Report

Storrington Air Quality Modelling

Air Quality Modelling

For Horsham District Council

26 March 2026

Air Quality Consultants | Part of Logika Group

Document Control

Project Title:	Storrington Air Quality Modelling
Project Number:	17016A
Client:	Horsham District Council
Principal Contact:	Thais Covre Delboni and Isabelle Carter
Document Title:	Air Quality Modelling
Document Number:	17016A-10-R02-02
Prepared By:	Dr Helen Robinson and Dr Rosie Watts
Reviewed By:	Dr Ben Marner

Revision History

01	27/02/2026
02	26/03/2026

Registered Office: 3rd Floor St Augustine's Court, 1 St. Augustine's Place Bristol BS1 4UD Tel: +44(0)117 974 1086

First Floor, 3 – 7 Herbal Hill, London, EC1R 5EJ Tel: +44(0)20 3873 4780

First Floor, Patten House, Moulders Lane, Warrington WA1 2BA Tel: +44(0)1925 937 195

Nile House, Nile St, Brighton and Hove, Brighton BN1 1HW Tel: +44(0)20 3873 4780

1 Aire St, Leeds LS1 4PR Tel: +44(0)20 3873 4780

Avenue du Port, 86c Box 204, 1000 Bruxelles Tel: +44(0)20 3873 4780

Contents

Tables

Figures

1 Introduction

1.1 Air Quality Consultants Ltd (AQC) has been appointed to carry out a study of air quality in Storrington. Horsham District Council (HDC) has declared an Air Quality Management Area (AQMA) for exceedances of the annual mean nitrogen dioxide (NO_2) objective, covering the A284 through the town centre, between the junction with Amberley Road and the bottom of Manley's Hill. Poor air quality in the area is principally due to road traffic, which is often heavy and congested.

1.2 Monitoring data presented in HDC's 2024 Annual status Report (ASR) shows that air quality in Storrington has improved over recent years, and there have been no measured exceedances of the annual mean NO_2 objective since 2019. However, the measured annual mean concentration at the junction of Manley's Hill and School Hill (site Storrington 19n), was 37.0 µg/m^3 in 2023, which is still close to the objective level. Taking this into consideration, HDC wishes to accelerate air quality improvements and enable revocation of the Storrington AQMA.

1.3 One issue, around which HDC and other bodies have worked to improve air quality in Storrington, is through the prohibition of vehicles over 7.5 tonnes from turning right into School Hill from Manley's Hill, with lorries instead being directed via Water Lane. This restriction was introduced in 2019. In 2022, West Sussex County Council (WSCC) and Storrington & Sullington Parish Council undertook a review of the restriction, which included a CCTV traffic survey of goods vehicles entering from either end of the restriction; an additional CCTV camera was located within the restriction length. After the survey, 51 letters were sent to companies that were breaching the weight limit restriction, and more signs were installed.

1.4 HDC considers that an important contributor to traffic and congestion through Storrington is drivers travelling east-west to avoid the A27, which is often heavily congested through Lancing and Worthing, and around Arundel. The proposed Arundel bypass is (as of January 2025[1]) not being taken forward, meaning that pressure on Storrington from this issue is likely to continue.

1.5 In light of this, HDC is considering what further measures can be taken to improve air quality in Storrington and hasten the revocation of the AQMA.

1.6 The overall aims of the study are to:

1) identify the amount of through traffic using roads in the town, and the types of vehicle;
2) assess compliance with the School Hill weight restriction;
3) understand the principal causes of poor air quality in Storrington; and
4) evaluate the air quality impacts of potential interventions.

1.7 The work programme consists of two principal stages: an ANPR survey followed by an air quality assessment. This report summarises the outcomes of the air quality assessment, and is supported by the following appendices: Appendix A1 provides details of the modelling methodology, Appendix A2 provides the results of a source apportionment exercise for receptors not presented in the main text, Appendix A3 provides the results of additional sensitivity tests of the modelled scenarios, Appendix A4 details the professional experience of the consultants involved in the study, and Appendix A5 provides the report on the ANPR data collected from the first stage of the study.

[1] National Highways: A27 Arundell bypass (cancelled). Latest update 16th January 2025, available here: https://nationalhighways.co.uk/our-roads/south-east/a27-arundel-bypass/

2 Pollutant Criteria

2.1 The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are based on assessment of the effects of each pollutant on human health, including the effects on sensitive sub-groups. The 'objectives' set out the extent to which the Government expects the standards to be achieved taking account of practical considerations. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations (2000) and the Air Quality (England) (Amendment) Regulations (2002).

2.2 The UK-wide objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour mean NO_2 objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60 µg/m³ (Defra, 2022). Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32 µg/m³ (Defra, 2022). The predicted annual mean PM_{10} concentrations are thus used as a proxy to determine the likelihood of an exceedance of the 24-hour mean PM_{10} objective. Where predicted annual mean concentrations are below 32 µg/m³ it is unlikely that the 24-hour mean objective will be exceeded.

2.3 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Defra explains where these objectives will apply in its Local Air Quality Management Technical Guidance (Defra, 2022). The annual mean objectives for NO_2 and PM_{10} are considered to apply at the façades of residential properties, schools, hospitals etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objective, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for NO_2 applies wherever members of the public might regularly spend 1-hour or more, including outdoor eating locations and pavements of busy shopping streets.

2.4 For $PM_{2.5}$, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see Paragraph 2.6), originally set at 25 µg/m³ and currently set at 20 µg/m³.

2.5 Defra has also set two targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One target focuses on absolute concentrations, with the long-term target to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m³ by the end of 2040 (referred to as the annual mean concentration target or AMCT). The second target relates to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels (referred to as the population exposure reduction target or PERT). The most recent interim targets published in the 2025 Environmental Improvement Plan (Defra, 2025a) aim to meet the AMCT 10 years early, by December 2030, with the interim PERT being a reduction of 30% by December 2030 (Table 2-1).

Table 2-1: Environment Act $PM_{2.5}$ Targets

Metric	Target	Target year
AMCT	Interim target: 10 µg/m³	2030
	Legally binding target: 10 µg/m³	2040
PERT	Interim target: 30% reduction in exposure compared to 2018	2030

Metric	Target	Target year
	Legally binding target: 35% reduction in exposure compared to 2018	2040

2.6 EU Directive 2008/50/EC (The European Parliament and the Council of the European Union, 2008) sets limit values for NO_2, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standards Regulations (2010)[2]. The limit values for NO_2 and PM_{10} are the same numerical concentrations as the UK objectives, but achievement of the limit values is a national obligation rather than a local one and concentrations are reported to the nearest whole number. In the UK, only monitoring and modelling carried out by UK Central Government meets the specification required to assess compliance with the limit values. Central Government does not normally recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded, unless such studies have been audited and approved by Defra and DfT's Joint Air Quality Unit (JAQU).

2.7 The relevant air quality criteria for this assessment are provided in Table 2-2.

Table 2-2: Air Quality Criteria for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Time Period	Value
NO_2	1-hour Mean	200 µg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40 µg/m^3
PM_{10}	24-hour Mean	50 µg/m^3 not to be exceeded more than 35 times a year
	Annual Mean	40 µg/m^3 [a]
$PM_{2.5}$	Annual Mean	20 µg/m^3 [b]

[a] A proxy value of 32 µg/m^3 as an annual mean is used in this assessment to assess the likelihood of the 24-hour mean PM_{10} objective being exceeded. Measurements have shown that, above this concentration, exceedances of the 24-hour mean PM_{10} objective are possible (Defra, 2022).

[b] There is no numerical $PM_{2.5}$ objective for local authorities (see Paragraph 2.4). Convention is to assess against the UK limit value which is currently 20 µg/m^3.

[2] As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

3 Assessment Approach

Aims

3.1 The aims of the air quality assessment are to:

- use the detailed vehicle classification data from the ANPR survey to predict air quality within the AQMA, and to source-apportion the predicted concentrations by vehicle type and, where possible, journey purpose (e.g. relating to through traffic); and
- use these current baseline air quality predictions and source-apportionment to assess interventions to improve air quality within the AQMA.

3.2 The study focuses on assessing concentrations of NO_2 and fine particulate matter (PM_{10} and $PM_{2.5}$), as these are the principal pollutants of potential concern.

Study Area

3.3 The study area for the assessment has been identified using professional judgement, focussing on the AQMA and surrounding road network to align with the ANPR survey locations. The study area is shown in Figure 3-1, including the ANPR locations which were deployed for this study, and Automatic Traffic Count (ATC) locations operated by WSCC from which data have also been obtained.

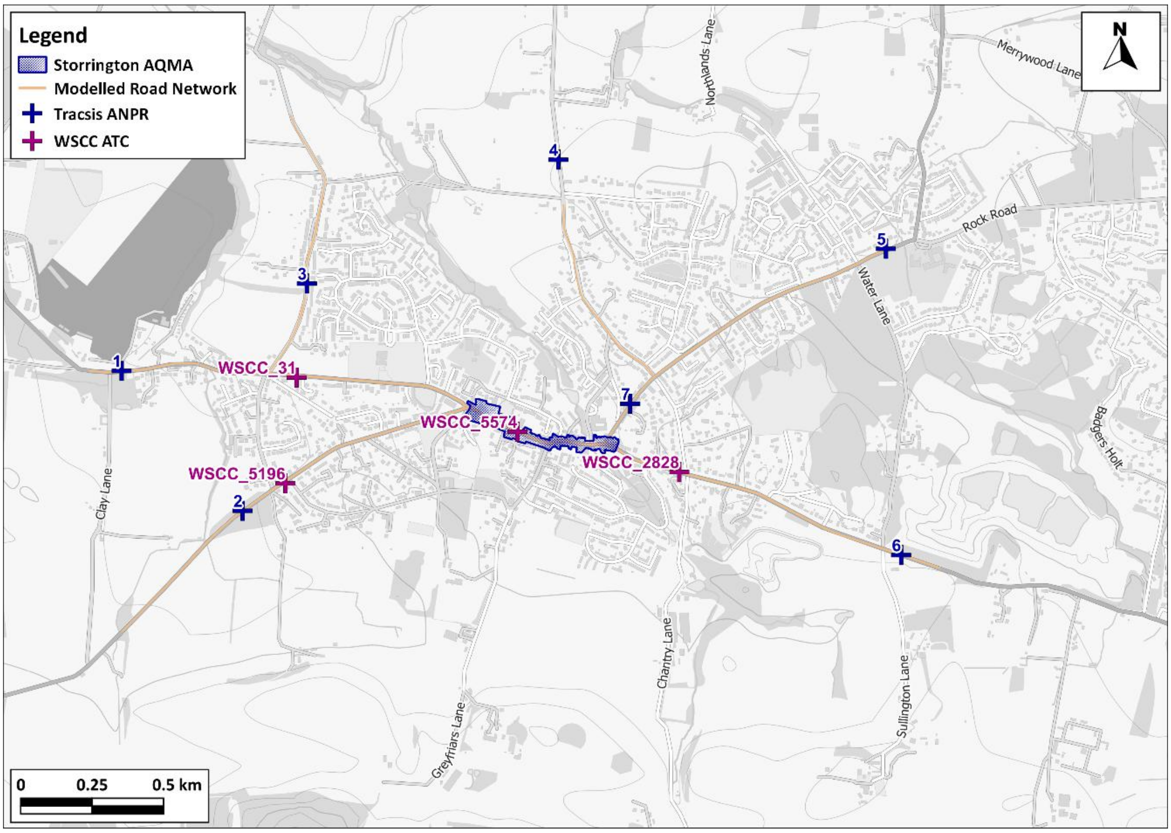

Figure 3-1: Study Area

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Receptors

3.4 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted at a number of locations across Storrington. These include:

- individual receptor locations;
- local air quality monitoring sites; and
- a fine grid of receptors, including both Cartesian and source-oriented grids, which have been used to generate contour maps.

3.5 Individual receptors have been identified to represent a range of exposure, including worst-case locations, such as the façades of residential properties closest to the road network. In total, 31 individual receptor locations have been modelled; these locations are described in Table 3-1 and shown in Figure 3-2. In addition, concentrations have been modelled at 12 monitoring locations across Storrington in order to verify the model outputs (see Appendix A1 for verification method).

Table 3-1: Description of Receptor Locations

ID	Type	Description	Co-ordinates (X,Y)	Height (m)[a]
1	Residential	Approx no.17	(508170,114481)	1.5
2	Residential	House No. unknown	(508335,114487)	1.5
3	Residential	House No. unknown	(508458,114414)	1.5
4	Residential	House No.61 - cottage on Esso roundabout	(508455,114393)	1.5
5	Residential	Houses adjacent to Interior Design Services	(508503,114369)	1.5
6	Residential	The Elms	(508519,114379)	1.5
7	Residential	Approx no.29	(508624,114313)	1.5
8	Nursery	The Nursery School	(508646,114320)	1.0
9	Residential	House No.23	(508667,114297)	1.5
10	Residential	House No.16	(508683,114301)	1.5
11	Residential	Flat above unoccupied shop	(508702,114281)	4.5
12	Residential	Flat above Vintage Barber	(508750,114277)	4.5
13	Residential	Flat above Fowlers Estate Agents	(508753,114288)	4.5
14	Residential	Flat above Eva Rose Bridal	(508789,114282)	4.5
15	Residential	Flat above Halcyon Days Cafe	(508820,114287)	4.5
16	Residential	Flat above The Card Shop	(508830,114273)	4.5
17	Residential	Flat above The Sign Shop	(508879,114268)	4.5
18	Residential	Flat above Nifty Art Gallery	(508932,114272)	4.5
19	Residential	House No.4 Stor Cottage	(508942,114270)	1.5
20	Residential	Virginia Cottage	(508943,114278)	1.5

ID	Type	Description	Co-ordinates (X,Y)	Height (m)[a]
21	Residential	House No. unknown	(508964,114258)	1.5
22	Residential	House No. unknown	(509129,114189)	1.5
23	Residential	Flat above Boots/Estate Agents	(508917,114293)	4.5
24	Residential	Unknown number - next to Vintage Rose tearoom	(508935,114301)	1.5
25	Residential	House No. unknown	(508961,114325)	1.5
26	Residential	House No. 14	(508991,114369)	1.5
27	Residential	House No.23	(508985,114376)	1.5
28	Residential	House No. unknown - opposite fire station	(509035,114451)	1.5
29	Residential	House No.3	(509451,114747)	1.5
30	Residential	House No. unknown	(508354,114369)	1.5
31	Residential	House No.6/8	(508245,114353)	1.5

[a] A height of 1.5 m is used to represent ground-floor level exposure.

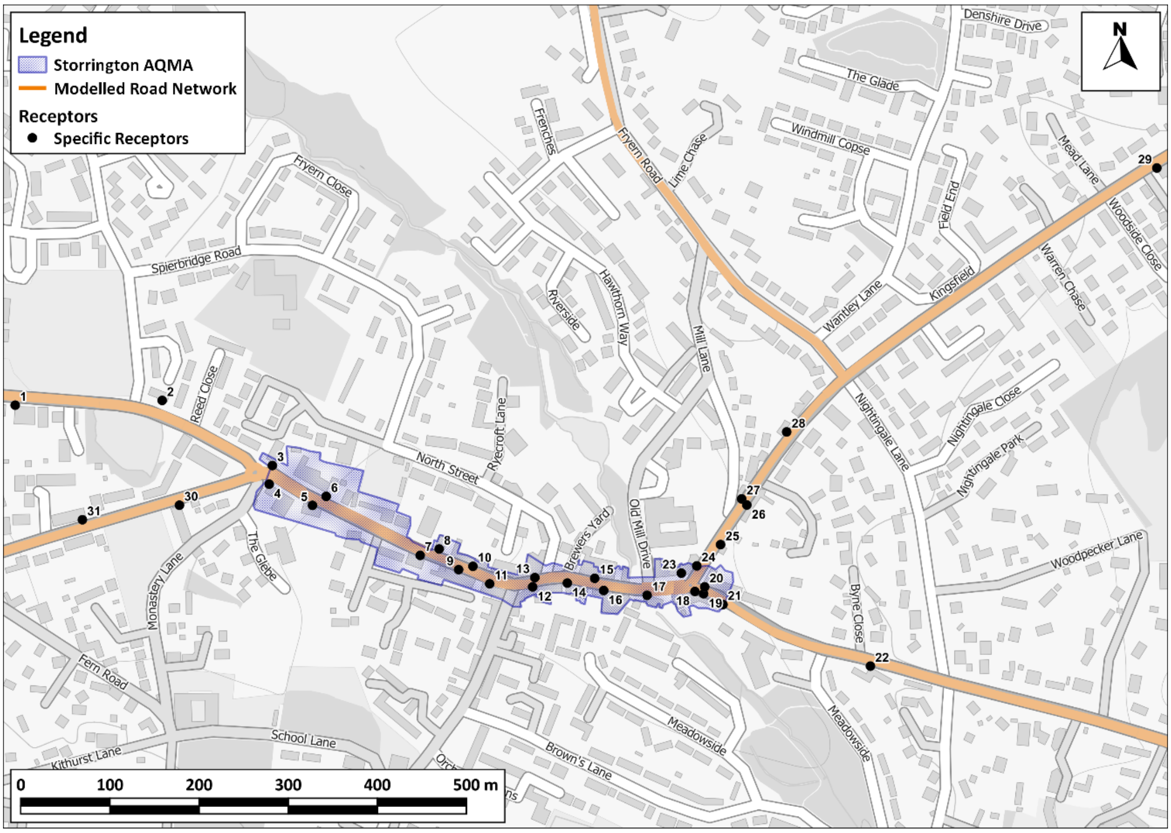

Figure 3-2: Receptor Locations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

3.6 Concentrations have also been predicted across the study area using a Cartesian grid with a spacing of 50 m, and a source-orientated grid of 5 m spacing set back from the road edges by 0.5 m, 1.0 m, 3 m, 5 m, 10 m, 20 m, 50, and 100 m. Both receptor grids have been modelled at a height of 1.5 m above ground level. Receptors have not been modelled within the road network itself.

Data Sources

3.7 Model data inputs and baseline air quality conditions within the study area have been defined using a number of data source:

- information on existing air quality has been obtained by collating the results of monitoring carried out by HDC;
- background concentrations have been defined using Defra's 2021-based background maps (Defra, 2025b). These cover the whole of the UK on a 1x1 km grid. The background annual mean NO_2 maps have been calibrated against concurrent measurements[3]. Mapped background concentrations of PM_{10} and $PM_{2.5}$ have not been adjusted;

[3] https://www.aqconsultants.co.uk/resources

- information on traffic flows and fleet compositions has been collated by compiling the data recorded in the ANPR survey for this study and from ATC sites run by WSCC for the same period (5th – 11th November 2025).

Modelling Methodology

3.8 Concentrations have been predicted using the ADMS-Roads dispersion model, with vehicle emissions derived using Defra's Emissions Factors Toolkit (EFT) (v13.1) (Defra, 2025b). Details of the model inputs and the model verification are provided in Appendix A1.

3.9 NO_2, PM_{10} and $PM_{2.5}$ concentrations have been predicted for one baseline scenario and five assessment scenarios. The rationale behind the assessment scenarios is provided in Section 5. In brief, the following model simulations have been run:

- Baseline: monitored traffic flows and fleet for verification and to represent 'current' conditions;
- Scenario 1 (Sc1): Target local traffic;
- Scenario 2 (Sc2): Target through traffic;
- Scenario 3 (Sc3): Combination of above to target both local and through traffic;
- Scenario 4 (Sc4): Euro standard upgrade; and
- Scenario 5 (Sc5): Organic fleet evolution to 2035.

Impact Description

3.10 The approach developed jointly by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM)[4] (Moorcroft and Barrowcliffe et al, 2017) has been used in describing the modelled impacts of the scenarios tested. The approach identifies impacts at individual receptors based on the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. Table 3-2 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level or AQAL has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

Table 3-2: Air Quality Impact Descriptors for Individual Receptors for All Pollutants [a]

Long-Term Average Concentration At Receptor In Assessment Year	Change in concentration relative to AQAL [b]				
	0%	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial

[4] The IAQM is the professional body for air quality practitioners in the UK.

Long-Term Average Concentration At Receptor In Assessment Year	Change in concentration relative to AQAL [b]				
	0%	1%	2-5%	6-10%	>10%
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

[a] Values are rounded to the nearest whole number.

[b] AQAL = Air Quality Assessment Level, which may be an air quality objective, limit or target value.

Uncertainty

3.11 There are many components that contribute to the uncertainty of modelling predictions. The road traffic emissions dispersion model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them. There are then additional uncertainties, as models are required to simplify real-world conditions into a series of algorithms.

3.12 An important stage in the process is model verification, which involves comparing the model output with measured concentrations (see Appendix A1). The level of confidence in the verification process is necessarily enhanced when data from an automatic analyser have been used, as has been the case for this assessment (see Appendix A1). Because the model has been verified and adjusted, there can be reasonable confidence in the prediction of baseline concentrations.

3.13 Uncertainty in the source apportionment, and in the scenario modelling, is greater. This is because the EFT is unlikely to predict emissions from each vehicle in Storrington with equal reliability. The modelling may therefore underpredict emissions from one vehicle while overpredicting those from another. The current total modelled concentration compares well with measurements, but the relative importance of each vehicle and journey type may be wrong. In practice, the study follows robust and appropriate methods, and therefore this issue has been minimised as far as is practical.

3.14 Scenarios Sc1 to Sc4 have been constructed subjectively, taking account of experience in how different interventions might affect local traffic. The position is therefore that the input assumptions used could almost certainly be delivered. It has not, however, been possible to define the precise local actions which would be needed to ensure this.

4 Baseline Conditions

Local Air Quality Monitoring

4.1 HDC operates three automatic monitoring stations within its area, and one of these is situated within the study area ('HO4'). The Council also operates a number of NO_2 monitoring sites using diffusion tubes prepared and analysed by Socotec (using the 50% TEA in acetone method). Annual mean results for the years 2020 to 2024 are summarised in Table 4-1, while results relating to the 1-hour mean objective are summarised in Table 4-2. Only sites which have been included in the model verification (i.e. sites which were operational in 2024 and adjacent to the modelled road network) are summarised here; the monitoring locations are shown in Figure 4-1. The monitoring data have been taken from HDC's 2025 Annual Status Report (ASR) (HDC, 2025).

Table 4-1: Summary of Annual Mean NO_2 Monitoring (2020-2024) (µg/m³)

Site No.	Site Type	Location	2020	2021	2022	2023	2024
HO4	Roadside	Storrington AURN	17.4	20.1	17.6	17.4	16.6
Storrington1	Roadside	Manley's Hill Roundabout	31.6	24.3	32.9	32.9	28.6
Storrington3	Roadside	School Hill	23.3	24.8	23.7	21.8	19.3
Storrington4	Roadside	High St	25.5	25.9	26.7	24.5	23.3
Storrington5	Roadside	West St	18.7	19.9	19.0	19.2	16.4
Storrington6	Roadside	Pulborough Rd	14.8	17.1	17.4	17.9	15.9
Storrington7	Roadside	Amberley Rd / The Willows	15.6	17.6	17.7	18.8	15.9
Storrington11n	Roadside	53 West St	25.0	26.5	25.9	24.8	20.7
Storrington13n	Roadside	18 West St	21.4	23.1	23.0	21.1	18.4
Storrington14.1n	Roadside	Moorings, Washington Rd	-	-	-	-	26.1
Storrington16n	Roadside	School Hill	18.9	19.2	18.4	17.5	15.1
Storrington19n	Roadside	Manley's Hill	38.4	39.6	38.1	37.0	32.7
Objective			40				

Table 4-2: Number of Hours with NO_2 Concentrations Above 200 µg/m³

Site No.	Site Type	Location	2020	2021	2022	2023	2024
HO4	Roadside	Storrington AURN	0	0	0 (77.2)	0	0
Objective			18 (200) [a]				

[a] Values in brackets are 99.79th percentiles, which are presented where data capture is <75%.

