent real world driving conditions. It has therefore been agreed that a new drive cycle will be introduced, the World Light-duty Test Cycle (WLDTTC), as well as an on-road test termed Real Driving Emissions (RDE).

Up until September 2017, Euro 6 vehicles were only tested in the laboratory against the NEDC, and these vehicles are termed Euro 6ab. However, from September 2017, new models are tested against the WLDTTC and will also have a RDE test. The initial introduction of the RDE test will allow vehicles to have average RDE test emissions of 2.1 times the WLDTTC test standard. The 2.1 factor is termed the conformity factor and will apply to new vehicle models from September 2017 and all new vehicles from September 2019. From January 2020, the conformity factor will reduce to 1.5 for new vehicle models (January 2021 for all new vehicles).

Air Quality Consultants undertook some research into the performance of diesel vehicles to support a methodology that they have adopted for undertaking air quality assessments<sup>1</sup>. As part of the analysis, they compared the real world test results of current Euro 6ab diesel vehicles and calculated an average conformity factor of 3.9 from the tests that were assessed. This work led to AQC publishing the CURED v2A calculator which attempted to take account of the real world emissions performance of diesel vehicles. The approach using CURED v2A was generally accepted to be conservative when considering developments a long time in the future.

Subsequently, the Department for Transport have undertaken testing of Euro 5 and 6ab diesel vehicles and found that the average NO<sub>x</sub> emissions were 1135 mg/km for Euro 5 vehicles and 500 mg/km for Euro 6ab vehicles<sup>2</sup>. These work out to be a conformity factor of 6.30 and 6.25 for Euro 5 and Euro 6ab respectively. Adding in the Department for Transport (DfT) results to the AQC results gives an overall average conformity factor for Euro 6ab vehicles tested of 4.1.

A paper presented by Dr Marc Stettler at the recent Westminster Energy, Environment & Transport Forum<sup>3</sup> included results of RDE testing of existing Euro 6ab vehicles. Whilst there was wide range in the results, a number of the vehicles tested did already comply with the Euro 6c standard.

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<sup>1</sup> Emissions of Nitrogen Oxides from Modern Diesel Vehicles. AQC January 2016

<sup>2</sup> Vehicle Emissions Testing Programme DfT Cm 9259 April 2016

<sup>3</sup> Priorities for reducing air quality impacts of road vehicles. Dr Marc Stettler 17<sup>th</sup> May 2016

Similar results have been reported in a study led by Rosalind O’Driscoll of Imperial College<sup>4</sup>. This showed that the average NO<sub>x</sub> emissions were 4.5 times higher than the Euro 6 limit, with an average NO<sub>2</sub> percentage of 44%.

From the emissions testing work undertaken to date on Euro 6ab vehicles it is clear that the NO<sub>x</sub> emissions performance of Euro 6ab vehicles is significantly better than Euro 5 vehicles, although not in line with the laboratory standards. The introduction of Euro 6 should therefore see a significant reduction in NO<sub>x</sub> emissions in the future, as outlined in the following table.

Emission Standard	Real Driving Emissions NO <sub>x</sub> mg/km
Euro 5, DfT testing	1135
Euro 6ab, DfT testing	500
Euro 6c, September 2017 models	168
Euro 6c, January 2020 models	120

Further testing of vehicles is ongoing, with Emissions Analytics regularly publishing the results of real world emissions testing on vehicles<sup>5</sup>. Also, in the November 2017 budget, the government announced a one-off tax on new diesel cars not meeting Euro 6c standards. Both of these factors should help put pressure on vehicle manufacturers to meet the RDE standards. In the longer term, there is also the move to electric vehicles which will gather pace.