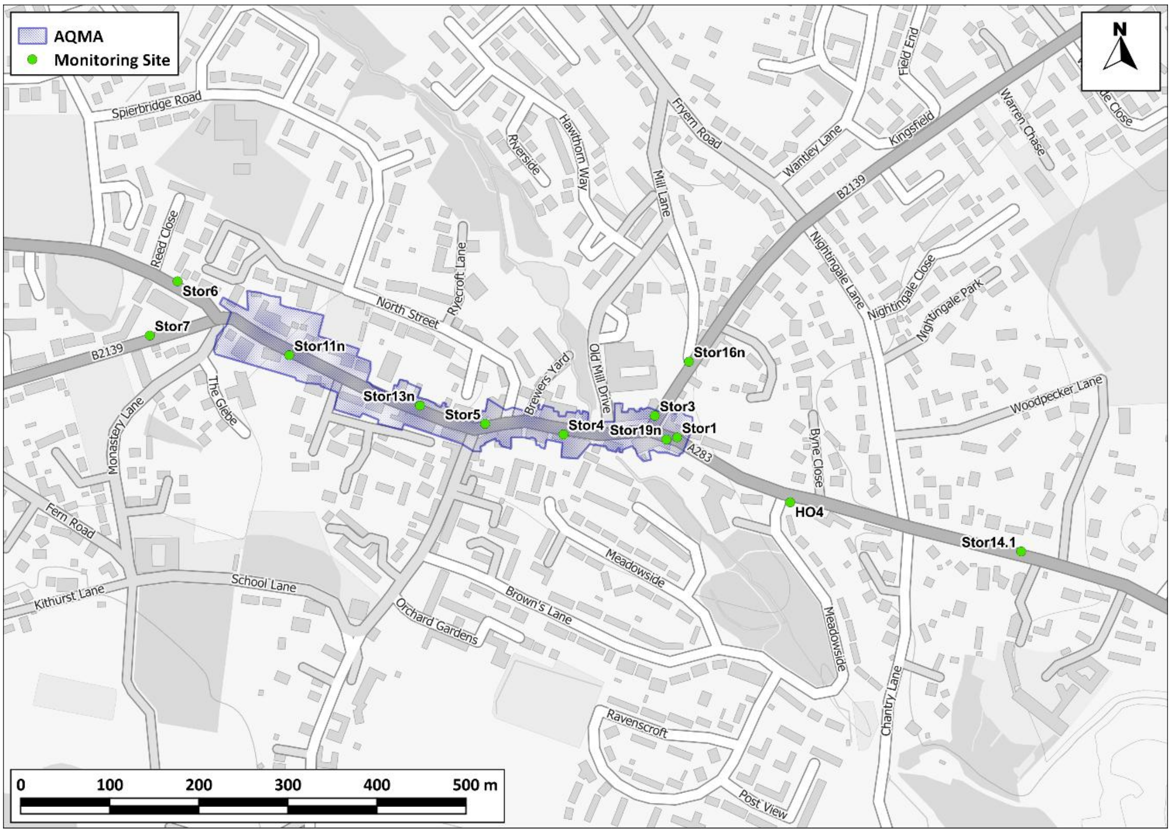

Figure 4-1: Monitoring Locations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

4.2 Monitoring across Storrington has shown that concentrations have been below the annual mean and 1-hour mean NO_2 objectives at all sites in the last five years. The highest concentrations in 2024 were recorded at sites 'Storrington19n' and 'Storrington1', which are both located at the bottom of Manley's Hill.

4.3 While 2020 results have been presented in this Section for completeness, they are not relied upon in any way as they will not be representative of 'typical' air quality conditions due to the considerable impact of the Covid-19 pandemic on traffic volumes and thus pollutant concentrations.

4.4 The HO4 roadside automatic monitoring station also measures PM_{10} and $PM_{2.5}$ concentrations. Annual mean results for the years 2020 to 2024 are summarised in Table 4-3, while results relating to the daily mean objective are summarised in Table 4-4.

Table 4-3: Summary of Annual Mean PM_{10} and $PM_{2.5}$ Monitoring (2020-2024) (µg/m³)

Site No.	Site Type	Location	2020	2021	2022	2023	2024
PM_{10}							
HO4	Roadside	Storrington AURN	-	-	14.0	13.7	12.6
Objective			40				
$PM_{2.5}$							
HO4	Roadside	Storrington AURN	-	-	7.3	7.7	7.7
Objective / AMCT			20 [a] /10 [b]				

[a] The 20 µg/m³ $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[b] To be met by 2040.

Table 4-4: Number of Days with PM_{10} Concentrations Above 50 µg/m³

Site No.	Site Type	Location	2020	2021	2022	2023	2024
HO4	Roadside	Storrington AURN	-	-	0 (21.5)	0	0
Objective			35 (50) [a]				

[a] Values in brackets are 90.4th percentiles, which are presented where data capture is <85%.

Background Concentrations

4.5 Estimated background concentrations in the study area are set out in Table 4-5; a range of values is presented as the study area covers multiple 1x1 km grid squares.

Table 4-5: Estimated Annual Mean Background Pollutant Concentrations in 2024 and 2035 (µg/m³)

Year	NO_2	PM_{10}	$PM_{2.5}$
2024	7.62 – 7.76	9.99 – 10.00	6.13 – 6.21
2035	5.35 – 5.42	9.21 – 9.24	5.46 – 5.52
Objective	40	40	20 [a]
AMCT	-	-	10 [b]

[a] The 20 µg/m³ $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[b] To be met by 2040

Baseline Dispersion Model Results

Modelled Concentrations

4.6 Baseline concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been modelled at each of the existing receptor locations (see Figure 3-2 and Table 3-1 for receptor locations) for 2024, and the results are set out in Table 4-6. The modelled road components of nitrogen oxides have been increased from those predicted by the model based on a comparison with local measurements (see Appendix A1 for the verification methodology).

Table 4-6: Baseline Modelled Annual Mean Pollutant Concentrations of NO_2, PM_{10} and $PM_{2.5}$ (µg/m³) at Individual Receptors

Receptor	NO_2	PM_{10}	$PM_{2.5}$
1	12.8	10.5	6.5
2	13.2	10.6	6.5
3	28.8	12.1	7.4
4	25.4	11.7	7.2
5	20.5	11.4	7.0
6	23.3	11.8	7.2
7	22.3	11.6	7.1
8	24.7	11.9	7.3
9	24.7	11.9	7.2
10	27.6	12.3	7.4
11	13.2	10.5	6.5
12	14.1	10.6	6.5
13	14.7	10.7	6.6
14	14.1	10.6	6.6
15	14.7	10.7	6.6
16	14.1	10.6	6.5
17	14.9	10.6	6.6
18	16.0	10.7	6.6
19	32.6	12.6	7.6
20	37.2	13.2	7.9
21	27.3	11.9	7.3
22	19.7	11.4	6.9
23	16.1	10.8	6.6
24	26.2	11.8	7.2

Receptor	NO_2	PM_{10}	$PM_{2.5}$
25	21.8	11.4	7.0
26	18.4	11.1	6.8
27	17.7	11.0	6.8
28	15.4	10.8	6.6
29	14.5	10.8	6.5
30	18.1	11.1	6.8
31	17.0	11.0	6.8
Assessment Criterion	40	32 [a]	20 [b]
AMCT	-	-	10 [c]

[a] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[b] The 20 µg/m³ $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[c] To be met by 2040, and provided here for reference only.

4.7 The predicted baseline annual mean concentrations of NO_2 are below the annual mean objective at all receptors. The annual mean NO_2 concentrations are also below 60 µg/m³ at every receptor; it is, therefore, unlikely that the 1-hour mean NO_2 objective will be exceeded (see Paragraph 2.2). Receptors 19 and 20 which are located at the bottom of Manley's Hill have the highest modelled NO_2 concentrations, which reflects the higher measured concentrations in this area. The highest predicted annual mean NO_2 concentration at a location with relevant exposure is 37.2 µg/m³, at Receptor 20; this is 7% below the objective level.

4.8 The predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ are below the relevant objectives at all receptors, and $PM_{2.5}$ concentrations are also all below the AMCT. The annual mean PM_{10} concentrations are well below 32 µg/m³ and it is, therefore, highly unlikely that the 24-hour mean PM_{10} objective is exceeded.

4.9 These results are consistent with the conclusions of HDC's ASR.

Contour Maps

4.10 The baseline modelled concentrations across the AQMA, as contour maps, are shown in Figure 4-2 for NO_2, Figure 4-3 for PM_{10} and Figure 4-4 for $PM_{2.5}$. The concentrations across all three pollutants are greatest at the Manley's Hill roundabout in the east of the AQMA.

Figure 4-2: Modelled Baseline NO_2 Concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

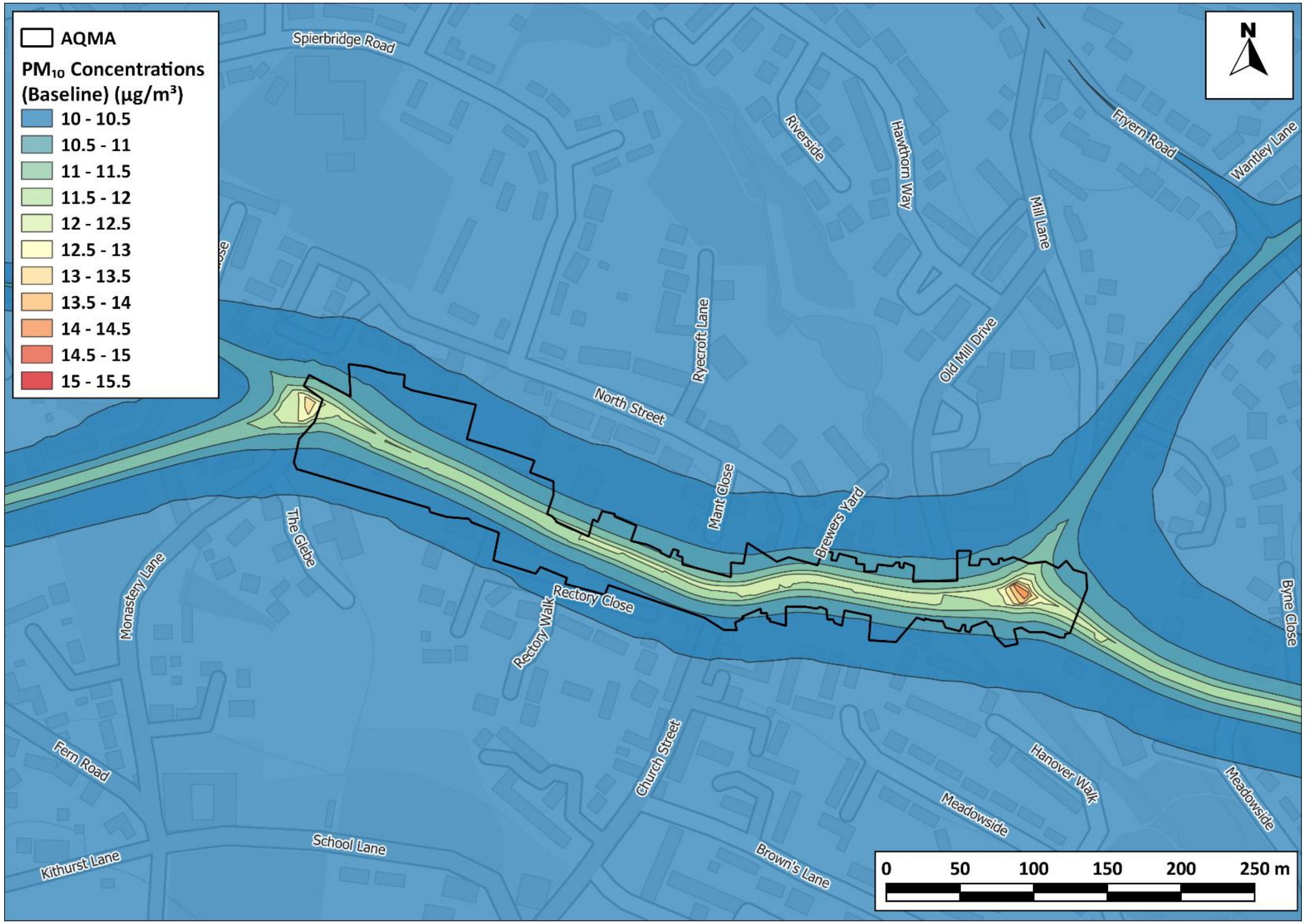

Figure 4-3: Modelled Baseline PM_{10} Concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Figure 4-4: Modelled Baseline $PM_{2.5}$ Concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Source-apportionment

4.11 A source apportionment exercise has been undertaken to demonstrate the proportional contribution to modelled concentrations by journey purpose (i.e. local trips vs through traffic) and by vehicle type (e.g. petrol cars, diesel cars etc.).

4.12 The source apportionment exercise was undertaken for all receptors. However, the results of the exercise were very similar for receptors in close proximity and where they were adjacent to the same road. Therefore, results are presented for a selected number of receptors below to show a representative example across road links modelled. These are provided for all other receptors in Appendix A2.

4.13 The source apportionment at receptors 2, 6, 11, 20, 22, 25 and 30 are shown in Figure 4-5, Figure 4-6, Figure 4-7, Figure 4-8, Figure 4-9, Figure 4-10, and Figure 4-11.

4.14 In the figures, the main vehicle types are labelled. Emissions were also speciated for minority vehicle types, such as LPG cars etc.. These are included in the plots but are not specifically labelled because they contribute relatively little to the totals and labelling every vehicle type would make the plots unreadable.

4.15 Road-attributable pollutant concentrations at receptors adjacent to roads outside the AQMA boundary which aren't classified as a 'through route' (e.g. Receptors 2 and 25) are largely dominated by emissions from local traffic. Meanwhile receptors within the AQMA boundary and adjacent to West St / Manley's Hill (e.g. Receptors 6, 11, and 20) receive approximately a third of road-attributable pollutant concentrations from through traffic. The greatest relative contribution from through traffic to concentrations is along Amberley Road, where approximately half the road contribution of NO_2, PM_{10} and $PM_{2.5}$ concentrations originates from through traffic.

4.16 Diesel cars and diesel LGVs consistently contribute the largest proportion of the modelled NO_2 concentrations from road traffic. Conversely, petrol cars consistently contribute the largest proportion of the modelled PM_{10} and $PM_{2.5}$ concentrations from road traffic.

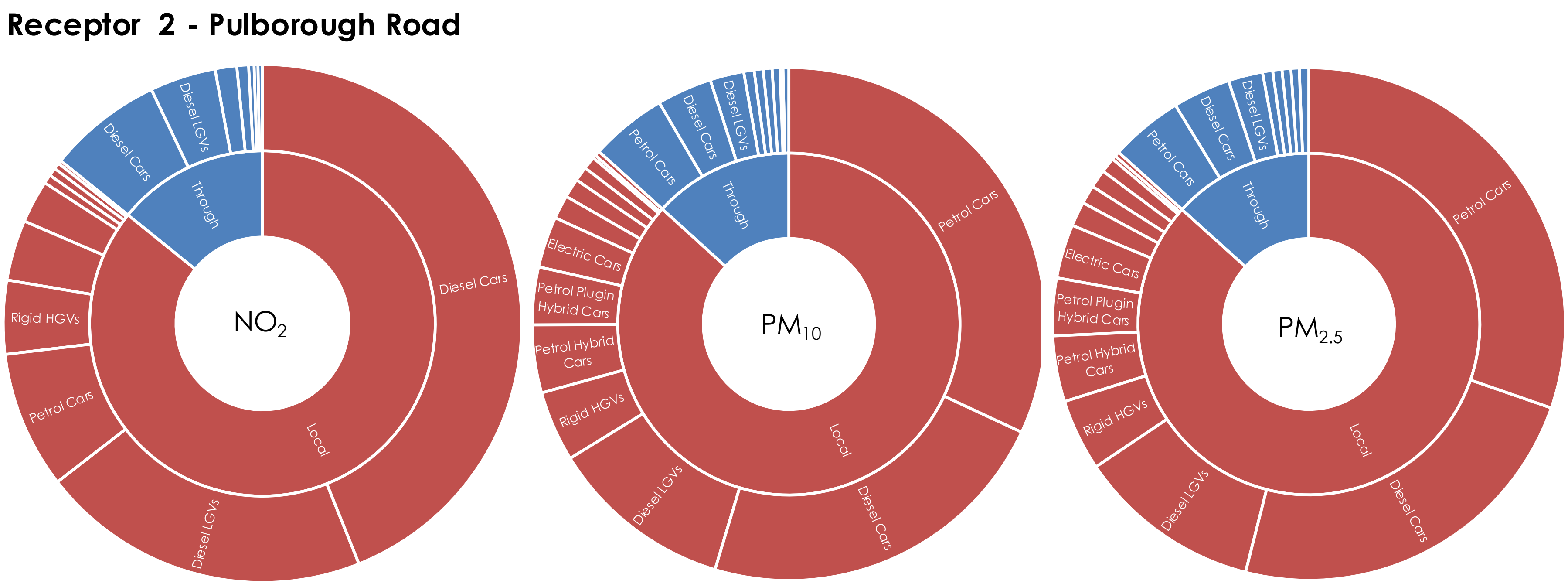

Figure 4-5: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 2 on Pulbuborough Road. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

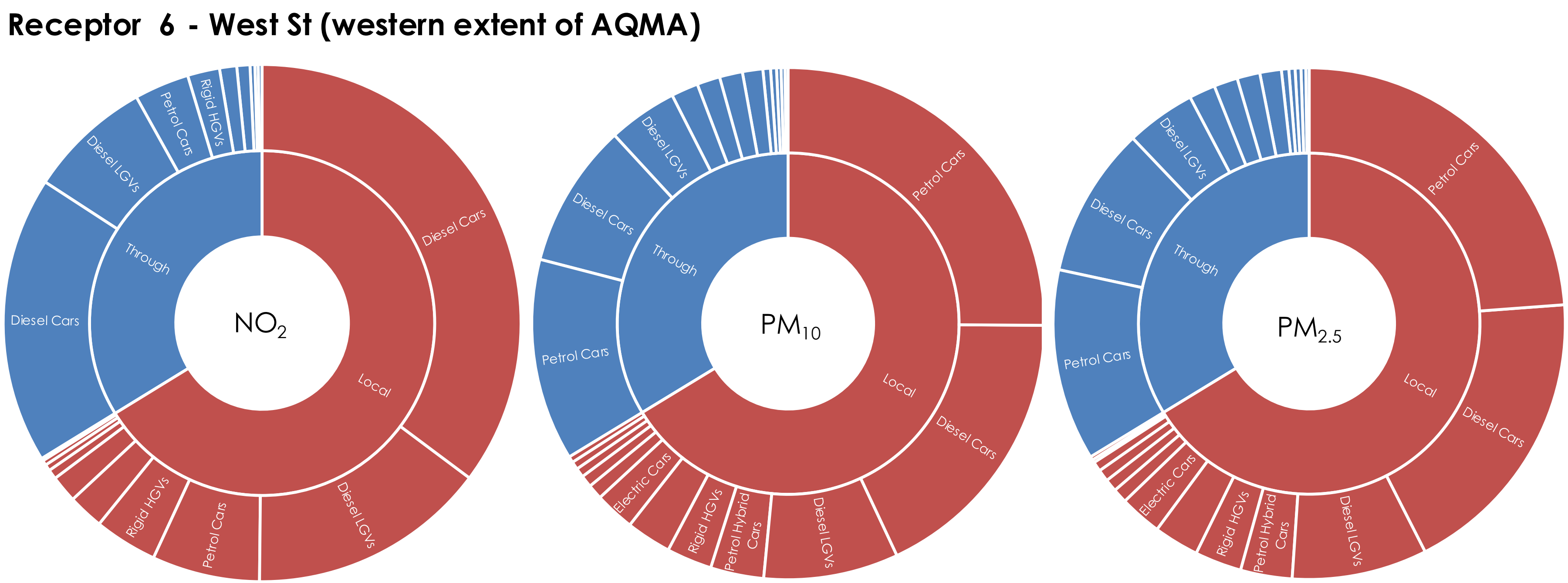

Figure 4-6: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 6 on West St (within the AQMA). The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 11 - West St (central AQMA)

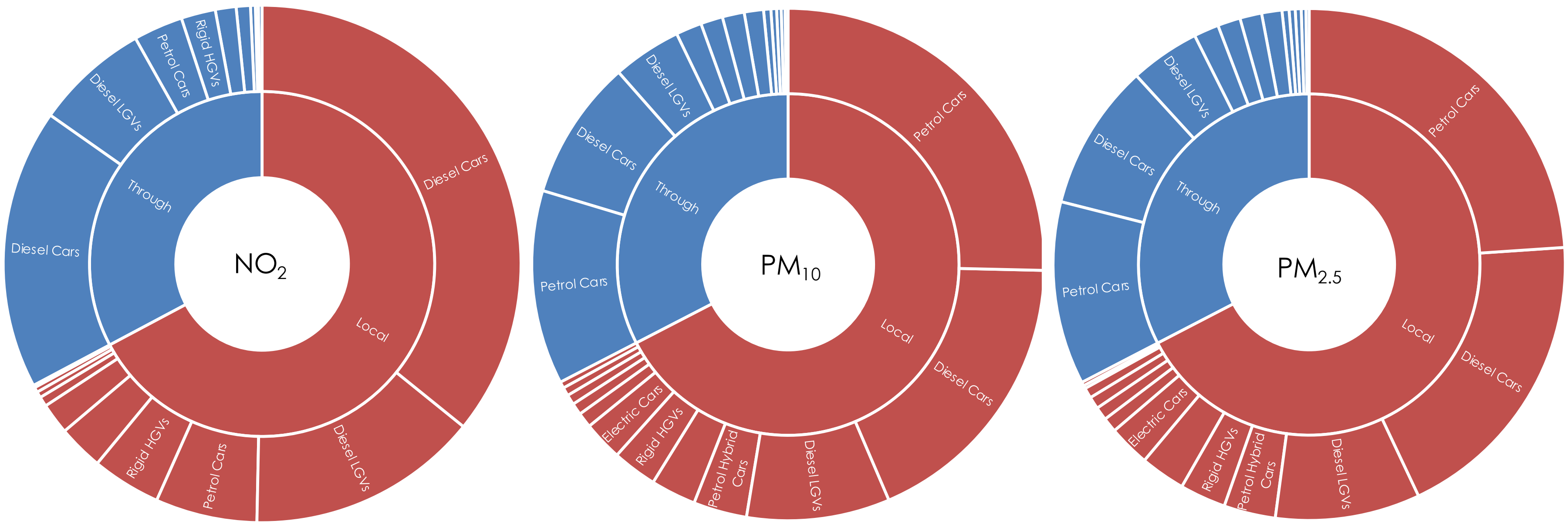

Figure 4-7: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 11 on West St (within AQMA). The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

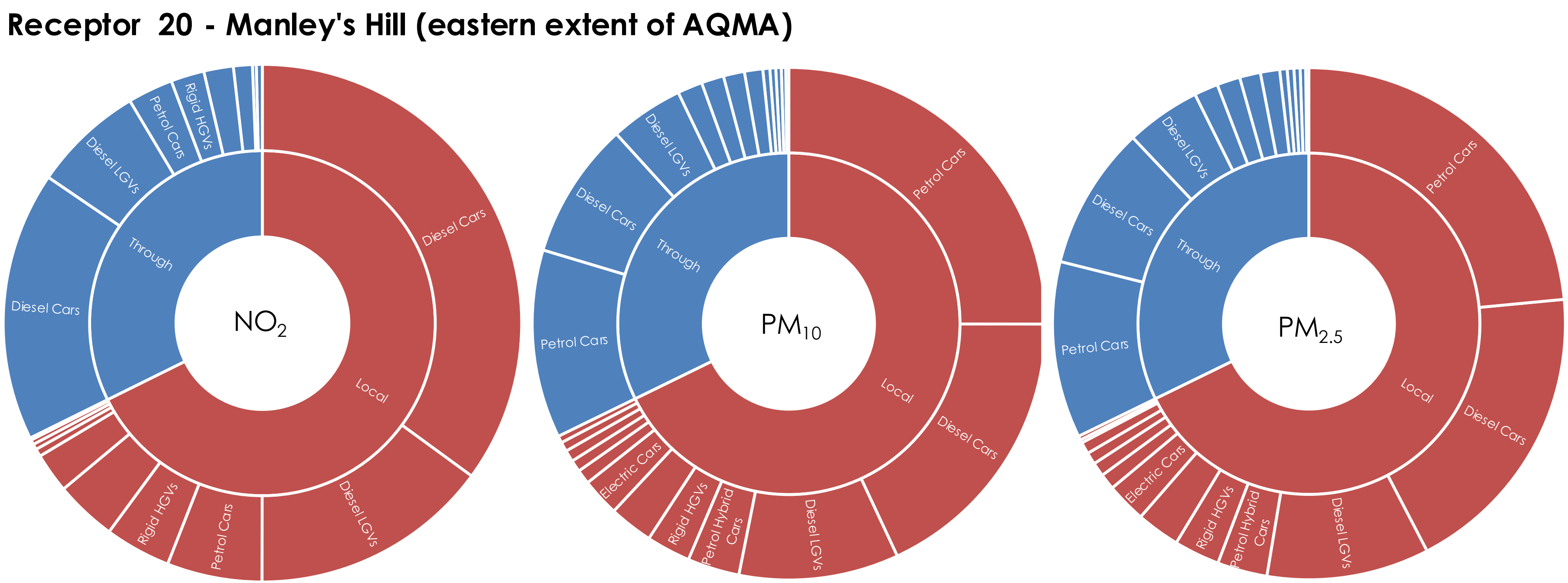

Figure 4-8: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 20 at the bottom of Manley's Hill (within AQMA). The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