### 1.7.5 Emissions in the EFT

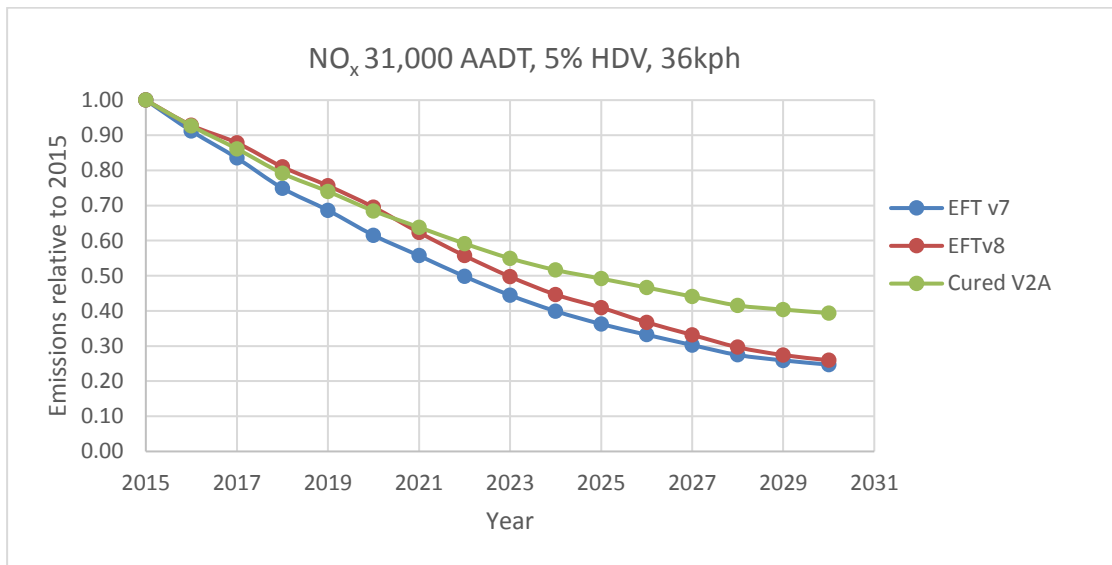
As noted in Section 3, the EFT contains estimates of vehicle emissions by Euro Class. The database was updated in November 2017 from v7.0 to v8.0. It now uses NO<sub>x</sub> emissions factors for the vehicles taken from the European Environment Agency’s COPERT 5 database, compared to the previous COPERT 4 version v11. In the November 2015 submissions to the European Union for compliance against EU Limit Values, Defra used COPERT 4 v11 factors without taking account of the real world performance of the vehicle fleet to data.

The EFT now takes account of the real world performance of Euro 6ab diesel cars, applying a high conformity factor to these vehicles. For Euro 6c vehicles, it assumes that the RDE will be effective in bringing down vehicle emissions. The following graph shows the relative decline in vehicle NO<sub>x</sub> emissions predicted for a road in outer London with 5% Heavy Duty Vehicle traffic travelling at 36kph. As air quality models are verified against historic data, the emissions decline is shown relative to 2015.

<sup>4</sup> A Portable Emissions Measurement System (PEMS) study of NO<sub>x</sub> and primary NO<sub>2</sub> emissions from Euro 6 diesel passenger cars and comparison with COPERT emission factors. Rosalind O’Driscoll. September 2016

<sup>5</sup> <http://equaindex.com/equa-air-quality-index/>





For emission years prior to 2021, the CURED v2A methodology is likely to give similar results to using the EFT v8.0 data. Post 2021, when the introduction of Euro 6c begins to take effect, then CURED v2A and the EFT v8.0 begin to diverge.

### 1.7.6 Future Year Assessment Methodology

The selection of emission factors for a future year assessment depends partly on the situation regarding the assessment to be undertaken. Where pollutant concentrations are low and are unlikely to exceed threshold levels, then one may take a conservative approach and keep emission factors at current levels. This will produce a conservative result, but as the result will be ‘acceptable’ in terms of leading to no exceedances of National Air Quality Strategy Objectives, then it is a reasonable approach to adopt as it avoids uncertainty as to whether there will be exceedances in the future.

In contrast, where pollutant concentrations are high, then a different approach to uncertainty is required. In addition, for a formal Environmental Impact Assessment the legal requirement is to assess ‘likely significant effects’. This is not ‘worst case’ significant effects, but ‘likely’ significant effects and therefore must allow for a degree of uncertainty in the predictions.

As discussed in Section 2, the use of the verification factor in the modelling takes account, amongst other things, of the difference in the real world emissions performance of vehicles in the fleet. For developments up until 2021, the current EFT should be reasonably accurate as to NO<sub>x</sub> emissions as the problem with the performance of diesel vehicles has been recognised. As such, one is justified in using the emission factors for the year of the assessment as the uncertainty in the emission factors is taken account of by using the verification factor.

Developments post 2021 will increasingly be influenced by the assumption that the RDE testing of diesel vehicles is effective, which may or may not turn out to be the case. In essence, the result is likely to lie between the green and red curves of the previous graph. This is likely to become less important as the actual levels of emissions is significantly reduced in the future. If a conservative approach is warranted, one could follow the green curve, the effect of which is outlined in the table below.

Traffic Data year	EFT v8 year
2015	2015
2016	2016
2017	2017

2018	2018
2019	2019
2020	2020
2021	2021
2022	2021
2023	2022
2024	2022
2025	2023
2026	2023
2027	2024
2028	2024
2029	2025
2030	2025
Beyond 2030	2025

In the case of a large development with a completion year a long time into the future, then if only completion year traffic data are available, it is likely to be appropriate to assume that the completed year traffic data occurs at the opening year of the development. As appropriate, the change a change in emission year in accordance with the above table may be considered.