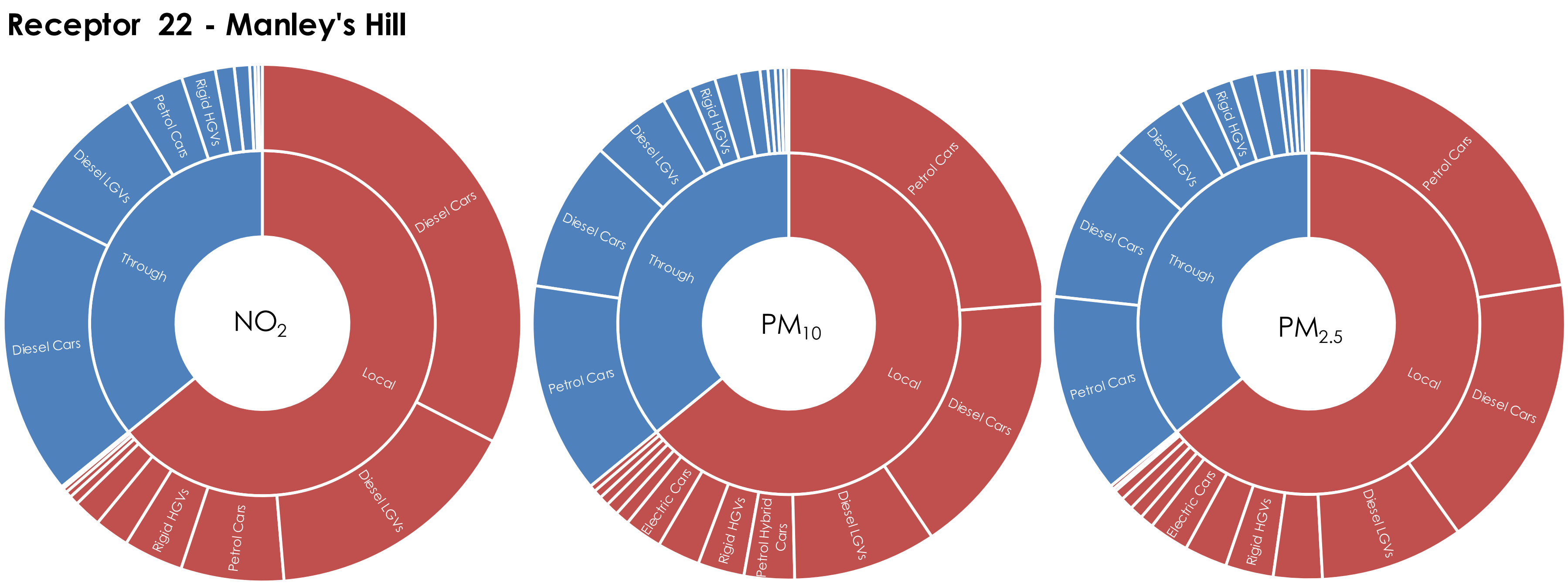

Figure 4-9: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 22 on Manley's Hill. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

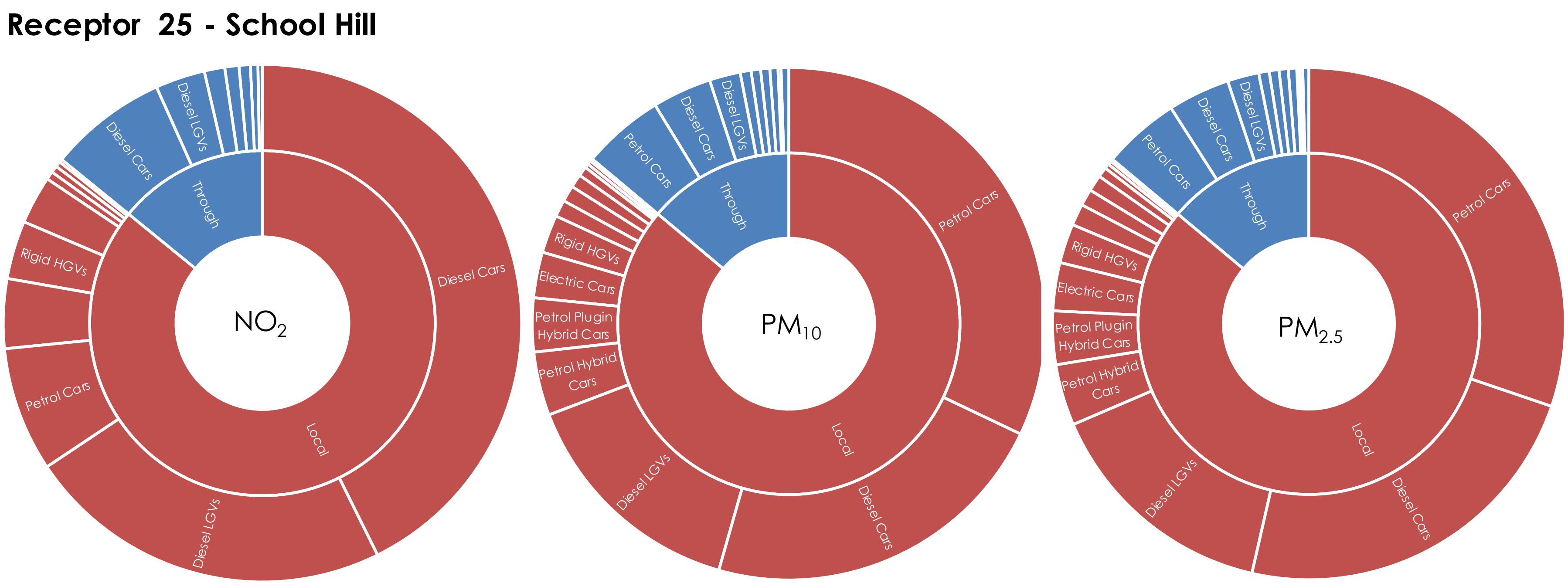

Figure 4-10: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 25 on School Hill. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

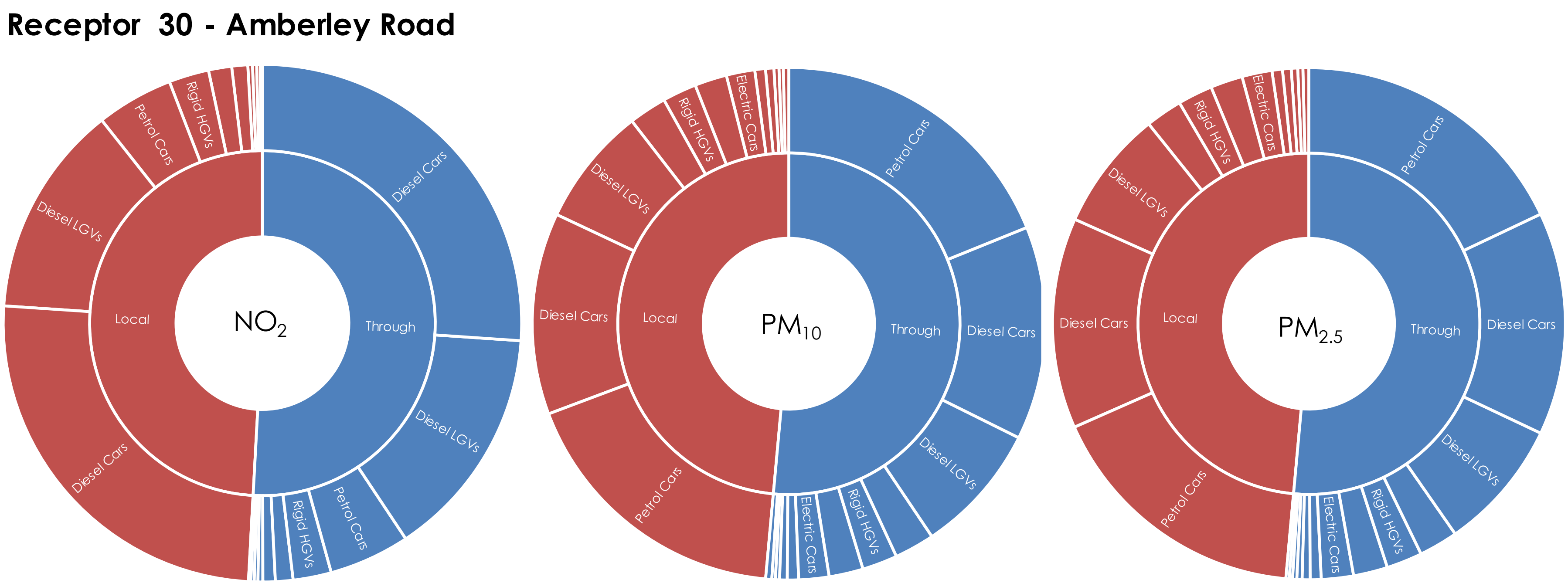

Figure 4-11: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 30 on Amberley Road. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

5 Scenario Testing

Scenario Definition

5.1 Five alternative scenarios have been developed for testing in ADMS. Each scenario represents a set of changes to traffic volumes and fleet composition that could, in principle, be achieved through one or more interventions. The interventions which have been considered are:

- A 20 mph speed limit through Storrington.
- HGV access restrictions.
- A 50 mph speed limit on Amberley Road.
- Changes to road signage and routing information.
- Local active travel and car share.
- Increased EV charging provision.
- Access management and filters.
- Parking management.
- Public transport service changes.
- Fright and servicing management.
- Demand management and pricing.
- Emissions-based access charging.

5.2 It is not within the scope of this study to consider the deliverability, or other consequences, of these interventions, such as economic consequences for local businesses. The inclusion of an intervention in this list should not be taken to suggest that any one of these interventions is currently being considered by HDC. The evidence is provided for information to demonstrate the magnitude of change that such an intervention could conceivably have on air quality. This may inform the design of policies which take account of local deliverability

5.3 In practice, the precise effect of any intervention will depend on how it is implemented, and on a wide range of factors specific to Storrington. It is not within the scope of this study to precisely quantify the local traffic response to each intervention. Different interventions, or packages of interventions, might ultimately deliver the same outcome with respect to changes to local traffic. The approach has therefore been to select broad scenarios which might plausibly be delivered by ambitious local action and to demonstrate the effect that each scenario will have on local air quality.

5.4 The scenarios are described in Table 5-1, and a commentary on each potential facilitating intervention is summarised in the subsections below. It has only been possible to use ADMS to illustrate a limited selection of scenarios, but the source-apportionment data presented in Section 4 is informative in understanding the effect that targeting individual subsets of the fleet could have.

Table 5-1: Assessment Scenarios Considered

Scenario	Parameters	Vehicle types	Possible Interventions
Sc1 Target local traffic	5% traffic removal (cars) and 2% EV share increase (cars and LGVs)	Local/destination traffic only. No change to through traffic or EVs in through component.	20 mph with calming; Active travel / car share; EV charging; Parking management; Public transport
Sc2 Target through traffic	20% removal (all vehicle types in through traffic component)	Through traffic only.	HGV access restriction; Signage / routing; Access management / filters; Freight and servicing management
Sc3 Combined	Sc1 + Sc2 combined	Both local and through components as above.	All of the above in combination.
Sc4 Euro standard upgrade	90% diesel cars and LGVs Euro 6; 95% HDVs Euro VI	All traffic (fleet composition change only; no volume change).	Emissions-based access charging (CAZ-type scheme).
Sc5 Organic fleet evolution	Using EFT inbuilt projections to modify the baseline fleet to year 2035	All traffic	Do nothing but wait until 2035.

20 mph speed limit through the Town Centre

Through traffic

5.5 For through traffic, a 20 mph limit primarily influences route choice and the mix of vehicles choosing a route such as through Storrington versus the A27. Evaluations of sign-only 20 mph limits on former 30 mph urban roads in England show relatively small speed reductions and no significant change in traffic volumes (Atkins, 2010); (DfT, 2018); (Bornioli, 2020). The large-scale Welsh national 20 mph rollout since September 2023 has recorded only small reductions of speed on main restricted roads, with no systematic evidence of significant shifts in through-traffic volumes (Transport for Wales, 2025). Under these conditions, there is little evidence that through traffic diverts away from the treated corridor in a systematic way, and the proportions of cars, light goods vehicles (LGVs) and heavy goods vehicles (HGVs) tend to remain broadly unchanged.

5.6 Where 20 mph limits or zones on village and small-town main streets are accompanied by stronger traffic-calming and place-making measures (for example vertical deflections, build-outs, narrowed carriageways, streetscape changes and prominent gateways), case studies report more noticeable impacts on through flows in the presence of a realistic alternative route (Wheeler, 2010); (TRL, 2003). In such schemes, longer-distance through traffic, particularly non-local car and van trips, can reassign to nearby trunk roads to avoid lower speeds, changes in priority and a more "street-like" environment in the town centre. Reductions in through-traffic volumes on treated links might range from a few per cent up to more than 10%, depending on the strength of the measures. This could therefore contribute to the 20% reduction assumed in Scenarios 2 and 3.

Local traffic

5.7 For local traffic, a 20 mph limit has the potential to influence both the propensity to make short car trips into and within the centre and the mix of vehicle types used for local access. It might also make the uptake of active travel measures (see below) more likely. Evidence from UK 20 mph zones and area-wide schemes, including residential and mixed-use areas, suggests that where lower limits are supported by some physical calming and public-realm improvements, there can be modest (up to ca. 10%) reductions in local car volumes and a shift towards walking and cycling, particularly for short journeys such as school travel and local shopping trips (Atkins, 2010); (DfT, 2004); (Nightingale, 2021). These changes tend to be concentrated in discretionary short-distance car trips rather than across all local traffic (Atkins, 2018). This could therefore contribute to the 5% reduction assumed in Scenarios 1 and 3.

Effect on Average Emissions per Vehicle

5.8 When evaluating the air quality effects of a 20 mph limit using the EFT, there is a significant methodological limitation. The EFT derives its speed–emission curves from the European COPERT model. These curves relate mean link speed to emissions per vehicle kilometre, but the drive cycles underlying the curves at low speeds (e.g. below around 25 mph) reflect congested urban driving conditions characterised by frequent stop–start activity, heavy acceleration events and idle time. When a mean link speed of 20 mph is entered into the EFT, the model therefore interprets this as representative of congested traffic rather than of free-flowing traffic travelling smoothly at or below 20 mph.

5.9 In a small-town context where a sign-only 20 mph limit is introduced on a previously 30 mph road, the actual drive cycle is likely to remain largely unchanged but slightly smoothed: acceleration events are likely to be reduced rather than increased. The EFT, however, assigns the 20 mph speed bin its congested-condition emission factors. The consequence is that a simple comparison using the EFT produces a counterintuitive result: calculated NOx emissions at 20 mph appear higher than at 30 mph, giving the wrong sign of change.

5.10 This limitation has been documented in detail by Defra's Air Quality Expert Group (AQEG, 2021). Evidence from the Wales national rollout also found that measured NO_2 concentrations inside and outside 20 mph areas were within measurement uncertainty (Transport for Wales, 2025).

5.11 In practice, any change to emissions per vehicle caused by introducing a sign-only 20 mph speed restriction is likely to be a modest benefit, but this cannot be simulated using the EFT. Conversely, the introduction of physical calming might increase emissions from acceleration, although this is not currently possible to predict. Emissions associated with a 20 mph zone (e.g. Scenario 1) have therefore been calculated using the same speed assumptions both without and with the intervention.

HGV access restriction

Through traffic

5.12 HGV access restrictions, such as weight limits, time-of-day bans or permit systems, can be powerful measures for changing the through-traffic fleet on a town-centre corridor. Displaced HGVs would be expected to reroute to higher-standard roads or designated lorry routes, with car and LGV flows changing relatively little. Where restrictions are framed as "except for access", local and quasi-local HGVs (for example those serving premises in the town) still enter, but longer-distance through HGVs reassign. The amount of change expected would depend entirely on the restrictions imposed and how they are enforced. This scenario could therefore contribute to the 20% reduction in through traffic assumed in Scenarios 2 and 3.

Local traffic

5.13 For local traffic, HGV restrictions affect the number and nature of delivery and servicing trips entering the town centre and may also lead to some substitution between vehicle types. Local HGV trips to premises within restricted areas often continue via access exemptions, while unnecessary or opportunistic routing through the centre is removed (DfT, 2004b). Some operators could conceivably respond by consolidating deliveries, using fewer, better-loaded HGV trips, or by switching some last-mile operations to LGVs or smaller trucks where feasible (Triantafyllou, 2025). Again, the precise effect would depend on what the restrictions are and are not currently possible to predict. These effects are not, therefore, included in the modelled scenarios.

50 mph limit on Amberley Road

Through traffic

5.14 For through traffic, lowering a higher-speed approach (for example from the national speed limit to 50 mph) mainly affects the relative attractiveness of the "through-town" option compared with remaining on a strategic route. This might be particularly important for longer-distance trips and for freight, where journey-time reliability is especially important. In this context, a 50 mph limit on Amberley Road is likely to make diversion via the town relatively less attractive in conditions where the A27 is not severely congested, and to encourage a slightly higher share of long-distance and freight traffic to remain on the A27. This may therefore contribute to the 20% reduction across all vehicle types assumed in Scenarios 2 and 3.

Local traffic

5.15 For local traffic, a 50 mph limit on Amberley Road is unlikely to materially change trip generation, but may influence route choice and perceived safety, possibly making measures around active travel more effective. This is not, therefore, included in the modelled Scenarios.

Changes to road signage and routing information

Through traffic

5.16 For through traffic, signage that promotes a strategic route and de-emphasises a town-centre corridor might have a significant effect on route choice, particularly for non-local drivers, if coupled with suitable engagement with sat-nav providers. A thorough and coordinated signing and routing strategy that directs longer-distance and freight traffic, including using sat-nav systems, towards the A27 and presents the town-centre corridor mainly as access to local destinations might reduce non-local traffic by several percent. This may therefore contribute to the 20% reduction in traffic assumed in Scenarios 2 and 3.

Local traffic

5.17 For local traffic, changes in signage mainly influence route choice within the local network rather than the number of trips. Local residents rely more on network knowledge than on strategic signing, although clearer signs to car parks, key destinations and service areas can redistribute local access traffic between different approaches. This does not, therefore, influence any of the modelled scenarios.

Local active travel and car share

Through traffic

5.18 Through traffic is largely unaffected directly by local active-travel and car-share measures, as these interventions target residents' mode choices and local trip patterns.

Local traffic

5.19 For local traffic, there is strong evidence that packages of walking, cycling and "smarter choices" measures can reduce car use and change the local fleet mix in some cases. The Sustainable Travel Towns programme found reductions in car driver trips of around 7-10% at the town-wide level over several years, with larger reductions in some corridors and trip purposes (DfT, 2010). Cycling Demonstration Towns and other cycling initiatives also show increased cycling and walking and corresponding decreases in short car trips (Sustrans, 2017) (Goodman, 2014). Car-sharing and car-club schemes can reduce annual car mileage for participating households, although the impact differs by location (Carplus, 2016). These measures may therefore make a significant contribution to the 5% local traffic removal assumed in Scenarios 1 and 3.

5.20 Active travel measures are most effective when combined with other interventions that make the walking and cycling environment safer and more attractive. When delivered alongside 20 mph limits with physical calming, parking management and improved public transport, the combined effect on local car volumes is likely to exceed the sum of the individual measures (DfT, 2010).

Increased EV charging provision

Through traffic

5.21 There is the potential for increased EV provision to cause some EV through trips to divert through the town in order to use charging facilities, but this is unlikely to be significant. Better EV charging provision is unlikely to significantly affect the fleet make up of through traffic.

Local traffic

5.22 A lack of charging opportunities is cited as one of the main barriers to the adoption of plug-in battery electric vehicles particularly for residents without private driveways (Budnitz, 2024). However, while improved local provision may change car purchasing choices, it is unlikely to significantly affect car purchasing timing, and so any effect on local fleets will be relatively slow and modest. Scenarios 1 and 3 therefore apply a 2 percentage point increase in EV share across cars and LGVs in the local traffic component, taking the local EV car share from approximately 6% to approximately 8%. Car purchasing decisions are complex and not driven by a single factor, and so achieving this outcome solely with local measures is unlikely to be straightforward, but similarly local measures are highly likely to be helpful.

Access management and filters

Through traffic

5.23 Access management and modal filters (for example closures to general traffic, bus-only streets, banned turns) directly target through movements and can substantially alter volumes and fleet composition on affected links. Through HGV and LGV movements can be largely eliminated where filters physically prevent larger vehicles or limit access to buses and authorised vehicles only. This measure could therefore conceivably deliver the 20% reduction in through traffic assumed in Scenarios 2 and 3, but is not directly relied upon (i.e. the same effect might be delivered by other interventions).

Local traffic

5.24 For local traffic, filters and access management change how residents, visitors and businesses move within the network and can also influence mode choice. Evidence from low-traffic neighbourhoods indicates substantial reductions in internal motor-traffic volumes and increases in walking and cycling where filters are part of a wider strategy (DfT, 2010). Again, therefore, this intervention could help deliver the 5% reduction in local trips assumed in Scenarios 1 and 3.

Parking management

Through traffic

5.25 Parking measures (such as tariffs, time limits and changes in supply) primarily affect vehicles that stop in the town rather than pure through traffic. Through-traffic volumes can therefore be treated as essentially unchanged by parking policy.

Local traffic

5.26 For local traffic, parking management can be a major determinant of whether people drive into the town. Studies show that increasing parking charges, tightening controls on long-stay parking and reducing supply can have substantial effects on car trips, depending on the scale of change and the availability of alternatives (Marsden, 2006). Workplace parking levies may reduce car commuting and shift demand to public transport and active modes (Dale, 2019). Again, therefore, this provides another means by which the 5% reduction in local traffic assumed in Scenarios 1 and 3 might be achieved.

5.27 Parking management is most effective as part of a wider package. The combination of parking restraint, improved public transport, and enhanced active-travel infrastructure can achieve reductions in local car trips that are substantially greater than any single measure alone.

Public transport service changes

Through traffic

5.28 Changes in local bus services mainly affect local trip behaviour and have limited direct impact on non-stopping through traffic.

Local traffic

5.29 Better bus services can support reductions in local car use, particularly for commuting and shopping trips where the service quality is high relative to the car alternative. The evidence base on the scale of car trip reduction attributable specifically to bus service improvements in small towns is limited; most UK evaluations focus on urban Quality Bus Partnership schemes or larger city networks. DfT (2004) reviewed public transport promotion as one component of a smarter choices package, noting modest but real contributions to car trip reduction when combined with complementary measures. WebTAG unit M2 provides cross-elasticity estimates between bus service quality and car use that can inform quantitative appraisal, though these are derived from aggregate demand models rather than observed small-town evaluations. This measure is not needed to deliver the 5% reduction in local traffic assumed in Scenarios 1 and 3, but could contribute to this reduction if implemented.

Freight and servicing management (beyond HGV restriction)

Through traffic

5.30 Freight and servicing management, including routing agreements and delivery and servicing plans (DSPs), can complement HGV restrictions in shaping the through-freight fleet. Case studies from UK and European towns show that consolidation schemes reduce the number of individual HGV trips into central areas by concentrating loads on fewer vehicles, while DSPs can align customer and operator behaviour with preferred routes and times (Triantafyllou, 2025); (Verlinde, 2014). In practice, this intervention would require significant levels of engagement outside of the local area, making it challenging to implement. It has not, therefore, been included directly in the modelled scenarios. Nevertheless, this intervention has the potential to reduce through traffic volumes, particularly if key operators could be identified and engaged with.

Local traffic

5.31 For local traffic, freight and servicing management might reshape how goods are delivered within a town, potentially reducing trip numbers and changing vehicle mix. Urban consolidation and coordinated delivery planning can reduce HGV trips to participating premises (Triantafyllou, 2025) (Verlinde, 2014). This intervention is not included directly in the modelled scenarios.

Demand management and pricing (e.g. road-user charging, workplace parking levy)

Through traffic

5.32 Although large-scale congestion charging is mainly used in big cities, evidence from London and Stockholm shows that such measures can reduce car and LGV entries to charged zones and shift the composition of traffic towards more essential movements. In a small-town context, a cordon or access charge around the centre could affect through traffic if it applies to vehicles passing through as well as stopping. This therefore provides a potentially very powerful means of delivering the reductions assumed in Scenarios 2 and 3, but is not specifically relied upon.

Local traffic

5.33 Demand-management measures such as workplace parking levies and local road-user charging are primarily intended to influence local car use and, in some cases, car ownership. Evidence from Nottingham's Workplace Parking Levy shows that such measures can hold down or reduce car commuting and support mode shift towards public transport and active modes (Dale, 2019). This intervention could, therefore, contribute to the 5% reduction in local trips considered in Scenarios 1 and 3.

Emissions-based access charging (Clean Air Zone-type scheme)

5.34 An emissions-based access charge similar to a Clean Air Zone (CAZ) primarily affects the composition of the diesel fleet, and the routing of non-compliant vehicles, rather than total through-traffic volumes. Current UK CAZ practice, as applied in the Class C schemes operating in cities such as Birmingham and Bristol and in London's ULEZ and LEZ, sets minimum standards of Euro 6 for diesel cars and LGVs, Euro VI for HGVs and buses, and Euro 4 for petrol cars, with daily charges applied to non-compliant vehicles.

5.35 The ANPR data shows that the local HGV fleet is already approximately 90% Euro VI compliant. A CAZ targeting HDVs at Euro VI compliance would therefore already be largely met by the current through-HGV fleet. For diesel cars and LGVs, the current local Euro 6 share is approximately 45% for cars and 74% for LGVs; a CAZ requiring Euro 6 would therefore provide a more significant incentive for fleet renewal in these categories. Scenario 4 targets 90% diesel car and LGV Euro 6 and 95% HDV Euro VI compliance. Petrol through-traffic is already mostly Euro 4 or better, so the petrol component of through traffic would not be affected.

5.36 Despite the much smaller size of Storrington than any existing CAZ, it is reasonable to expect that an emissions-based charge applied to the town-centre would lead non-compliant diesel HGVs and LGVs used for through movements either to upgrade to Euro VI/Euro 6 or divert to the A27 to avoid charges. There would, therefore, be both a change in the fleet composition and likely a reduction in through traffic volumes. It has not, however, been possible to predict the scale of rerouting and so Scenario 4 has assumed no change in traffic volume.

5.37 For local traffic, a CAZ-type emissions charge affects ownership, replacement timing and use of non-compliant vehicles among residents, businesses and local fleets. Local diesel car and van owners who regularly access the charged area face repeated charges if they retain non-compliant vehicles, creating a strong incentive either to replace those vehicles with Euro 6 diesels, petrol, hybrid or electric vehicles, or to reduce car use where alternatives exist.

5.38 In practice, access restrictions are often accompanied by exemptions, and the treatment of exemptions can determine how effective such a zone would be in terms of reducing emissions. Furthermore, the specific pricing model significantly affects decisions regarding whether to upgrade a vehicle or pay the charge. The compliance rates assumed in Scenario 4 are in line with observations made for CAZ cities.

Organic Fleet Evolution

5.39 The natural turnover of the vehicle fleet steadily replaces older vehicles with newer ones which meet tighter emissions standards or may be EVs. Scenarios 1 to 4 have considered the implementation of measures to the existing vehicle fleet. Scenario 5 has considered air quality conditions in 2035 without any of these measures but assuming natural fleet turnover.

Scenario Modelling Results

Scenario 1: Target local traffic

Change in Concentrations at Individual Receptors

5.40 Table 5-2 and Table 5-3 show the predicted concentrations at each receptor compared to the baseline.

Table 5-2: Predicted Impacts on Annual Mean NO_2 concentrations ($\mu g/m^3$) for Scenario 1[a]

Receptor	Baseline	Scenario 1	% Change [a]	Descriptor
1	12.8	12.4	-1	Negligible
2	13.2	12.8	-1	Negligible
3	28.8	27.8	-2	Negligible
4	25.4	24.5	-2	Negligible
5	20.5	19.8	-2	Negligible
6	23.3	22.5	-2	Negligible
7	22.3	21.5	-2	Negligible
8	24.7	23.9	-2	Negligible
9	24.7	23.9	-2	Negligible
10	27.6	26.6	-2	Negligible
11	13.2	12.9	-1	Negligible
12	14.1	13.8	-1	Negligible
13	14.7	14.3	-1	Negligible
14	14.1	13.7	-1	Negligible

15	14.7	14.3	-1	Negligible
16	14.1	13.8	-1	Negligible
17	14.9	14.5	-1	Negligible
18	16.0	15.5	-1	Negligible
19	32.6	31.5	-3	Slight Beneficial
20	37.2	36.0	-3	Slight Beneficial
21	27.3	26.4	-2	Negligible
22	19.7	19.0	-2	Negligible
23	16.0	15.6	-1	Negligible
24	26.2	25.2	-3	Negligible
25	21.8	20.9	-2	Negligible
26	18.4	17.6	-2	Negligible
27	17.7	17.0	-2	Negligible
28	15.4	14.8	-1	Negligible
29	14.5	14.0	-1	Negligible
30	18.1	17.7	-1	Negligible
31	17.0	16.6	-1	Negligible
Objective	40			

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

5.41 The annual mean NO_2 concentrations are already below the objective at all receptors. Receptors 19 and 20 have the highest change in concentration, with a reduction of 3% (when rounded). The changes in concentrations are described as slight beneficial. All other receptors have changes in concentrations which are described as negligible in line with the EPUK/IAQM guidance.

Table 5-3: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ concentrations ($\mu g/m^3$) for Scenario 1[a]

Receptor	Annual Mean PM_{10} ($\mu g/m^3$)				Annual Mean $PM_{2.5}$ ($\mu g/m^3$)			
	Baseline	Scenario 1	% Change [a]	Impact Descriptor	Baseline	Scenario 1	% Change [a]	Impact Descriptor
1	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
2	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
3	12.1	12.0	0	Negligible	7.4	7.3	0	Negligible
4	11.7	11.7	0	Negligible	7.2	7.1	0	Negligible
5	11.4	11.4	0	Negligible	7.0	7.0	0	Negligible

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 1	% Change [a]	Impact Descriptor	Baseline	Scenario 1	% Change [a]	Impact Descriptor
6	11.8	11.7	0	Negligible	7.2	7.2	0	Negligible
7	11.6	11.6	0	Negligible	7.1	7.1	0	Negligible
8	11.9	11.9	0	Negligible	7.3	7.2	0	Negligible
9	11.9	11.8	0	Negligible	7.2	7.2	0	Negligible
10	12.3	12.2	0	Negligible	7.4	7.4	0	Negligible
11	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
12	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
13	10.7	10.6	0	Negligible	6.6	6.6	0	Negligible
14	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
15	10.7	10.7	0	Negligible	6.6	6.6	0	Negligible
16	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
17	10.6	10.6	0	Negligible	6.6	6.6	0	Negligible
18	10.7	10.7	0	Negligible	6.6	6.6	0	Negligible
19	12.6	12.5	0	Negligible	7.6	7.6	0	Negligible
20	13.2	13.1	0	Negligible	7.9	7.9	0	Negligible
21	11.9	11.9	0	Negligible	7.3	7.2	0	Negligible
22	11.4	11.3	0	Negligible	6.9	6.9	0	Negligible
23	10.8	10.7	0	Negligible	6.6	6.6	0	Negligible
24	11.8	11.7	0	Negligible	7.2	7.2	0	Negligible
25	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
26	11.1	11.1	0	Negligible	6.8	6.8	0	Negligible
27	11.0	11.0	0	Negligible	6.8	6.8	0	Negligible
28	10.8	10.8	0	Negligible	6.6	6.6	0	Negligible
29	10.8	10.7	0	Negligible	6.5	6.5	0	Negligible
30	11.1	11.1	0	Negligible	6.8	6.8	0	Negligible
31	11.0	11.0	0	Negligible	6.8	6.8	0	Negligible
Criterion	32 [b]		-	-	20 [c]		-	-
AMCT	-		-	-	10 [d]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[d] To be met by 2040, and provided here for reference only.

5.42 The annual mean PM_{10} and $PM_{2.5}$ concentrations are already well below the relevant criteria at all receptors. The changes in concentrations are all 0% (when rounded) and impacts are thus all described as negligible.

Gridded Receptors

5.43 As the changes in concentrations of PM_{10} and $PM_{2.5}$ at selected receptors under Scenario 1 have been shown in Table 5-3 to be negligible at all receptors, the following mapped concentrations and changes compared to the baseline are only presented for NO_2.

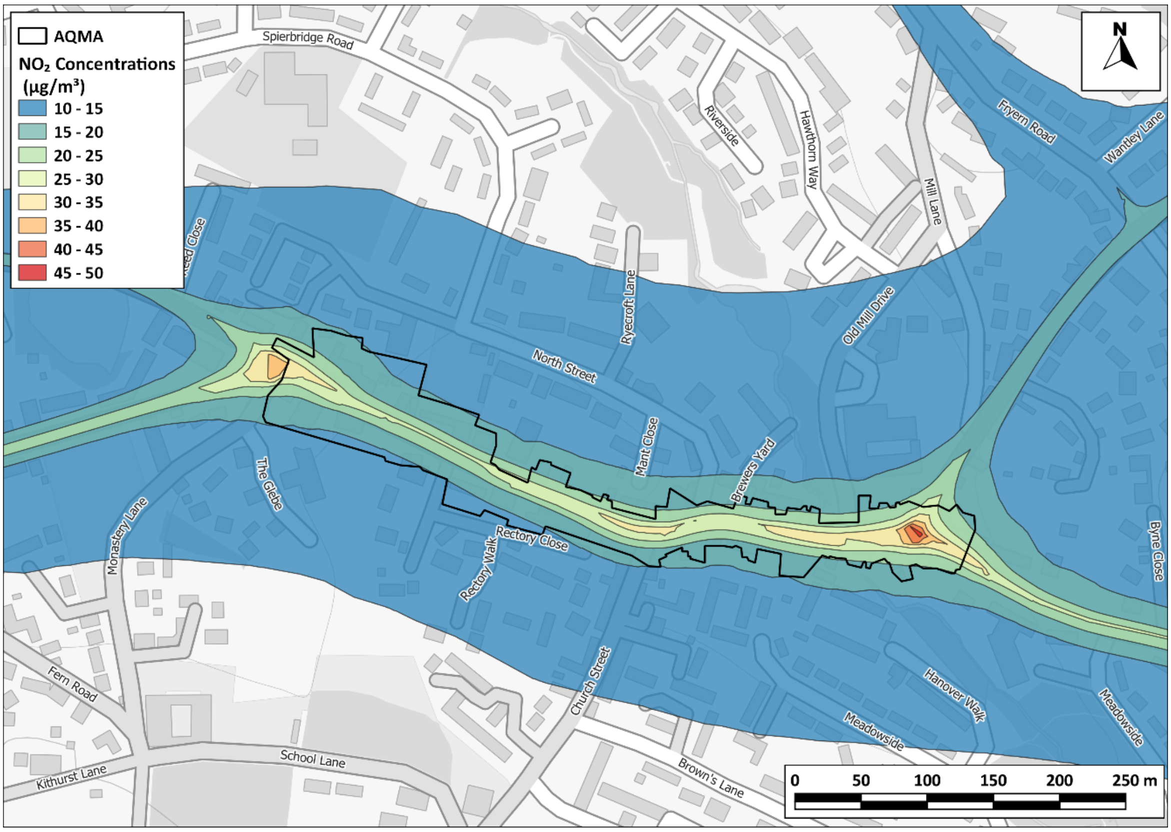

Figure 5-1: Scenario 1 – Modelled NO_2 concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

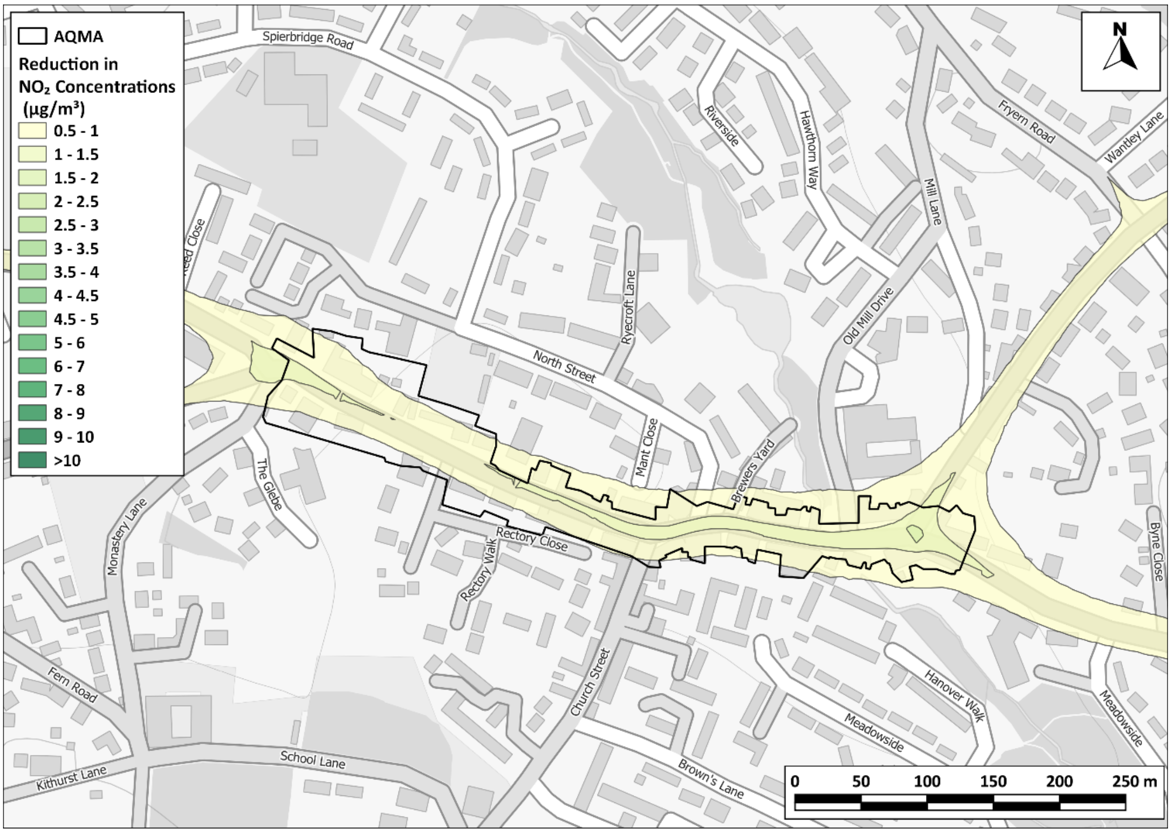

Figure 5-2: Scenario 1 – Modelled NO_2 changes (µg/m³) relative to the baseline

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

5.44 Figure 5-1 and Figure 5-2 show that NO_2 concentrations marginally decrease across the AQMA, these changes are observed along all modelled roads. The greatest changes are found where there are the highest concentrations, primarily at Manley's Hill roundabout.

Scenario 2: Target through traffic

Change in Concentrations at Individual Receptors

5.45 Table 5-4 and Table 5-5 show the predicted concentrations at each receptor compared to the baseline.

Table 5-4: Predicted Impacts on Annual Mean NO_2 concentrations (µg/m³) for Scenario 2[a]

Receptor	Baseline	Scenario 2	% Change [a]	Descriptor
1	12.8	12.7	0	Negligible
2	13.2	13.1	0	Negligible
3	28.8	27.6	-3	Negligible
4	25.4	24.3	-3	Negligible
5	20.5	19.7	-2	Negligible
6	23.3	22.4	-2	Negligible

7	22.3	21.4	-2	Negligible
8	24.7	23.8	-2	Negligible
9	24.7	23.8	-2	Negligible
10	27.6	26.5	-3	Negligible
11	13.2	12.9	-1	Negligible
12	14.1	13.8	-1	Negligible
13	14.7	14.3	-1	Negligible
14	14.1	13.7	-1	Negligible
15	14.7	14.3	-1	Negligible
16	14.1	13.7	-1	Negligible
17	14.9	14.4	-1	Negligible
18	16.0	15.5	-1	Negligible
19	32.6	31.3	-3	Slight Beneficial
20	37.2	35.8	-4	Slight Beneficial
21	27.3	26.1	-3	Negligible
22	19.7	18.9	-2	Negligible
23	16.0	15.6	-1	Negligible
24	26.2	25.5	-2	Negligible
25	21.8	21.5	-1	Negligible
26	18.4	18.2	0	Negligible
27	17.7	17.5	0	Negligible
28	15.4	15.3	0	Negligible
29	14.5	14.5	0	Negligible
30	18.1	17.1	-2	Negligible
31	17.0	16.1	-2	Negligible
Objective	40			

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

5.46 The annual mean NO_2 concentrations are already below the objective at all receptors. Receptors 19 and 20 have the highest change in concentration, with a reduction of 3% and 4% (when rounded), respectively. The changes in concentrations are described as slight beneficial. All other receptors have changes in concentrations that are described as negligible. Scenario 2 is therefore fractionally more effective than Scenario 1 at reducing concentrations at the worst-case receptors, but less effective on peripheral roads which do not carry as much through traffic.

Table 5-5: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ concentrations (µg/m³) for Scenario 2[a]

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 2	% Change [a]	Impact Descriptor	Baseline	Scenario 2	% Change [a]	Impact Descriptor
1	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
2	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
3	12.1	12.0	0	Negligible	7.4	7.3	0	Negligible
4	11.7	11.6	0	Negligible	7.2	7.1	0	Negligible
5	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
6	11.8	11.7	0	Negligible	7.2	7.1	0	Negligible
7	11.6	11.5	0	Negligible	7.1	7.0	0	Negligible
8	11.9	11.8	0	Negligible	7.3	7.2	0	Negligible
9	11.9	11.8	0	Negligible	7.2	7.2	0	Negligible
10	12.3	12.1	0	Negligible	7.4	7.4	0	Negligible
11	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
12	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
13	10.7	10.6	0	Negligible	6.6	6.6	0	Negligible
14	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
15	10.7	10.6	0	Negligible	6.6	6.6	0	Negligible
16	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
17	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
18	10.7	10.7	0	Negligible	6.6	6.6	0	Negligible
19	12.6	12.4	-1	Negligible	7.6	7.5	0	Negligible
20	13.2	13.0	-1	Negligible	7.9	7.8	-1	Negligible
21	11.9	11.8	0	Negligible	7.3	7.2	0	Negligible
22	11.4	11.3	0	Negligible	6.9	6.8	0	Negligible
23	10.8	10.7	0	Negligible	6.6	6.6	0	Negligible
24	11.8	11.7	0	Negligible	7.2	7.2	0	Negligible
25	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
26	11.1	11.1	0	Negligible	6.8	6.8	0	Negligible
27	11.0	11.0	0	Negligible	6.8	6.8	0	Negligible

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 2	% Change [a]	Impact Descriptor	Baseline	Scenario 2	% Change [a]	Impact Descriptor
28	10.8	10.8	0	Negligible	6.6	6.6	0	Negligible
29	10.8	10.8	0	Negligible	6.5	6.5	0	Negligible
30	11.1	11.0	0	Negligible	6.8	6.8	0	Negligible
31	11.0	10.9	0	Negligible	6.8	6.7	0	Negligible
Criterion	32 [b]		-	-	20 [c]		-	-
AMCT	-		-	-	10 [d]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[d] To be met by 2040, and provided here for reference only.

5.47 The annual mean PM_{10} and $PM_{2.5}$ concentrations are already well below the relevant criteria at all receptors. The changes in concentrations are all between 0% and -1% (when rounded) and impacts are all described as negligible.

Gridded Receptors

5.48 As the changes in concentrations of PM_{10} and $PM_{2.5}$ at selected receptors under Scenario 2 have been shown in Table 5-5 to be negligible at all receptors, the following mapped concentrations and changes compared to the baseline are only presented for NO_2.

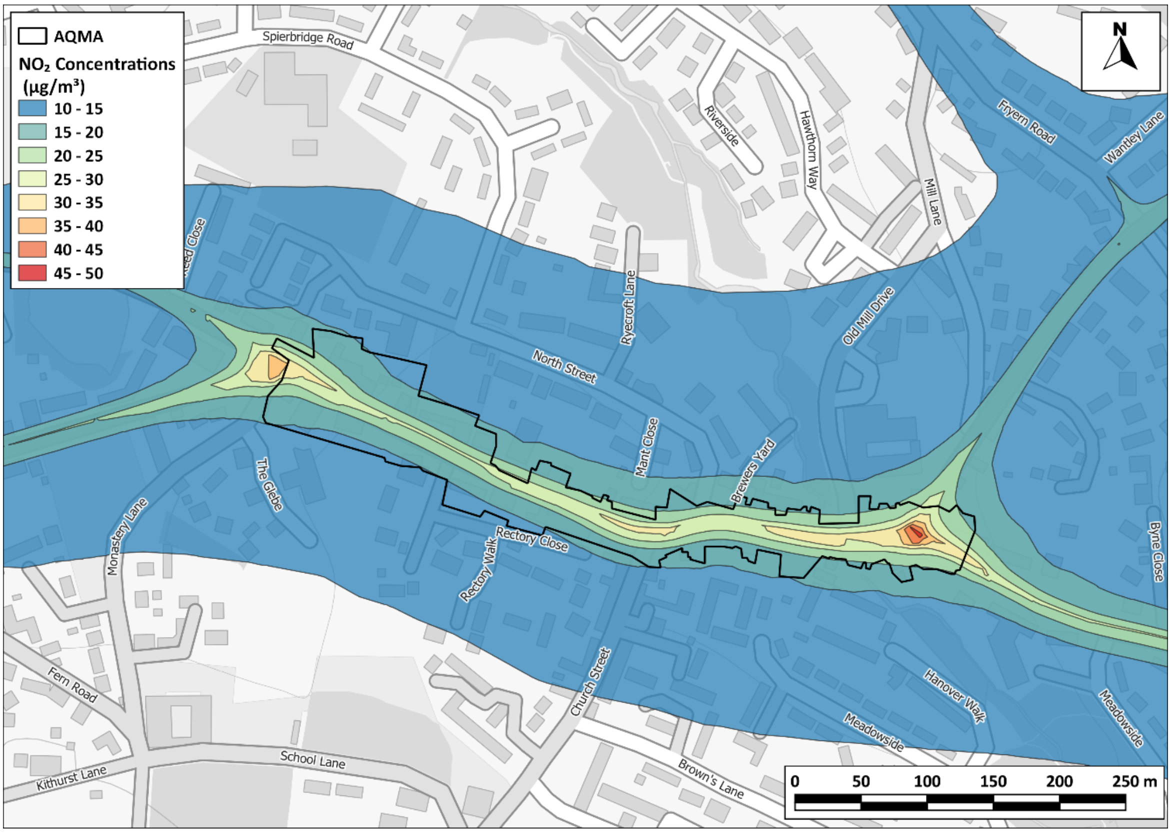

Figure 5-3: Scenario 2 – Modelled NO_2 concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

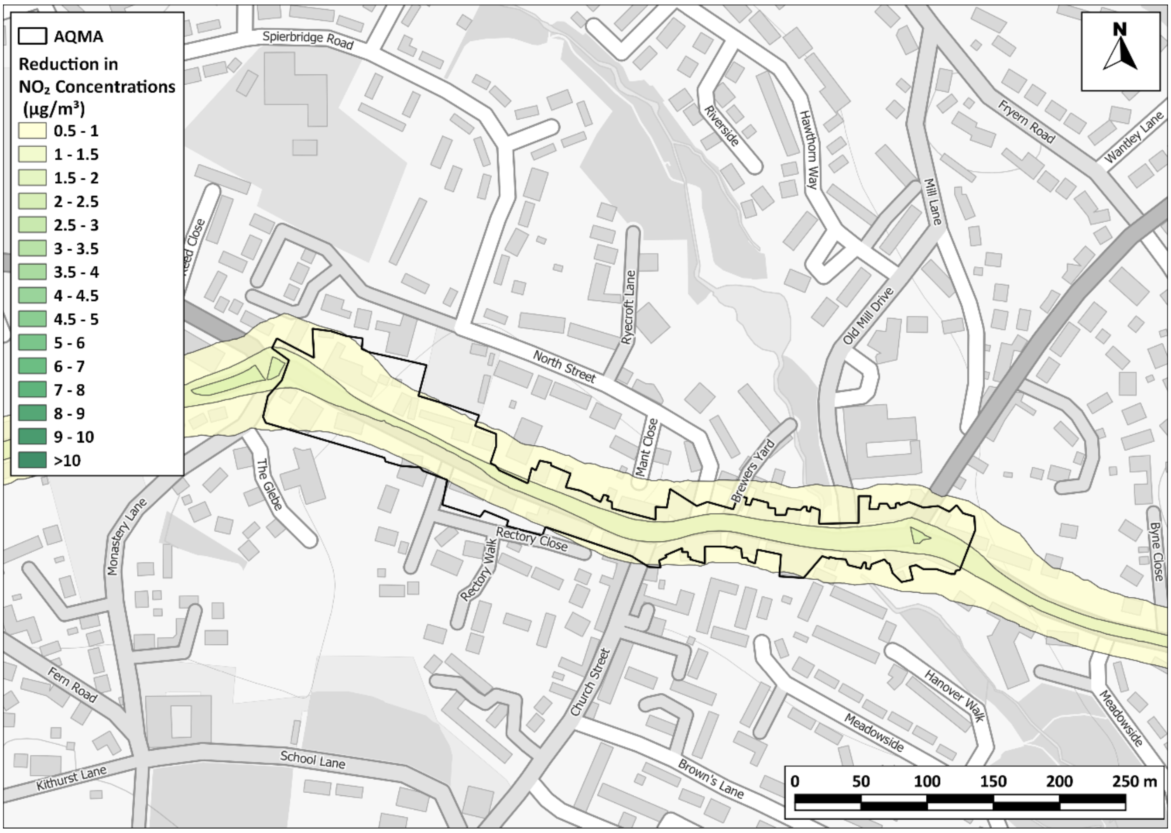

Figure 5-4: Scenario 2 –Modelled NO_2 changes (µg/m³) relative to the baseline

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

5.49 Figure 5-3 and Figure 5-4 show that there are changes in NO_2 concentrations as a result of Scenario 2 across the entire AQMA and along Amberley Road and Manley's Hill. The greatest changes are at the junctions with Pulborough Road and School Hill.

Scenario 3: Combined action to target both local and through traffic

Change in Concentrations at Individual Receptors

5.50 Table 5-6 and Table 5-7 show the predicted concentrations at each receptor compared to the baseline.

Table 5-6: Predicted Impacts on Annual Mean NO_2 concentrations (µg/m³) for Scenario 3[a]

Receptor	Baseline	Scenario 3	% Change [a]	Descriptor
1	12.8	12.3	-1	Negligible
2	13.2	12.6	-1	Negligible
3	28.8	26.6	-5	Negligible
4	25.4	23.5	-5	Negligible
5	20.5	19.0	-4	Negligible
6	23.3	21.6	-4	Negligible

7	22.3	20.7	-4	Negligible
8	24.7	22.9	-5	Negligible
9	24.7	22.9	-5	Negligible
10	27.6	25.5	-5	Negligible
11	13.2	12.6	-2	Negligible
12	14.1	13.4	-2	Negligible
13	14.7	13.9	-2	Negligible
14	14.1	13.4	-2	Negligible
15	14.7	13.9	-2	Negligible
16	14.1	13.4	-2	Negligible
17	14.9	14.0	-2	Negligible
18	16.0	15.1	-2	Negligible
19	32.6	30.1	-6	Moderate Beneficial
20	37.2	34.5	-7	Moderate Beneficial
21	27.3	25.2	-5	Negligible
22	19.7	18.2	-4	Negligible
23	16.0	15.1	-2	Negligible
24	26.2	24.5	-4	Negligible
25	21.8	20.6	-3	Negligible
26	18.4	17.4	-2	Negligible
27	17.7	16.8	-2	Negligible
28	15.4	14.7	-2	Negligible
29	14.5	13.9	-1	Negligible
30	18.1	16.7	-3	Negligible
31	17.0	15.7	-3	Negligible
Objective	40			

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

5.51 The annual mean NO_2 concentrations are below the objective at all receptors. Receptors 19 and 20 have the highest change in concentration, with a reduction of 6% and 7% (when rounded), respectively. The changes in concentrations are described as moderate beneficial. All other receptors have changes in concentrations that are described as negligible.

Table 5-7: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ concentrations (µg/m³) for Scenario 3[a]

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 3	% Change [a]	Impact Descriptor	Baseline	Scenario 3	% Change [a]	Impact Descriptor
1	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
2	10.6	10.5	0	Negligible	6.5	6.5	0	Negligible
3	12.1	11.9	-1	Negligible	7.4	7.3	-1	Negligible
4	11.7	11.6	-1	Negligible	7.2	7.1	0	Negligible
5	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
6	11.8	11.6	-1	Negligible	7.2	7.1	0	Negligible
7	11.6	11.5	0	Negligible	7.1	7.0	0	Negligible
8	11.9	11.7	-1	Negligible	7.3	7.2	-1	Negligible
9	11.9	11.7	-1	Negligible	7.2	7.1	-1	Negligible
10	12.3	12.0	-1	Negligible	7.4	7.3	-1	Negligible
11	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
12	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
13	10.7	10.6	0	Negligible	6.6	6.5	0	Negligible
14	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
15	10.7	10.6	0	Negligible	6.6	6.5	0	Negligible
16	10.6	10.5	0	Negligible	6.5	6.5	0	Negligible
17	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
18	10.7	10.7	0	Negligible	6.6	6.6	0	Negligible
19	12.6	12.3	-1	Negligible	7.6	7.5	-1	Negligible
20	13.2	12.9	-1	Negligible	7.9	7.8	-1	Negligible
21	11.9	11.7	-1	Negligible	7.3	7.2	-1	Negligible
22	11.4	11.3	0	Negligible	6.9	6.8	0	Negligible
23	10.8	10.7	0	Negligible	6.6	6.6	0	Negligible
24	11.8	11.7	0	Negligible	7.2	7.1	0	Negligible
25	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
26	11.1	11.1	0	Negligible	6.8	6.8	0	Negligible
27	11.0	11.0	0	Negligible	6.8	6.8	0	Negligible

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 3	% Change [a]	Impact Descriptor	Baseline	Scenario 3	% Change [a]	Impact Descriptor
28	10.8	10.8	0	Negligible	6.6	6.6	0	Negligible
29	10.8	10.7	0	Negligible	6.5	6.5	0	Negligible
30	11.1	11.0	0	Negligible	6.8	6.8	0	Negligible
31	11.0	10.9	0	Negligible	6.8	6.7	0	Negligible
Criterion	32 [b]		-	-	20 [c]		-	-
AMCT	-		-	-	10 [d]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[d] To be met by 2040, and provided here for reference only.

5.52 The annual mean PM_{10} and $PM_{2.5}$ concentrations are well below the relevant criteria at all receptors. The changes in concentrations are all between 0% and -1% (when rounded) and impacts are all described as negligible.

Gridded Receptors

5.53 As the changes in concentrations of PM_{10} and $PM_{2.5}$ at selected receptors under Scenario 3 have been shown in Table 5-7 to be negligible at all receptors, the following mapped concentrations and changes compared to the baseline are only presented for NO_2.

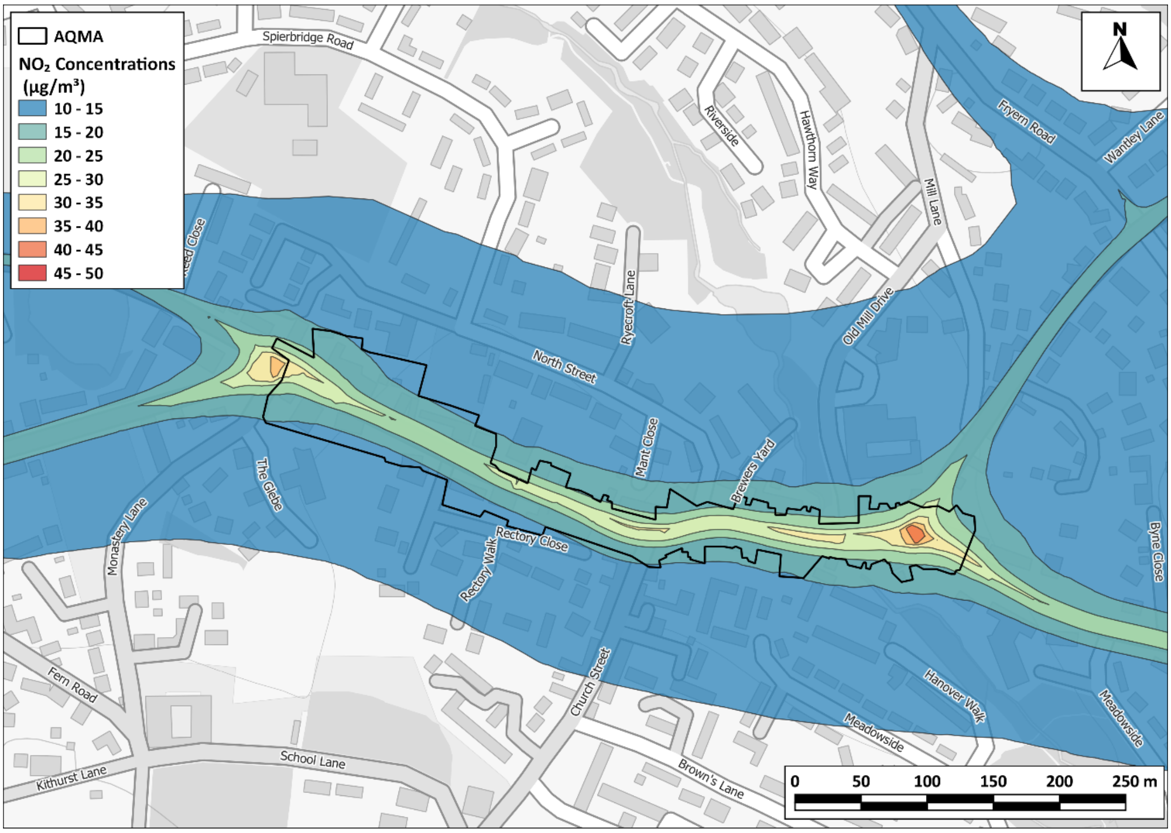

Figure 5-5: Scenario 3 – Modelled NO_2 concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Figure 5-6: Scenario 3 –Modelled NO_2 changes (μg/m³) relative to the baseline

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

5.54 Figure 5-5 and Figure 5-6 show that concentrations decrease across the AQMA as result of Scenario 3. The greatest changes occur at both roundabouts, as well as generally within the eastern extent of the AQMA.

Scenario 4: Euro standard upgrade

Change in Concentrations at Individual Receptors

5.55 Table 5-8 and Table 5-9 show the predicted concentrations at each receptor compared to the baseline.

Table 5-8: Predicted Impacts on Annual Mean NO_2 concentrations (μg/m³) for Scenario 4[a]

Receptor	Baseline	Scenario 4	% Change [a]	Descriptor
1	12.8	11.8	-2	Negligible
2	13.2	12.1	-3	Negligible
3	28.8	25.1	-9	Slight Beneficial
4	25.4	22.2	-8	Slight Beneficial
5	20.5	18.3	-5	Negligible
6	23.3	20.7	-6	Slight Beneficial

7	22.3	19.8	-6	Slight Beneficial
8	24.7	21.9	-7	Slight Beneficial
9	24.7	21.8	-7	Slight Beneficial
10	27.6	24.3	-8	Slight Beneficial
11	13.2	12.2	-3	Negligible
12	14.1	12.9	-3	Negligible
13	14.7	13.4	-3	Negligible
14	14.1	12.9	-3	Negligible
15	14.7	13.4	-3	Negligible
16	14.1	12.9	-3	Negligible
17	14.9	13.4	-4	Negligible
18	16.0	14.3	-4	Negligible
19	32.6	28.0	-12	Moderate Beneficial
20	37.2	32.1	-13	Moderate Beneficial
21	27.3	23.5	-9	Slight Beneficial
22	19.7	17.6	-5	Negligible
23	16.0	14.4	-4	Negligible
24	26.2	22.8	-9	Slight Beneficial
25	21.8	19.2	-7	Slight Beneficial
26	18.4	16.5	-5	Negligible
27	17.7	15.9	-4	Negligible
28	15.4	14.0	-4	Negligible
29	14.5	13.4	-3	Negligible
30	18.1	16.3	-4	Negligible
31	17.0	15.5	-4	Negligible
Objective	40			

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

5.56 Receptors 19 and 20 have the highest change in concentration, with a reduction of 12% and 13% (when rounded), respectively. The changes in concentrations are described as moderate beneficial. A further 10 receptors have a change in concentration which is described as slight beneficial. All other receptors have changes in concentrations that are described as negligible.

Table 5-9: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ concentrations (µg/m³) for Scenario 4[a]

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 4	% Change [a]	Impact Descriptor	Baseline	Scenario 4	% Change [a]	Impact Descriptor
1	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
2	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
3	12.1	12.0	0	Negligible	7.4	7.3	0	Negligible
4	11.7	11.7	0	Negligible	7.2	7.1	0	Negligible
5	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
6	11.8	11.7	0	Negligible	7.2	7.1	0	Negligible
7	11.6	11.6	0	Negligible	7.1	7.0	0	Negligible
8	11.9	11.9	0	Negligible	7.3	7.2	0	Negligible
9	11.9	11.8	0	Negligible	7.2	7.2	0	Negligible
10	12.3	12.2	0	Negligible	7.4	7.4	0	Negligible
11	10.5	10.5	0	Negligible	6.5	6.5	0	Negligible
12	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
13	10.7	10.6	0	Negligible	6.6	6.6	0	Negligible
14	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
15	10.7	10.6	0	Negligible	6.6	6.6	0	Negligible
16	10.6	10.6	0	Negligible	6.5	6.5	0	Negligible
17	10.6	10.6	0	Negligible	6.6	6.5	0	Negligible
18	10.7	10.7	0	Negligible	6.6	6.6	0	Negligible
19	12.6	12.5	0	Negligible	7.6	7.5	-1	Negligible
20	13.2	13.1	0	Negligible	7.9	7.8	-1	Negligible
21	11.9	11.9	0	Negligible	7.3	7.2	0	Negligible
22	11.4	11.3	0	Negligible	6.9	6.8	0	Negligible
23	10.8	10.7	0	Negligible	6.6	6.6	0	Negligible
24	11.8	11.7	0	Negligible	7.2	7.1	0	Negligible
25	11.4	11.3	0	Negligible	7.0	6.9	0	Negligible
26	11.1	11.1	0	Negligible	6.8	6.8	0	Negligible
27	11.0	11.0	0	Negligible	6.8	6.7	0	Negligible

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 4	% Change [a]	Impact Descriptor	Baseline	Scenario 4	% Change [a]	Impact Descriptor
28	10.8	10.8	0	Negligible	6.6	6.6	0	Negligible
29	10.8	10.7	0	Negligible	6.5	6.5	0	Negligible
30	11.1	11.1	0	Negligible	6.8	6.8	0	Negligible
31	11.0	11.0	0	Negligible	6.8	6.7	0	Negligible
Criterion	32 [b]		-	-	20 [c]		-	-
AMCT	-		-	-	10 [d]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[d] To be met by 2040, and provided here for reference only.

5.57 The changes in PM_{10} and $PM_{2.5}$ concentrations for Scenario 4 are all between 0% and -1% (when rounded) and impacts are all described as negligible.

Gridded Receptors

5.58 As the changes in concentrations of PM_{10} and $PM_{2.5}$ at selected receptors under Scenario 4 have been shown in Table 5-9 to be negligible at all receptors, the following mapped concentrations and changes compared to the baseline are only presented for NO_2.

Figure 5-7: Scenario 4 – Modelled NO_2 concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

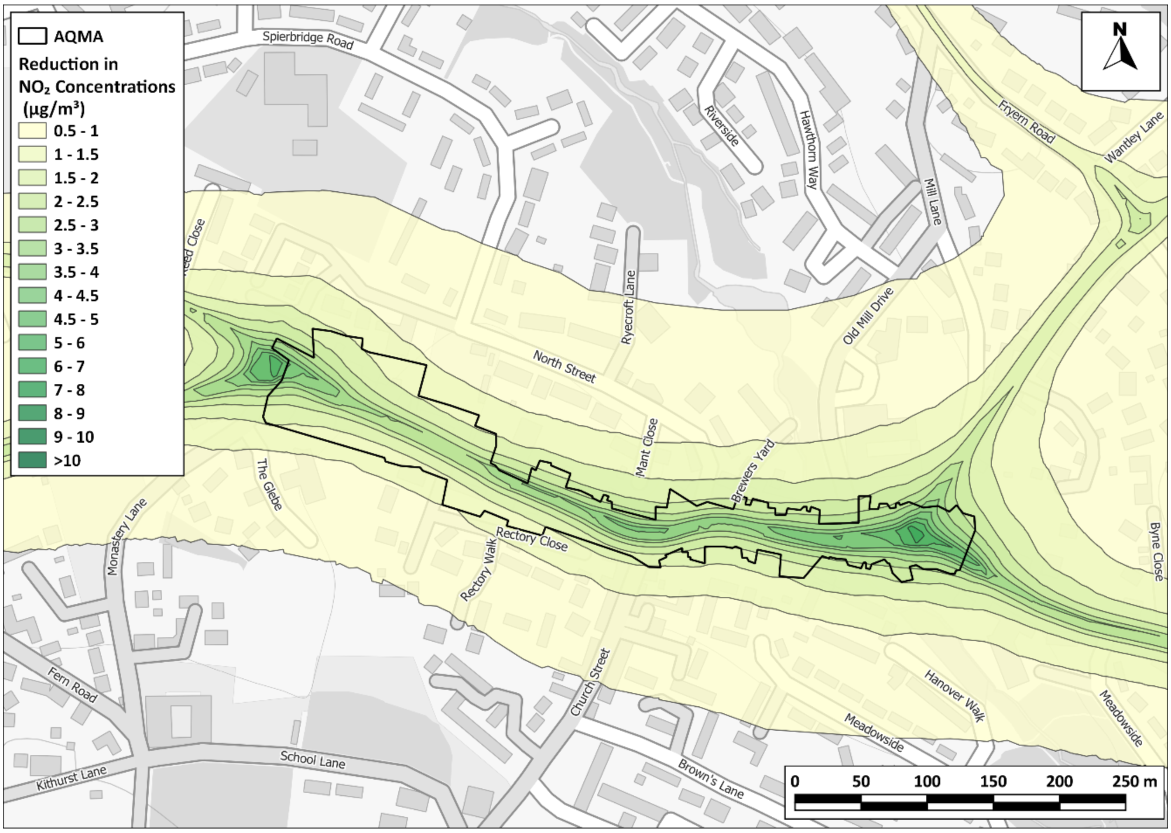

Figure 5-8: Scenario 4 –Modelled NO_2 changes (µg/m³) relative to the baseline

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

5.59 Figure 5-7 and Figure 5-8 show that there are larger changes as a result of Scenario 4 compared to previous scenarios, with appreciable reductions throughout the AQMA.

Scenario 5: Organic fleet evolution

Change in Concentrations at Individual Receptors

5.60 Table 5-10 and Table 5-11 show the predicted concentrations at each receptor compared to the baseline.

Table 5-10: Predicted Impacts on Annual Mean NO_2 concentrations (µg/m³) for Scenario 5[a]

Receptor	Baseline	Scenario 5	% Change [a]	Descriptor
1	12.8	8.0	-12	Moderate Beneficial
2	13.2	8.2	-12	Moderate Beneficial
3	28.8	17.6	-28	Moderate Beneficial
4	25.4	15.4	-25	Moderate Beneficial
5	20.5	12.5	-20	Moderate Beneficial
6	23.3	14.3	-23	Moderate Beneficial

Receptor	Baseline	Scenario 5	% Change [a]	Descriptor
7	22.3	13.6	-22	Moderate Beneficial
8	24.7	15.2	-24	Moderate Beneficial
9	24.7	15.1	-24	Moderate Beneficial
10	27.6	17.0	-27	Moderate Beneficial
11	13.2	8.4	-12	Moderate Beneficial
12	14.1	8.9	-13	Moderate Beneficial
13	14.7	9.3	-14	Moderate Beneficial
14	14.1	8.9	-13	Moderate Beneficial
15	14.7	9.2	-14	Moderate Beneficial
16	14.1	8.9	-13	Moderate Beneficial
17	14.9	9.2	-14	Moderate Beneficial
18	16.0	9.8	-15	Moderate Beneficial
19	32.6	19.5	-33	Moderate Beneficial
20	37.2	22.7	-36	Moderate Beneficial
21	27.3	16.2	-28	Moderate Beneficial
22	19.7	11.9	-19	Moderate Beneficial
23	16.0	9.9	-15	Moderate Beneficial
24	26.2	15.6	-26	Moderate Beneficial
25	21.8	13.0	-22	Moderate Beneficial
26	18.4	11.0	-18	Moderate Beneficial
27	17.7	10.7	-18	Moderate Beneficial
28	15.4	9.4	-15	Moderate Beneficial
29	14.5	9.0	-14	Moderate Beneficial
30	18.1	10.9	-18	Moderate Beneficial
31	17.0	10.3	-17	Moderate Beneficial

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

5.61 Receptors 19 and 20 have the largest change in concentration, with a reduction of 33% and 36% (when rounded), respectively. All of the changes in concentrations are described as moderate beneficial.

Table 5-11: Predicted Impacts on Annual Mean PM_{10} and $PM_{2.5}$ concentrations (µg/m³) for Scenario 5[a]

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 5	% Change [a]	Impact Descriptor	Baseline	Scenario 5	% Change [a]	Impact Descriptor
1	10.5	9.7	-3	Negligible	6.5	5.8	-4	Negligible
2	10.6	9.8	-3	Negligible	6.5	5.8	-4	Negligible
3	12.1	11.3	-3	Negligible	7.4	6.6	-4	Negligible
4	11.7	10.9	-3	Negligible	7.2	6.4	-4	Negligible
5	11.4	10.6	-3	Negligible	7.0	6.2	-4	Negligible
6	11.8	10.9	-3	Negligible	7.2	6.4	-4	Negligible
7	11.6	10.8	-3	Negligible	7.1	6.3	-4	Negligible
8	11.9	11.1	-3	Negligible	7.3	6.5	-4	Negligible
9	11.9	11.0	-3	Negligible	7.2	6.5	-4	Negligible
10	12.3	11.4	-3	Negligible	7.4	6.7	-4	Negligible
11	10.5	9.7	-3	Negligible	6.5	5.8	-4	Negligible
12	10.6	9.8	-2	Negligible	6.5	5.8	-4	Negligible
13	10.7	9.9	-3	Negligible	6.6	5.9	-4	Negligible
14	10.6	9.8	-3	Negligible	6.6	5.8	-4	Negligible
15	10.7	9.9	-3	Negligible	6.6	5.9	-4	Negligible
16	10.6	9.8	-3	Negligible	6.5	5.8	-4	Negligible
17	10.6	9.8	-3	Negligible	6.6	5.8	-4	Negligible
18	10.7	9.9	-3	Negligible	6.6	5.9	-4	Negligible
19	12.6	11.7	-3	Negligible	7.6	6.8	-4	Negligible
20	13.2	12.3	-3	Negligible	7.9	7.1	-4	Negligible
21	11.9	11.1	-3	Negligible	7.3	6.5	-4	Negligible
22	11.4	10.6	-3	Negligible	6.9	6.1	-4	Negligible
23	10.8	10.0	-3	Negligible	6.6	5.9	-4	Negligible
24	11.8	10.9	-3	Negligible	7.2	6.4	-4	Negligible
25	11.4	10.5	-3	Negligible	7.0	6.2	-4	Negligible
26	11.1	10.3	-3	Negligible	6.8	6.1	-4	Negligible

Receptor	Annual Mean PM_{10} (µg/m³)				Annual Mean $PM_{2.5}$ (µg/m³)			
	Baseline	Scenario 5	% Change [a]	Impact Descriptor	Baseline	Scenario 5	% Change [a]	Impact Descriptor
27	11.0	10.2	-3	Negligible	6.8	6.0	-4	Negligible
28	10.8	10.0	-2	Negligible	6.6	5.9	-4	Negligible
29	10.8	10.0	-2	Negligible	6.5	5.8	-4	Negligible
30	11.1	10.3	-3	Negligible	6.8	6.1	-4	Negligible
31	11.0	10.2	-3	Negligible	6.8	6.0	-4	Negligible
Criterion	32 [b]		-	-	20 [c]		-	-
AMCT	-		-	-	10 [d]		-	-

[a] % changes are relative to the objective and have been rounded to the nearest whole number.

[b] While the annual mean PM_{10} objective is 40 µg/m³, 32 µg/m³ is the annual mean concentration above which an exceedance of the 24-hour mean PM_{10} objective is possible, as outlined in LAQM.TG22 (Defra, 2022). A value of 32 µg/m³ is thus used as a proxy to determine the likelihood of exceedance of the 24-hour mean PM_{10} objective, as recommended in EPUK & IAQM guidance (Moorcroft and Barrowcliffe et al, 2017).

[c] The $PM_{2.5}$ objective, which was to be met by 2020, is not in Regulations and there is no requirement for local authorities to meet it.

[d] To be met by 2040, and provided here for reference only.

5.62 The changes in PM_{10} and $PM_{2.5}$ concentrations for Scenario 5 are all between -2% and -4% (when rounded), which is the largest change across all scenarios. However, as the concentrations are already 75% or less of the AQAL (32 µg/m³ for PM_{10}, 20 µg/m³ for $PM_{2.5}$), impacts are all described as negligible.

Gridded Receptors

5.63 As the changes in concentrations of PM_{10} and $PM_{2.5}$ at selected receptors under Scenario 5 have been shown in Table 5-11 to be negligible at all receptors, the following mapped concentrations and changes compared to the baseline are only presented for NO_2.

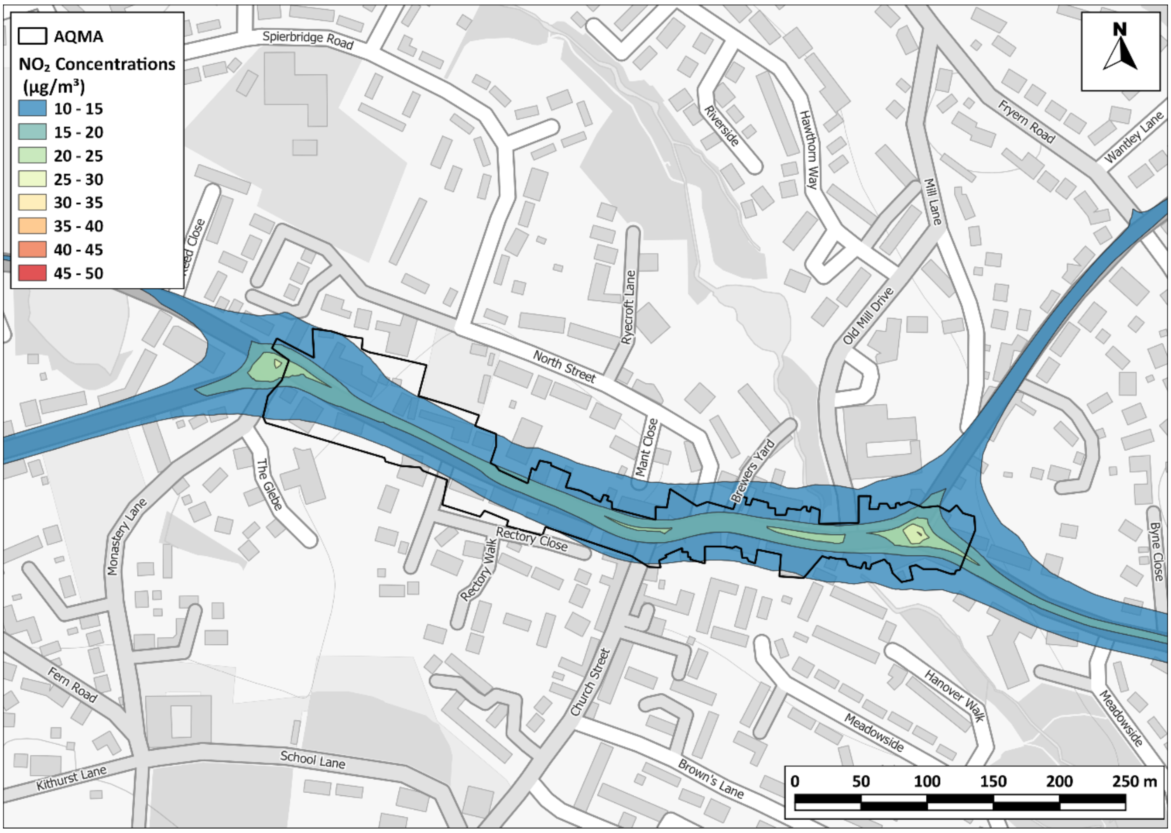

Figure 5-9: Scenario 5 – Modelled NO_2 concentrations

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

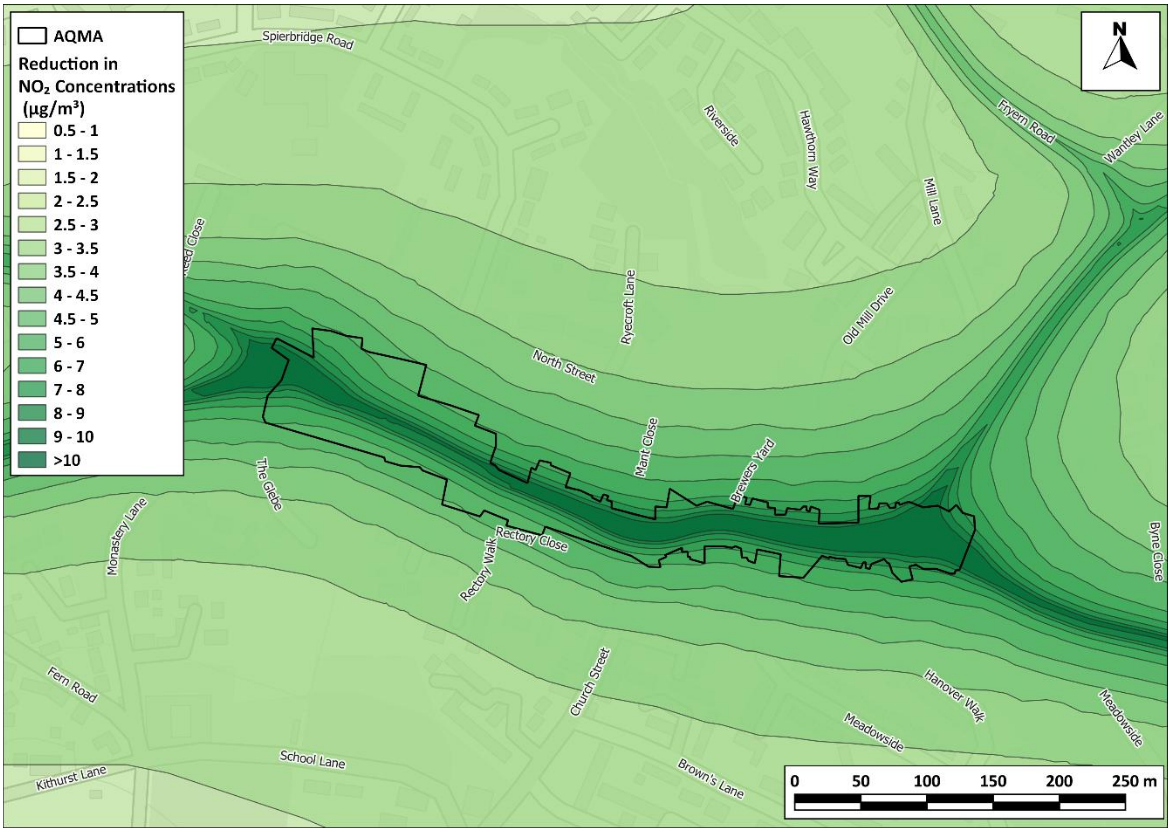

Figure 5-10: Scenario 5 –Modelled NO_2 changes (µg/m³) relative to the baseline

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

5.64 Figure 5-9 and Figure 5-10 highlight the extent of the reductions as a result of Scenario 5; the concentrations are significantly lower across the whole of the AQMA and the wider Storrington area. The changes presented in this scenario also incorporate reductions in background NO_2 concentrations and hence the wider study area, including areas of Storrington set back from the modelled roads, experienced a decrease of at least 2 µg/m³.

5.65 It should be noted that a direct comparison of Scenario 5 with Scenarios 1 to 4 is unfair. In practice, it would take time to implement any of the interventions listed in Paragraphs 5.5 to 5.38. This means that the future baseline, onto which each of the interventions would overlay, will have changed from the current position before the intervention takes effect. The longer an intervention would take to implement and reach its full effect, the lower the concurrent baseline will have become. For Scenario 2, it is reasonable to expect a largely cumulative effect, such that natural evolution of the fleet could combine with a reduction in through traffic volumes to deliver even lower concentrations. For Scenario 1, and by extension Scenario 3, interventions which reduce local traffic would have a cumulative effect with natural fleet evolution, and any interventions to increase EV uptake would act on a higher baseline EV proportion but still be expected to deliver benefits. For Scenario 4, however, the efficacy of the intervention will erode over time, as the base fleet begins to meet the compliance rates assumed in the scenario. Sensitivity tests which explore how local measures might combine with organic fleet evolution, and traffic growth, are presented in Appendix A3.

Summary

5.66 The resulting minimum and maximum percentage point changes modelled at the individual receptors for the five assessment scenarios are summarised in Table 5-12.

5.67 The assessment scenarios had varying impacts on the NO_2 concentrations at modelled receptors, with slight beneficial impacts associated with Scenarios 1 and 2, and moderate beneficial impacts associated with Scenarios 3 and 4. The largest change in modelled concentrations (which also accounts for changes in background concentrations) were found under Scenario 5, which demonstrates the predicted evolution of the fleet to 2035. An example of the scale of these changes at a single receptor (Receptor 20) across all scenarios is provided in Figure 5-11. It is clear that emissions from road transport contribute significantly to NO_2 concentrations at this receptor compared to background sources, and the relative changes in concentrations are staggered through each of the scenarios, with the smallest reduction under Scenario 1, and the largest reduction under Scenario 5. In all scenarios the modelled NO_2 concentration is below the objective. Of the scenarios which incorporated local actions, Scenario 4 (upgrading the Euro standard of the fleet) had the greatest beneficial impact on NO_2 concentrations.

5.68 With respect to PM_{10} and $PM_{2.5}$, impacts across all scenarios were described as negligible; across all the scenarios, the maximum reduction in concentrations was by 1%. This is largely due to the combination of lower concentrations in relation to the AQAL, and because the contribution from road transport to PM_{10} and $PM_{2.5}$ concentrations is relatively small, as shown in Figure 5-12 and Figure 5-13.

5.69 The model scenarios presented above are those which can be predicted with the greatest certainty from the information available; it is not possible to directly combine these scenarios without additional inference and complexity, thus introducing uncertainty. However, additional sensitivity tests of these scenarios are provided in Appendix A3, which include incorporating local traffic growth into Scenario 5, and calculating the combined effect of Scenario 5 (i.e. a future fleet) with Scenarios 1-3 (i.e. behavioural changes). These sensitivity tests do not materially change the conclusions drawn from the scenario modelling presented above.

Table 5-12: Summary of the Changes in Pollutant Concentrations as a Result of the Five Scenarios

Scenario	Reduction in NO_2 Concentration		Reduction in PM_{10} Concentration		Reduction in $PM_{2.5}$ Concentration	
	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)
1	1	3	0	0	0	0
2	0	4	0	1	0	1
3	1	7	0	1	0	1
4	2	13	0	0	0	1
5	12	36	2	3	4	4

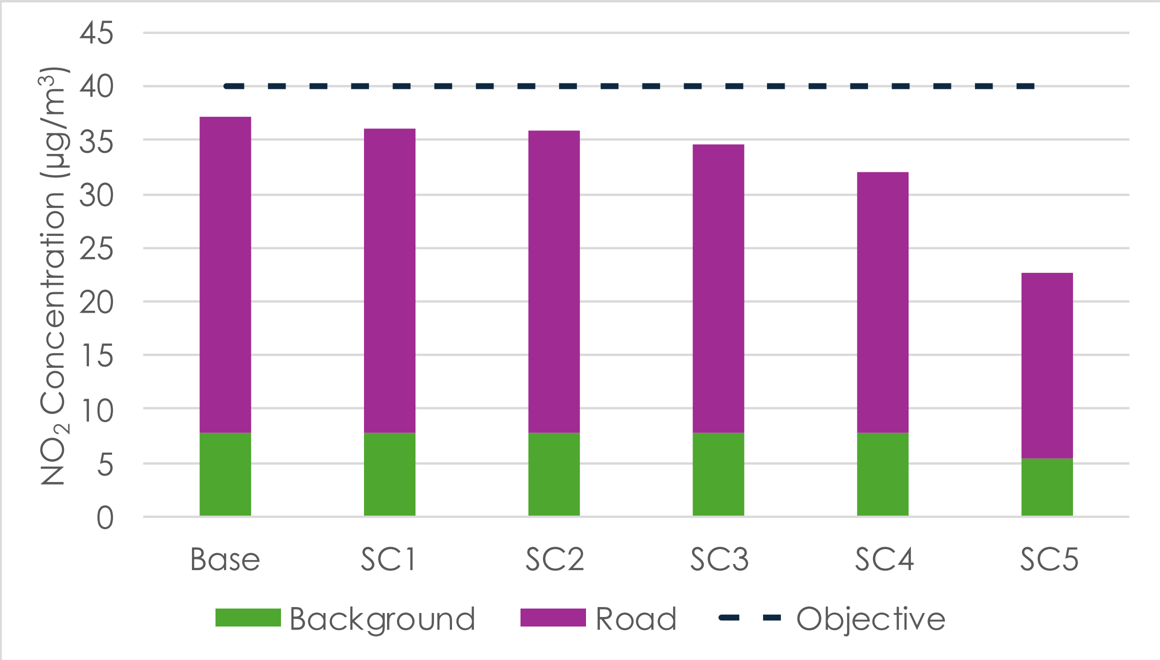

Figure 5-11: Modelled NO_2 concentrations at Receptor 20, source apportioned to show background (green) and road (purple) components for all modelled scenarios

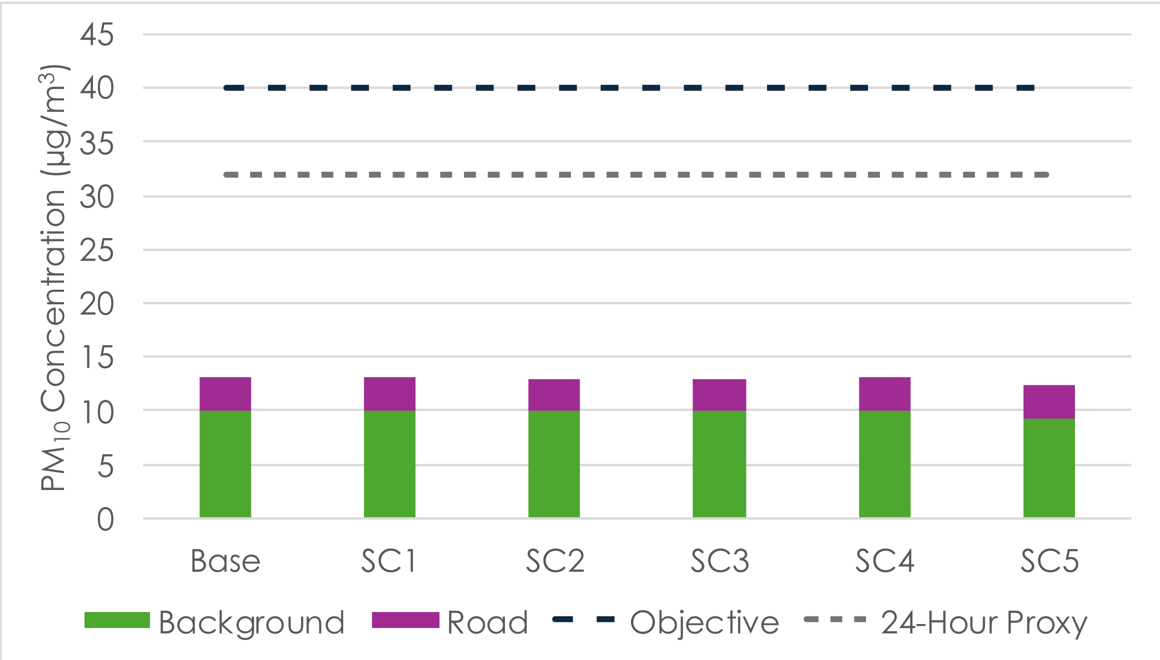

Figure 5-12: Modelled PM_{10} concentrations at Receptor 20, source apportioned to show background (green) and road (purple) components for all modelled scenarios

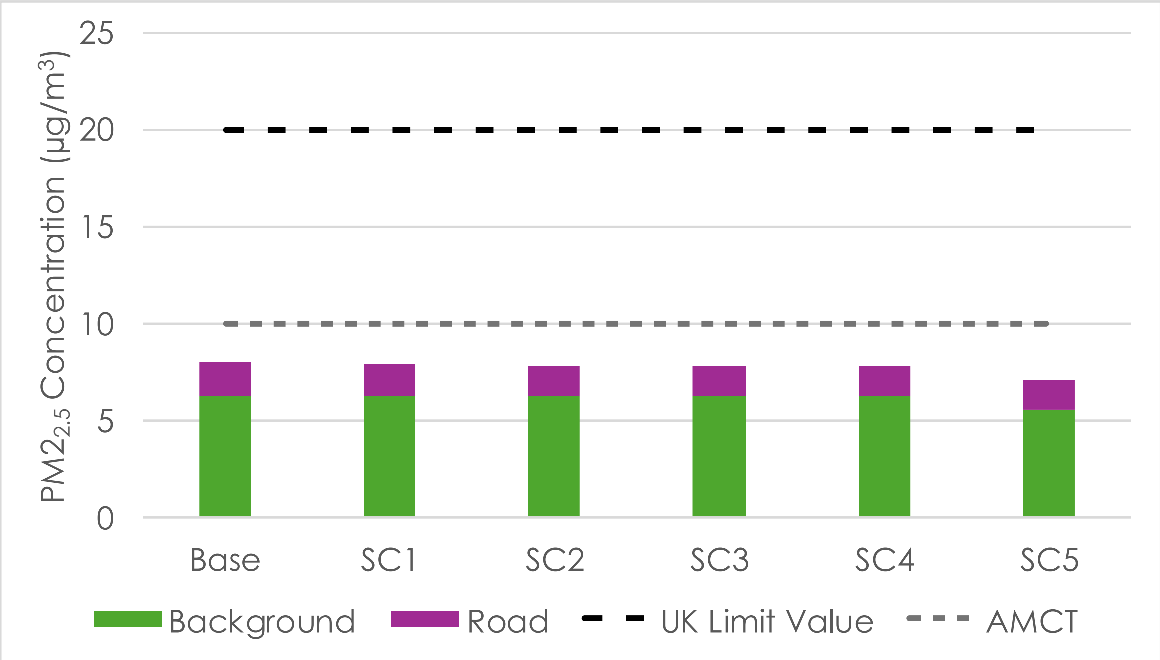

Figure 5-13: Modelled $PM_{2.5}$ concentrations at Receptor 20, source apportioned to show background (green) and road (purple) components for all modelled scenarios

6 Summary and Conclusions

6.1 This report describes air quality modelling carried out to investigate the causes of air quality issues in Storrington and to evaluate potential interventions. The study focused on concentrations of NO_2, PM_{10}, and $PM_{2.5}$.

Baseline Conditions

6.2 Monitoring data from 2020-2024 indicate that annual mean NO_2 concentrations in Storrington have been below the objective of 40 µg/m³ at all monitoring sites. The concentration at the junction of Manley's Hill and School Hill (site Storrington 19n) was 37.0 µg/m³ in 2023, close to the objective level. Annual mean PM_{10} and $PM_{2.5}$ concentrations were well below their respective criteria in all recent years of available monitoring data (2022-2024).

6.3 The baseline dispersion model for 2024 showed that predicted annual mean NO_2 concentrations were below the objective at all 31 individual receptors. The highest predicted annual mean NO_2 concentration was 37.2 µg/m³ at Receptor 20 (Virginia Cottage, at the bottom of Manley's Hill), which is 7% below the objective level. PM_{10} and $PM_{2.5}$ concentrations were also predicted to be below their relevant objectives at all receptors.

6.4 Source apportionment showed that road-attributable pollutant concentrations at some receptors outside the AQMA boundary (e.g., Receptors 2 and 25) were largely dominated by emissions from local traffic. Within the AQMA, particularly along West St and Manley's Hill (e.g., Receptors 6, 11, and 20), approximately one-third of road-attributable pollutant concentrations originated from through traffic. Amberley Road showed the greatest relative contribution from through traffic, with about half of the NO_2, PM_{10}, and $PM_{2.5}$ concentrations originating from this source. Diesel cars and LGVs were the largest contributors to NO_2 concentrations, while petrol cars contributed the most to PM_{10} and $PM_{2.5}$ concentrations from road traffic.

Scenario Testing

6.5 Five scenarios were developed to assess the impact of various interventions on air quality:

- Scenario 1: Target Local Traffic: This scenario involved a 5% reduction in local car traffic and a 2% increase in Electric Vehicle (EV) share for local cars and LGVs.
- Scenario 2: Target Through Traffic: This scenario assumed a 20% removal of all vehicle types from the through traffic component.
- Scenario 3: Combined: This scenario combined the interventions of Sc1 and Sc2.
- Scenario 4: Euro Standard Upgrade: This scenario assumed 90% Euro 6 compliance for diesel cars and LGVs, and 95% Euro VI compliance for Heavy Duty Vehicles (HDVs).
- Scenario 5: Organic Fleet Evolution to 2035: This scenario projected air quality conditions in 2035 based on natural fleet turnover without any specific interventions.

6.6 The impacts on annual mean NO_2 concentrations were:

- Scenario 1 (Target Local Traffic) resulted in slight beneficial impacts (3% reduction) at Receptors 19 and 20, and negligible impacts at all other receptors.

- Scenario 2 (Target Through Traffic) showed slight beneficial impacts (3-4% reduction) at Receptors 19 and 20, and negligible impacts elsewhere. This scenario was fractionally more effective than Sc1 at the worst-case receptors.
- Scenario 3 (Combined) showed moderate beneficial impacts (6-7% reduction) at Receptors 19 and 20, and negligible impacts at other receptors.
- Scenario 4 (Euro Standard Upgrade) produced moderate beneficial impacts (12-13% reduction) at Receptors 19 and 20, and slight beneficial or negligible impacts at other receptors. This scenario had the greatest beneficial impact on NO_2 concentrations among the intervention scenarios.
- Scenario 5 (Organic Fleet Evolution to 2035): Showed the most significant reductions across all receptors, with moderate beneficial impacts ranging from 12% to 36%. This highlights the substantial improvement expected from natural fleet turnover over time.

6.7 For PM_{10} and $PM_{2.5}$, all five scenarios resulted in negligible impacts across all receptors. The maximum reduction in concentrations across scenarios 1 to 4 was 1% for PM_{10} and $PM_{2.5}$. This is because of the already lower concentrations of these pollutants relative to their assessment levels, and the comparatively smaller contribution of road transport emissions to their overall concentrations.

Overall Conclusions

6.8 While Storrington's air quality already meets national objectives for NO_2, PM_{10}, and $PM_{2.5}$, further improvements are achievable through targeted interventions. However, even quite significant local interventions are likely to have relatively modest impacts when compared with the natural fleet evolution expected in the near future. It is, however, important to note that a direct comparison of the intervention scenarios with Scenario 5 is complex, as the future baseline for interventions will be influenced by ongoing fleet evolution, meaning that there would be combined benefits for some interventions (those which reduce total traffic volumes), and diminished co-benefits for others (those promoting fleet renewal).

6.9 The findings of this report may provide insights for HDC to consider when designing future policies and interventions aimed at accelerating air quality improvements. The effectiveness of any intervention will depend on its precise implementation and other local factors.

7 References

AQEG (2021) *Exhaust Emissions from Road Transport*, 0921122010141272021th edition.

Atkins (2010) *Interim Evaluation of the Implementation of 20 mph Speed Limits in Portsmouth*, 20th edition.

Atkins (2018) *20 mph Research Study*, 58650040063699927982420th edition.

Bornioli, A..B.I..P.P.a.P.J. (2020) *Effects of city-wide 20 mph (30km/hour) speed limits on road injuries in Bristol, UK*, 26185th edition.

Budnitz, H..M..S.T. (2024) *Electric vehicle adoption intentions among UK residents parking in shared and public spaces*, 10100711116024105180th edition.

Carplus (2016) *Carplus annual survey of car clubs 2015/2016*.

Dale, F.I.B. (2019) *The impact of the Nottingham Workplace Parking Levy on travel to work mode share*, 221362419301063rd edition.

Defra (2022) *Review & Assessment: Technical Guidance LAQM.TG22 August 2022 Version*, [Online], Available: https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf.

Defra (2025a) *Environmental Improvement Plan 2025*, [Online], Available: https://www.gov.uk/government/publications/environmental-improvement-plan-2025/environmental-improvement-plan-eip-2025.

Defra (2025b) *Local Air Quality Management (LAQM) Support Website*, [Online], Available: http://laqm.defra.gov.uk/.

DfT (2004) *Changing the Way We Travel*, https://www.gov.uk/government/publications/smarter-choices-main-report-about-changing-the-way-we-travel edition.

DfT (2004b) *Traffic Management Act 2004: Guidance on Part 6 — Network Management. London: DfT.*.

DfT (2010) *The Effects of Smarter Choice Programmes in the Sustainable Travel Towns*, https://www.gov.uk/government/publications/the-effects-of-smarter-choice-programmes-in-the-sustainable-travel-towns-full-report edition.

DfT (2018) *20mph Research Study*, 5865069527425303720nd edition.

DfT (2024) *DfT Road traffic statistics (TRA03)*, Available: https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra.

Goodman, A..S.S.a.O.D. (2014) *New walking and cycling routes and increased physical activity: one- and 2-year findings from the UK iConnect study', American Journal of Public Health, 104(9), pp. e38–e46.*.

HDC (2025) *2025 Air Quality Annual Status Report (ASR)*, Available: https://www.horsham.gov.uk/__data/assets/pdf_file/0019/151426/ASR_Horsham_2025.pdf.

Marsden (2006) *The evidence base for parking policies—a review*, 096707006000412th edition.

Moorcroft and Barrowcliffe et al (2017) *Land-Use Planning & Development Control: Planning For Air Quality v1.2*, IAQM, London, Available: http://iaqm.co.uk/guidance/.

Nightingale, G..W.A.J..H.R.F..W.J..T.K..C.C.L..B.G..K.M.P.. (2021) *Evaluating the citywide Edinburgh 20mph speed limit intervention effects on traffic speed and volume: A pre-post observational evaluation*, 1013710261383rd edition.

Sustrans (2017) *Summary of Outcomes of the Cycling Demonstration Towns and Cycling City and Towns Programmes*, 29642964th edition.

The Air Quality (England) (Amendment) Regulations 2002, Statutory Instrument 3043 (2002), HMSO, Available: https://www.legislation.gov.uk/uksi/2002/3043/contents/made.

The Air Quality (England) Regulations 2000 Statutory Instrument 928 (2000), HMSO, Available: http://www.legislation.gov.uk/uksi/2000/928/contents/made.

The Air Quality Standards Regulations 2010 Statutory Instrument 1001 (2010), HMSO, Available: http://www.legislation.gov.uk/uksi/2010/1001/pdfs/uksi_20101001_en.pdf.

The European Parliament and the Council of the European Union (2008) *Directive 2008/50/EC of the European Parliament and of the Council*, Available: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0050.

Transport for Wales (2025) *Default 20 mph Speed Limit on Restricted Roads: National Monitoring Report*, 2025th edition.

Triantafyllou, C.B. (2025) *Urban Freight Consolidation Centers case study in the uk retail sector*, 271840841st edition.

TRL (2003) *Review of 20 mph Zones in London Boroughs*, 20th edition.

Verlinde, S..M.C.a.W.F. (2014) *ncrease urban freight efficiency with delivery and servicing plan*, 117180th edition.

Wheeler, A..T.J.a.B.J. (2010) *Traffic Calming on Major Roads: The A49 Trunk Road, Craven Arms. TRL Report. Crowthorne: TRL.*, 212th edition.

8 Glossary

AADT	Annual Average Daily Traffic
ADMS-Roads	Atmospheric Dispersion Modelling System model for Roads
AMCT	Annual Mean Concentration Target (for $PM_{2.5}$)
ANPR	Automatic Number Plate Recognition
ATC	Automatic Traffic Count
AQC	Air Quality Consultants
AQMA	Air Quality Management Area
AURN	Automatic Urban and Rural Network
CAZ	Clean Air Zone
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factors Toolkit
EPUK	Environmental Protection UK
EU	European Union
EV	Electric Vehicle
Exceedance	A period of time when the concentration of a pollutant is greater than the appropriate air quality objective. This applies to specified locations with relevant exposure
HDC	Horsham District Council
HDV	Heavy Duty Vehicles (> 3.5 tonnes)
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
kph	Kilometres Per hour
LAQM	Local Air Quality Management
LDV	Light Duty Vehicles (<3.5 tonnes)
LGV	Light Goods Vehicle
LPG	Liquefied Petroleum Gas
$\mu g/m^3$	Microgrammes per cubic metre
NO	Nitric oxide

NO_2	Nitrogen dioxide
NOx	Nitrogen oxides (taken to be NO_2 + NO)
Objectives	A nationally defined set of health-based concentrations for nine pollutants, seven of which are incorporated in Regulations, setting out the extent to which the standards should be achieved by a defined date. There are also vegetation-based objectives for sulphur dioxide and nitrogen oxides
PERT	Population Exposure Reduction Target (for $PM_{2.5}$)
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
Standards	A nationally defined set of concentrations for nine pollutants based on assessment of the effects of each pollutant on human health, including the effects on sensitive sub-groups
TEA	Triethanolamine – used to absorb nitrogen dioxide
TEMPro	Trip End Model Presentation Program
WSCC	West Sussex County Council

9 Appendices

A1 Modelling Methodology

Model Inputs

A1.1 Predictions have been carried out using the ADMS-Roads dispersion model (v5.1). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics (including road width and gradient). Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 13.1) published by Defra (2025b). Model input parameters are summarised in Table A1-1 and, where considered necessary, discussed further below.

Table A1-1: Summary of Model Inputs

Model Parameter	Value Used
Terrain Effects Modelled?	Yes – 12km x 12km Cartesian grid at 50m resolution
Variable Surface Roughness File Used?	Yes – 12km x 12km Cartesian grid at 50m resolution
Urban Canopy Flow Used?	No
Advanced Street Canyons Modelled?	No [a]
Noise Barriers Modelled?	No
Meteorological Monitoring Site	Herstmonceux
Meteorological Data Year	2024
Dispersion Site Surface Roughness Length (m)	0.3
Dispersion Site Minimum MO Length (m)	1
Met Site Surface Roughness Length (m)	0.3
Met Site Minimum MO Length (m)	1
Gradients?	Yes

[a] The model was initial set up incorporating the Advanced Street Canyons module. However, the inclusion of canyons worsened the model's ability to predict concentrations at the monitoring sites included for verification. Canyons were therefore excluded from the model inputs.

A1.2 The traffic data used within this assessment has been compiled from both the ANPR survey undertaken for this study and from WSCC ATC locations. The datasets contained different levels of detail regarding traffic flows and fleet composition; the ANPR survey provided total counts and fleet composition disaggregated to vehicle classes to align with the 'All Vehicle Types' category of the EFT (the highest level of disaggregation of vehicle types it is possible to input to the EFT), while the ATC data provided vehicle counts for 10 'bins' (e.g. motorcycle, car, LGV). The fleet composition from the ANPR survey was therefore used to disaggregated these 'bins' further, including separation of vehicles by fuel type. Details of which traffic data source were assigned to each modelled road link are provided in Table A1-2.

A1.3 Additionally, as discussed in Appendix A5, analysis of the ANPR data determined the number of vehicles passing through Storrington during the survey period. The traffic data flows used in the baseline assessment are summarised in Table A1-3.

A1.4 Traffic speeds have been estimated based on professional judgement, taking account of the road layout, speed limits and the proximity to a junction. Gradients have been calculated by dividing the change in height between the start and end of road segments by the road link length; heights were obtained from Google Earth and cross-checked with contours provided by the Ordnance Survey. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT (2024); the ANPR data were of insufficient duration to provide this directly.

Table A1-2: Summary of Modelled Road Link Attributes

Model Link ID	Associated Traffic Flow	Speed (kph)	Gradient (%)
52	ANPR_1	48	0.0
53	ANPR_1	48	0.0
54	WSCC_31	48	0.0
56	WSCC_31	48	0.0
43	ANPR_3	20	0.0
44	ANPR_3	48	0.0
45	ANPR_3	48	0.0
46	ANPR_3	48	0.0
40	ANPR_3	48	0.0
42	ANPR_3	48	0.0
41	ANPR_3	48	0.0
47	WSCC_5196	48	0.0
1	WSCC_5574	20	4.0
2	WSCC_5574	48	4.0
3	WSCC_5574	48	4.0
6	WSCC_5574	32	2.3
7	WSCC_5574	32	2.3
8	WSCC_5574	20	2.3
10	WSCC_5574	32	2.3
11	WSCC_5574	32	2.3
13	WSCC_5574	20	2.3
14	WSCC_5574	20	0.0
15	ANPR_7	20	3.8
17	ANPR_7	48	3.8
21	ANPR_7	48	3.8
30	ANPR_5	48	0.0
35	ANPR_4	20	0.0

Model Link ID	Associated Traffic Flow	Speed (kph)	Gradient (%)
36	ANPR_4	48	0.0
37	ANPR_4	48	0.0
38	ANPR_4	48	0.0
39	ANPR_4	48	0.0
22	WSCC_2828	20	0.0
23	WSCC_2828	48	4.3
24	WSCC_2828	64	3.2
27	WSCC_2828	48	4.3
28	WSCC_2828	48	4.3
29	WSCC_2828	48	3.2
51	WSCC_5196	20	0.0
55	WSCC_31	20	0.0
57	Roundabout calculated	20	0.0
58	Roundabout calculated	20	0.0
59	Roundabout calculated	20	0.0
60	Roundabout calculated	20	0.0
61	Roundabout calculated	20	0.0
62	Roundabout calculated	20	0.0
32	ANPR_5	48	0.0
63	ANPR_2	96	0.0
64	ANPR_2	64	0.0
25	ANPR_6	64	1.7
31	ANPR_5	48	0.0
18	ANPR_7	48	3.8
48	ANPR_2	48	0.0
33	ANPR_5	48	2.2
34	ANPR_5	48	2.0
4	WSCC_5574	48	2.3
26	WSCC_2828	64	1.7
49	WSCC_5196	48	3.7
50	WSCC_5196	48	0.0
16	ANPR_7	20	3.8

Model Link ID	Associated Traffic Flow	Speed (kph)	Gradient (%)
19	ANPR_7	48	3.8
20	ANPR_7	48	3.8
12	WSCC_5574	32	2.3
9	WSCC_5574	20	2.3
5	WSCC_5574	32	2.3
65	WSCC_31	32	0.0

[a] All links were set to the 'Rural (not London)' road type within the EFT.

Table A1-3: Summary of Traffic Data used in the Baseline Assessment [a, b]

Road Link	2024																			
	AADT (veh)	Car (%)						LGV (%)					HGV (%)			Other (%)				
		Petrol	Petrol Hybrid	Petrol Plugin Hybrid	Diesel	Diesel Hybrid	Electric	Petrol	Petrol Hybrid	Petrol Plugin Hybrid	Diesel	Electric	Rigid Diesel	Rigid Electric	Arctic Diesel	Conventional Bus	Conventional Coach	Motorcycle	LPG Car	LPG LGV
ANPR_1	5,666	39.87	5.43	5.43	23.44	1.90	4.67	0.12	0.04	0.04	15.44	0.20	1.35	0.00	0.67	0.28	0.28	0.81	0.04	0.00
ANPR_2	9,825	34.21	5.83	5.83	22.63	1.52	6.36	0.19	0.12	0.12	20.78	0.20	0.90	0.01	0.35	0.05	0.05	0.85	0.01	0.00
ANPR_3	301	28.63	3.93	3.93	25.21	0.48	5.33	0.14	0.00	0.00	30.13	0.00	0.48	0.00	1.02	0.00	0.00	0.73	0.00	0.00
ANPR_4	2,923	39.84	6.69	6.69	21.90	2.37	6.01	0.25	0.02	0.02	13.46	0.26	0.71	0.01	0.03	0.58	0.58	0.60	0.00	0.00
ANPR_5	5,651	40.04	5.45	5.45	24.71	1.69	5.92	0.08	0.03	0.03	14.30	0.21	0.64	0.01	0.30	0.14	0.14	0.87	0.00	0.00
ANPR_6	18,068	37.29	5.54	5.54	22.35	1.53	5.93	0.17	0.08	0.08	18.39	0.23	1.10	0.01	0.68	0.23	0.23	0.60	0.02	0.00
ANPR_7	6,059	40.91	5.48	5.48	24.81	1.39	5.42	0.09	0.03	0.03	14.11	0.30	0.64	0.01	0.13	0.25	0.25	0.69	0.00	0.00
WSCC_2828	15,760	40.55	5.96	5.96	25.91	1.67	6.21	0.09	0.03	0.03	10.77	0.14	1.43	0.01	0.33	0.20	0.20	0.50	0.01	0.00
WSCC_31	6,269	40.70	5.99	5.99	26.00	1.68	6.23	0.09	0.03	0.03	9.96	0.13	1.68	0.01	0.49	0.26	0.26	0.48	0.01	0.00
WSCC_5196	10,009	39.89	5.87	5.87	25.48	1.64	6.11	0.11	0.03	0.03	12.34	0.16	1.33	0.01	0.24	0.10	0.10	0.68	0.01	0.00
WSCC_5574	17,394	41.25	6.07	6.07	26.36	1.70	6.32	0.08	0.02	0.02	9.53	0.12	1.30	0.01	0.29	0.18	0.18	0.48	0.01	0.00

[a] Proportions are presented to 2 decimal places.

[b] The EFT input utilised the 'All Vehicle Types' input option. All other categories not included above were set to 0.

A1.5 Figure A1-1 shows the road network included within the model, along with the speed at which each link was modelled.

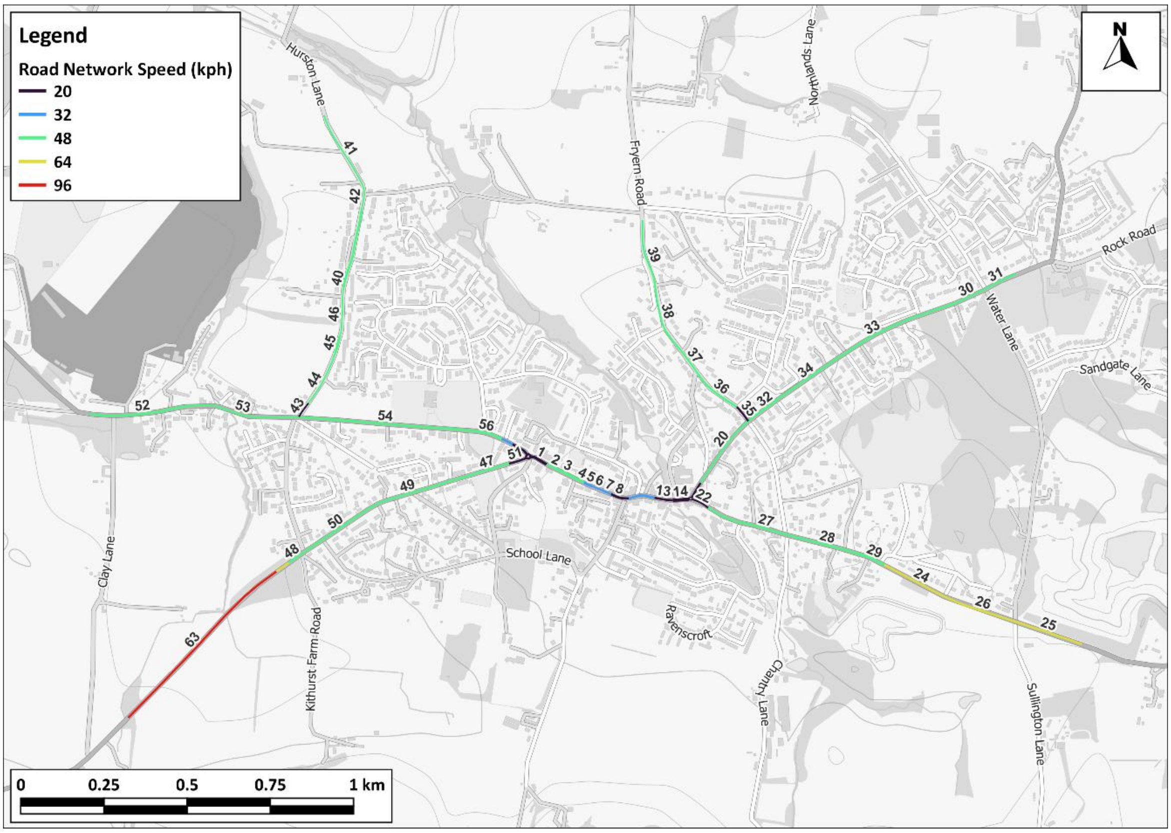

Figure A1-1: Modelled Road Network Speed and Link ID

Additional data sourced from third parties, including public sector information licensed under the Open Government Licence v3.0.

Model Verification

A1.6 Evidence collected over many years has shown that, in most urban areas, dispersion modelling relying upon Defra's EFT has tended to systematically under-predict roadside NO_2 concentrations. To account for this, it is necessary to adjust the model against local measurements. The model has been run to predict annual mean NO_2 concentrations during 2024 at the monitoring sites presented in Table 4-1. These sites have been selected because of their proximity to roads within the study area. The monitoring sites 18n, 12n, 14n, 15n did not have data available for 2024 and are therefore not included within the model verification. Additionally, there is no traffic data available adjacent to the monitoring site 17n and therefore this is also not included within the model verification.

Nitrogen Dioxide

A1.7 Most NO_2 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 of nitrogen oxides ($NOx = NO + NO_2$).

A1.8 The model output of road-NOx (i.e. the component of total NOx coming from road traffic) has been compared with the 'measured' road-NOx. Measured road-NOx has been calculated from the measured NO_2 concentrations and the predicted background NO_2 concentration using the NOx from NO_2 calculator (Version 9.1) available on the Defra LAQM Support website (Defra, 2025b).

A1.9 The unadjusted model has under predicted the road-NOx contribution; this is a common experience with this and most other road traffic emissions dispersion models. An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A1-2). The calculated adjustment factor of 2.9808 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations.

A1.10 The total NO_2 concentrations have then been determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx to NO_2 calculator. Figure A1-2 compares final adjusted modelled total NO_2 at each of the monitoring sites to measured total NO_2.

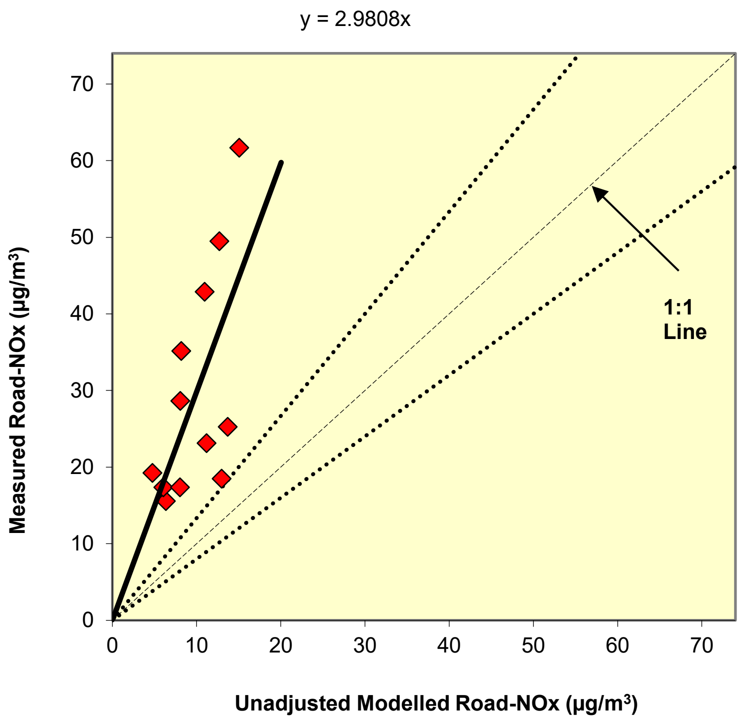

Figure A1-2: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations. The dashed lines show ± 25%.

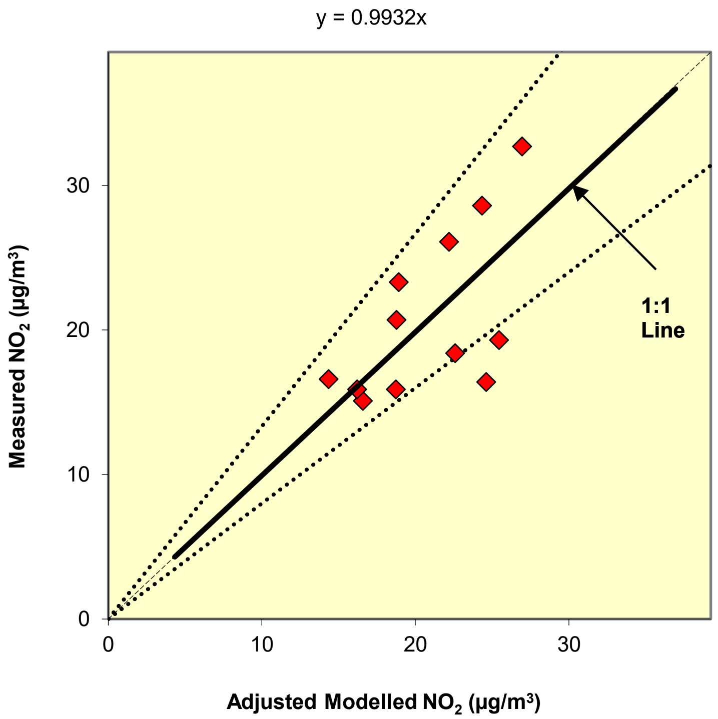

Figure A1-3: Comparison of Measured Total NO_2 to Final Adjusted Modelled Total NO_2 Concentrations. The dashed lines show ± 25%.

A1.11 Figure A1-3 appears to show two separate trend lines in the monitoring sites, with a cluster of overpredicted concentrations (dots below the 1:1 line), and a line of underpredicted concentrations (dots above the 1:1 line). The setting and surrounding environment of each monitor was examined in detail. While apparently clustered within this graph, the monitors do not group geographically or by setting type; the underpredicted and overpredicted sites are interspersed throughout the study area and across different setting types. There was, therefore, no basis for adjusting the model configuration or treating the settings separately.

A1.12 Table A1-4 shows the statistical parameters relating to the performance of the model, as well as the 'ideal' values (Defra, 2022). While the RMSE is equal to 10.9% of the objective, and therefore marginally above the recommended 10% as set out in TG22 (Defra, 2022), the RMSE is well below the value at which it is recommended to revisit the model (25%). Additionally, the model does not show a systematic tendency to over- or underpredict concentrations (fraction bias of 0).

Table A1-4: Statistical Model Performance

Statistical Parameter	Model-Specific Value	'Ideal' Value
Correlation Coefficient [a]	0.62	1
Root Mean Square Error (RMSE) [b]	4.35	0
Fractional Bias [c]	0.00	0

[a] Used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship.

[b] Used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared (i.e. µg/m³). TG22 (Defra, 2022) outlines that, ideally, a RMSE value within 10% of the air quality objective

(4µg/m³) would be derived. If RMSE values are higher than 25% of the objective (10 µg/m³) it is recommended that the model is revisited.

[c] Used to identify if the model shows a systematic tendency to over or under predict. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.

PM_{10} and $PM_{2.5}$

A1.13 The approach described above for NOx and NO_2 determines the road increment of concentrations by subtracting the predicted local background from the roadside measurements. This works well for NOx because the differences between roadside and background concentrations typically represent a large proportion of the total measured value. The same is not true for PM_{10} and $PM_{2.5}$ concentrations, which are dominated by non-road emissions, even at the roadside. In practice, the influence of a local road on concentrations can often be smaller than the uncertainty in the mapped background concentration. As an example of this, 31% of all roadside and kerbside sites in London which measured $PM_{2.5}$ in 2019 with >75% data capture, recorded an annual mean concentration lower than the equivalent Defra mapped background value. Using measured background concentrations does not provide any significant benefit, owing largely to the spatial resolution of available measurements, but also because of measurement uncertainty. For example, hourly-mean $PM_{2.5}$ concentrations measured at roadside sites are often lower than those measured at nearby urban background sites, while concentrations at urban background sites are often lower than those measured at rural sites.

A1.14 For these reasons, it is not appropriate to calculate the annual mean road-increment to PM_{10} and $PM_{2.5}$ concentrations by subtracting either the mapped background or a local measured background concentration. This, in turn, means that the approach to model adjustment which is described for NOx and NO_2 is not appropriate for PM_{10} and $PM_{2.5}$. Historically, many studies have derived a model adjustment factor for NOx and applied this to PM_{10} and $PM_{2.5}$. This is also not appropriate, since there is no reason to expect the same bias in emissions of NOx, PM_{10} and $PM_{2.5}$.

A1.15 While there is very strong evidence that EFT-based models have consistently under-predicted road-NOx concentrations in urban areas, there is no equivalent evidence for PM_{10} and $PM_{2.5}$. As the Storrington AURN monitoring site adjacent to Manley's Hill measures PM_{10} and $PM_{2.5}$, a comparison between modelled and measured concentrations is provided in Table A1-5. There is good agreement between the modelled and measured concentrations; the percentage difference is well within ±25% criterion set out in TG22 (Defra, 2022). Although the model does under-predict concentrations of both pollutants by 15-16%, there is no basis for determining whether this reflects error in the modelled local road component, the background component, or indeed in the characterisation of PM mass within the monitor. There is currently no strong basis for applying any adjustment to the model outputs. Predicted concentrations of PM_{10} and $PM_{2.5}$ have thus not been adjusted.

Table A1-5: Comparison of Measured PM_{10} and $PM_{2.5}$ Concentrations to Modelled PM_{10} and $PM_{2.5}$ Concentrations.

Pollutant	Measured Concentration (µg/m³)	Modelled Concentration (µg/m³)	Difference
PM_{10}	12.6	10.7	-15%
$PM_{2.5}$	7.7	6.5	-16%

Post-processing

A1.16 The model predicts road-NOx concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO_2, has been processed through the NOx to NO_2 calculator available on the Defra LAQM Support website (Defra, 2025b). The traffic mix within the calculator has been set to "All non-urban UK traffic", which is considered suitable for the study area. The calculator predicts the component of NO_2 based on the adjusted road-NOx and the background NO_2.

A2 Source Apportionment Results

Receptor 1

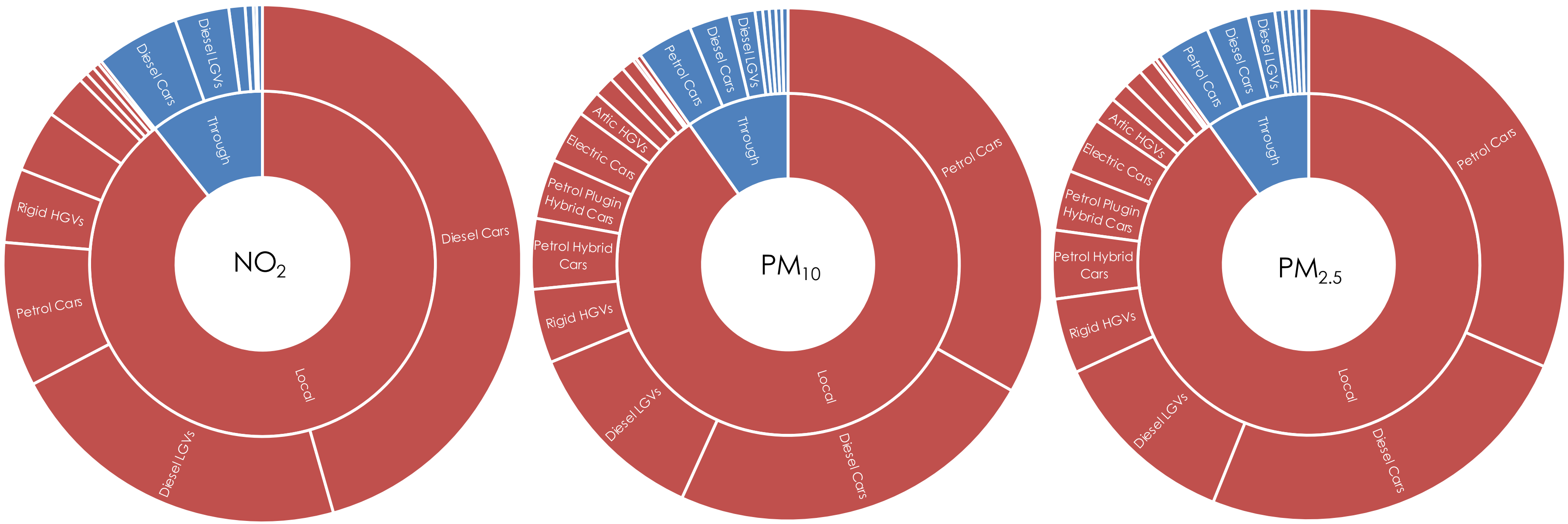

Figure A2-1: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 2 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 3

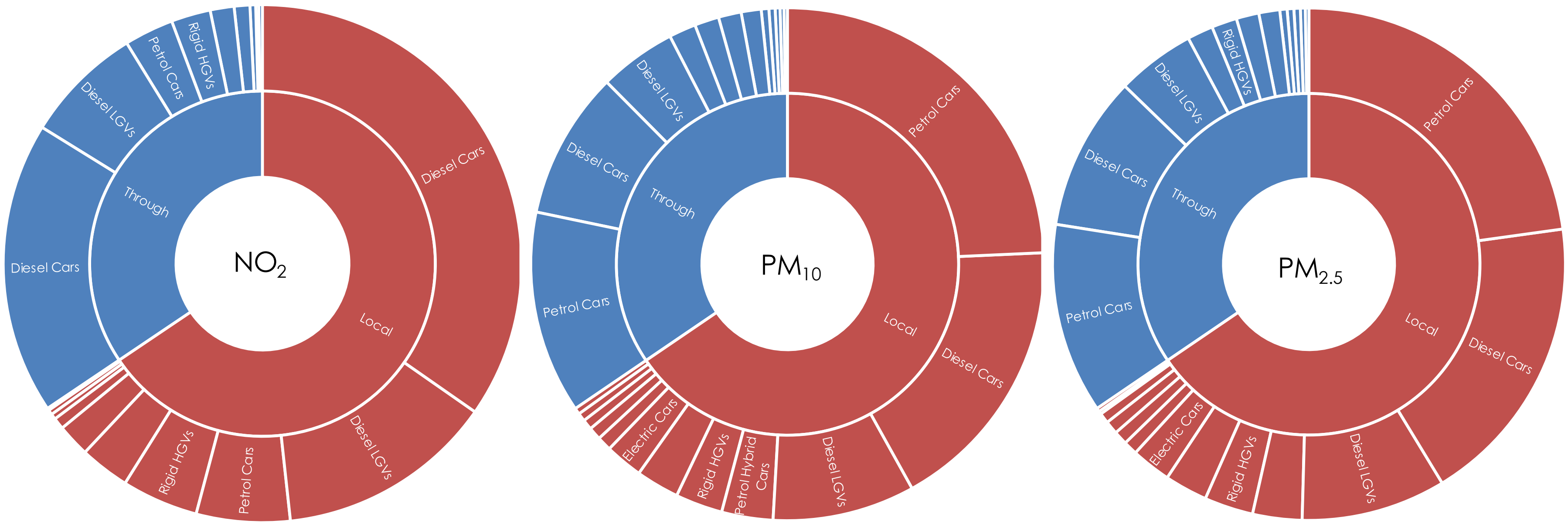

Figure A2-2: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 3 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 4

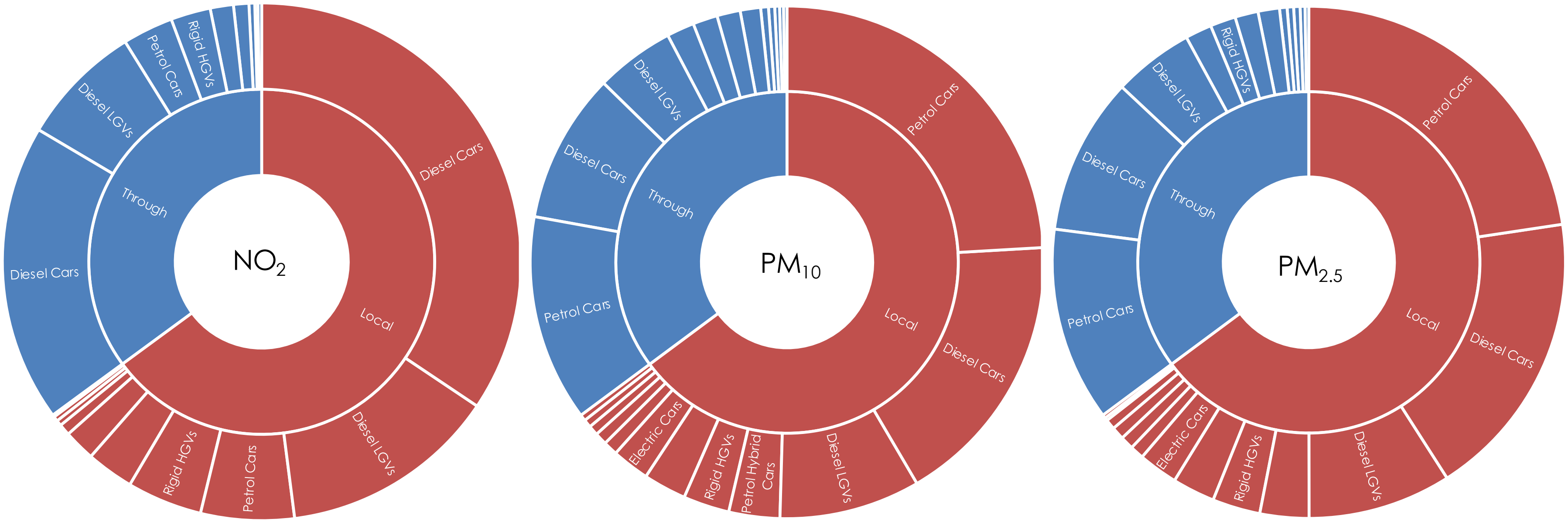

Figure A2-3: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 4 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 5

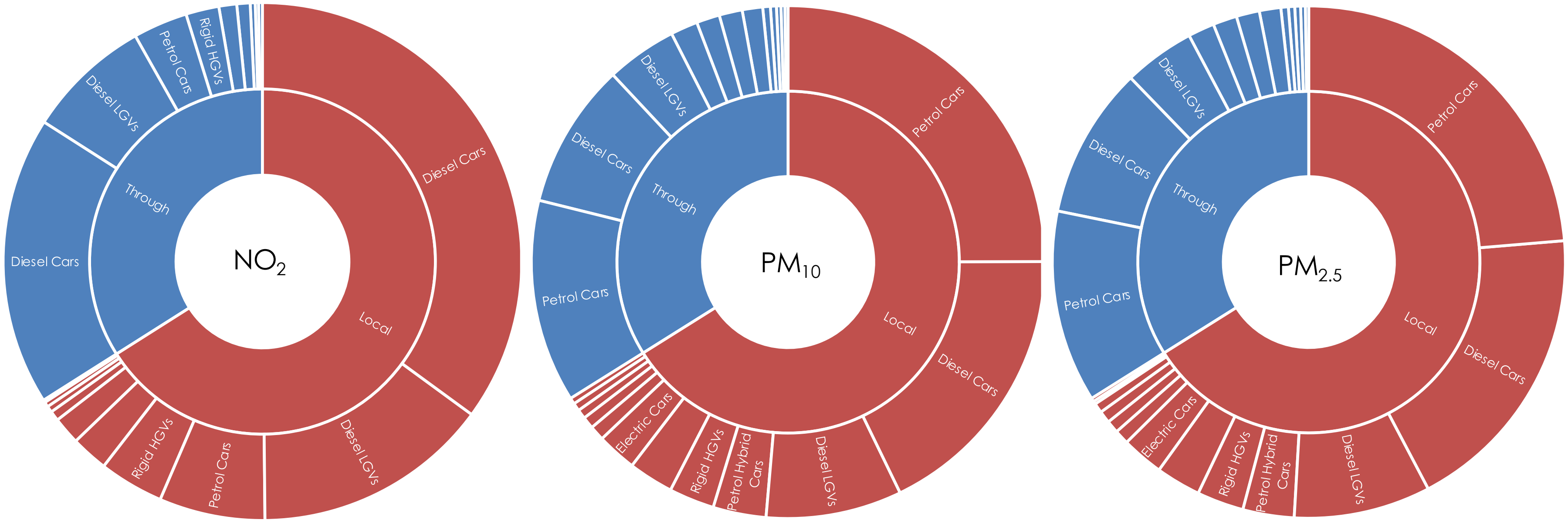

Figure A2-4: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 5 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 7

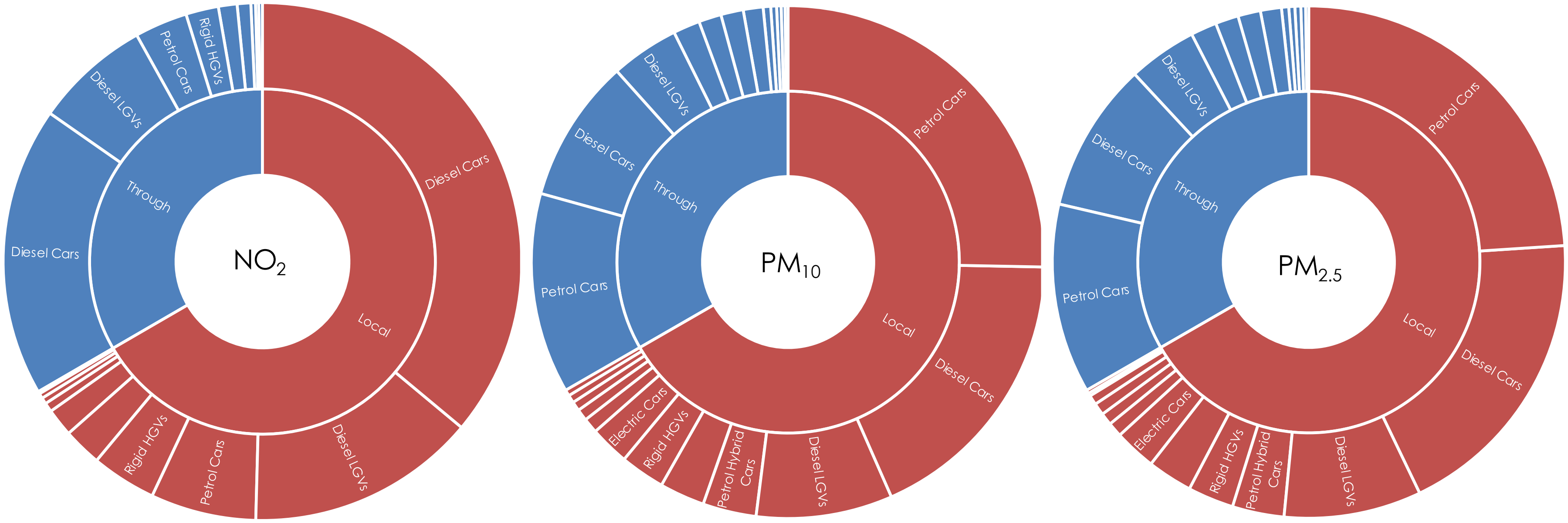

Figure A2-5: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 7 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 8

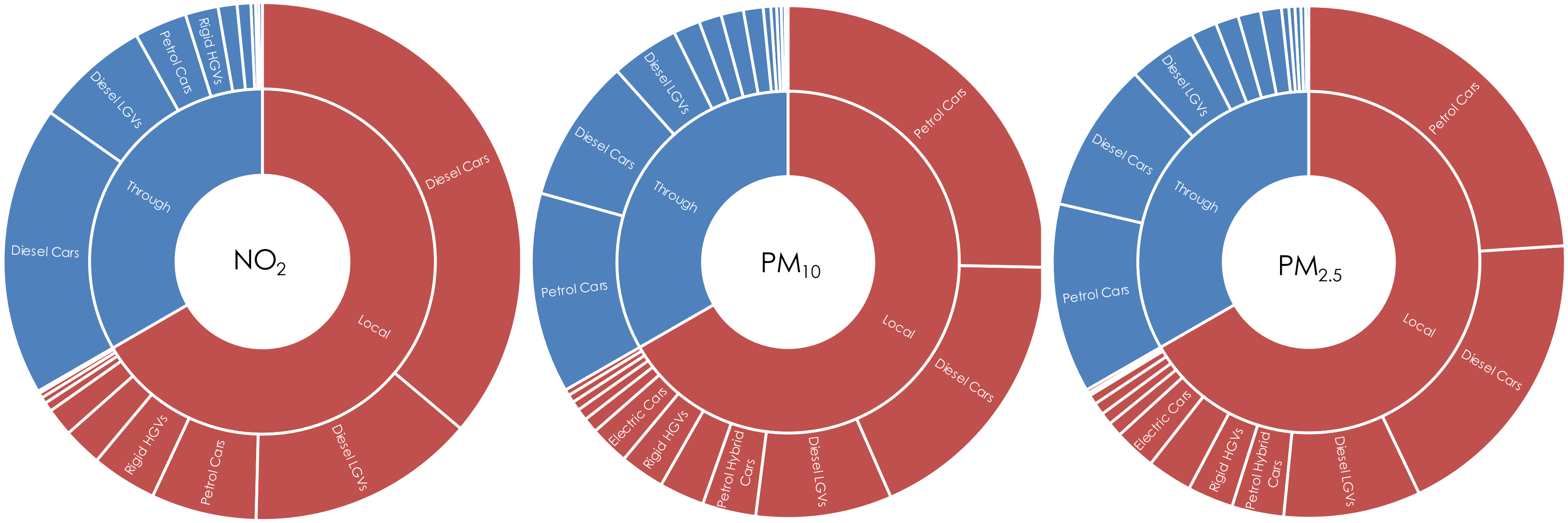

Figure A2-6: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 8 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 9

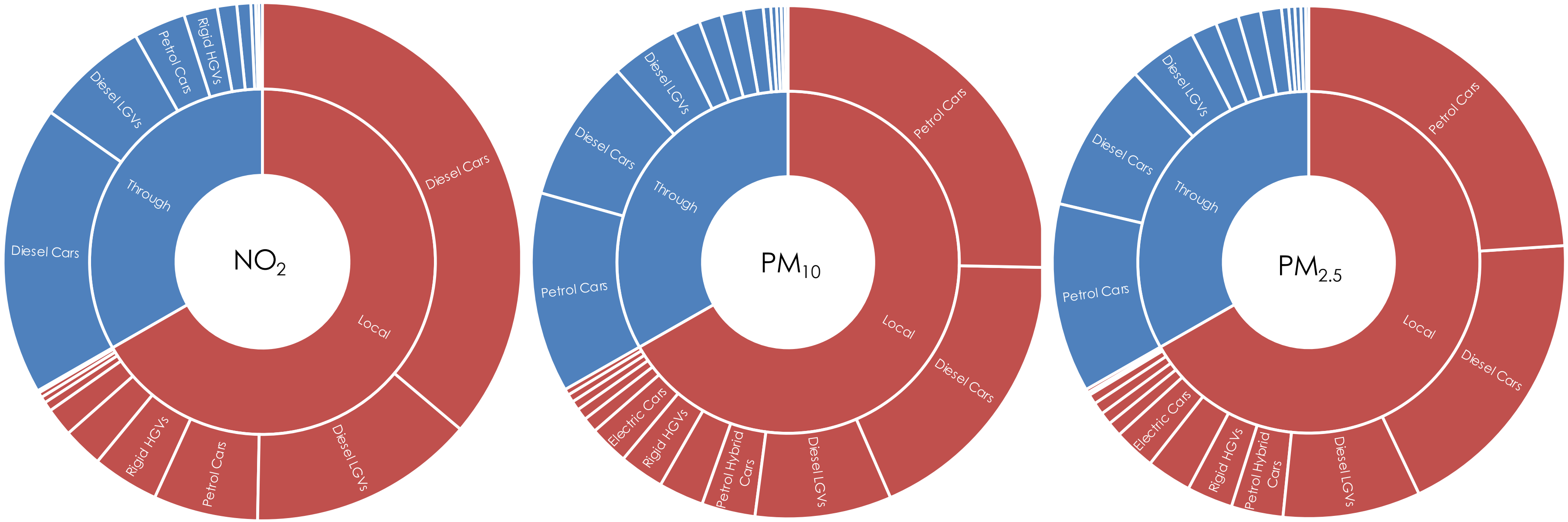

Figure A2-7: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 9 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 10

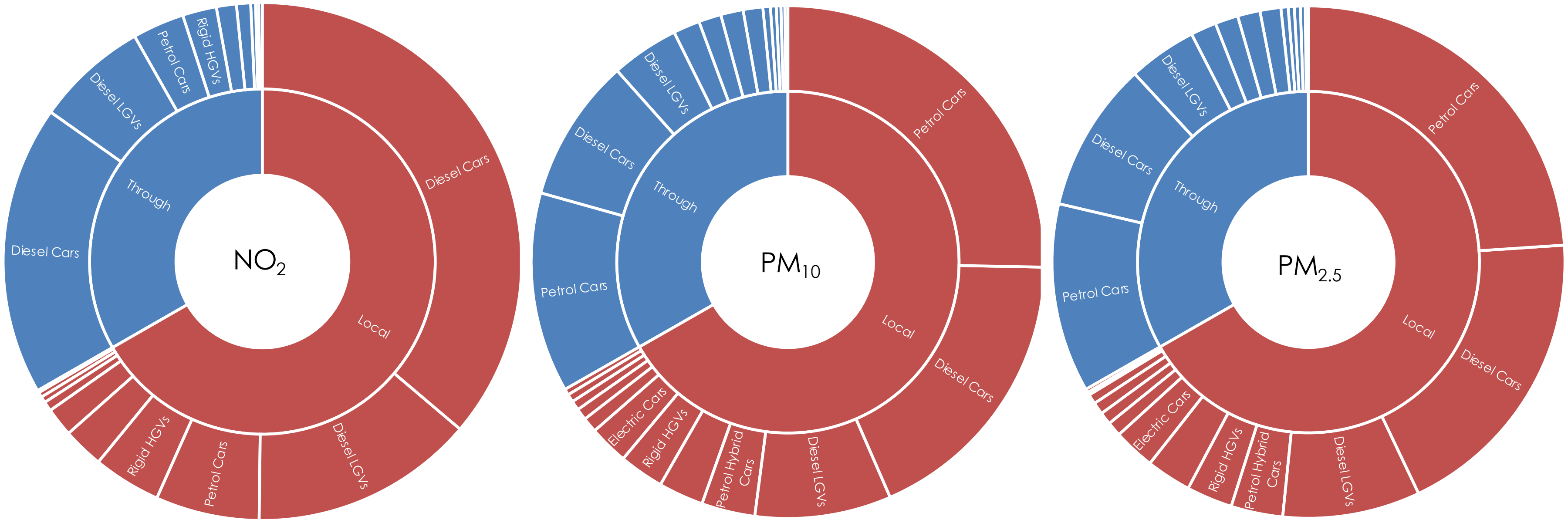

Figure A2-8: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 10 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 12

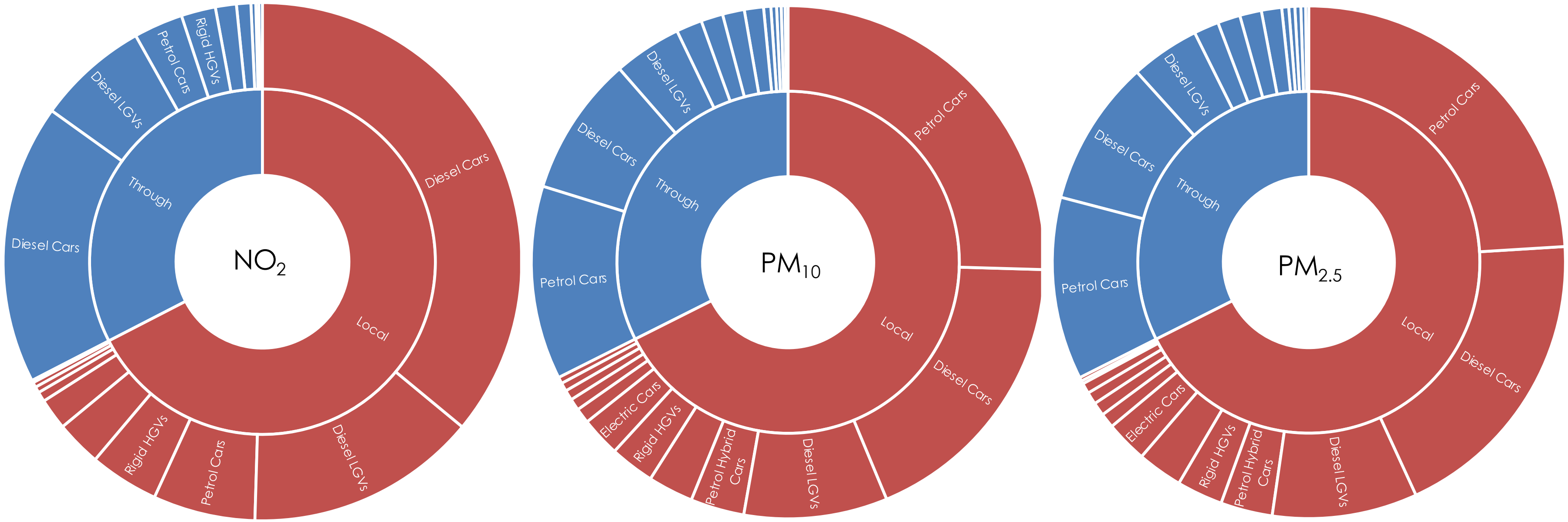

Figure A2-9: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 12 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 13

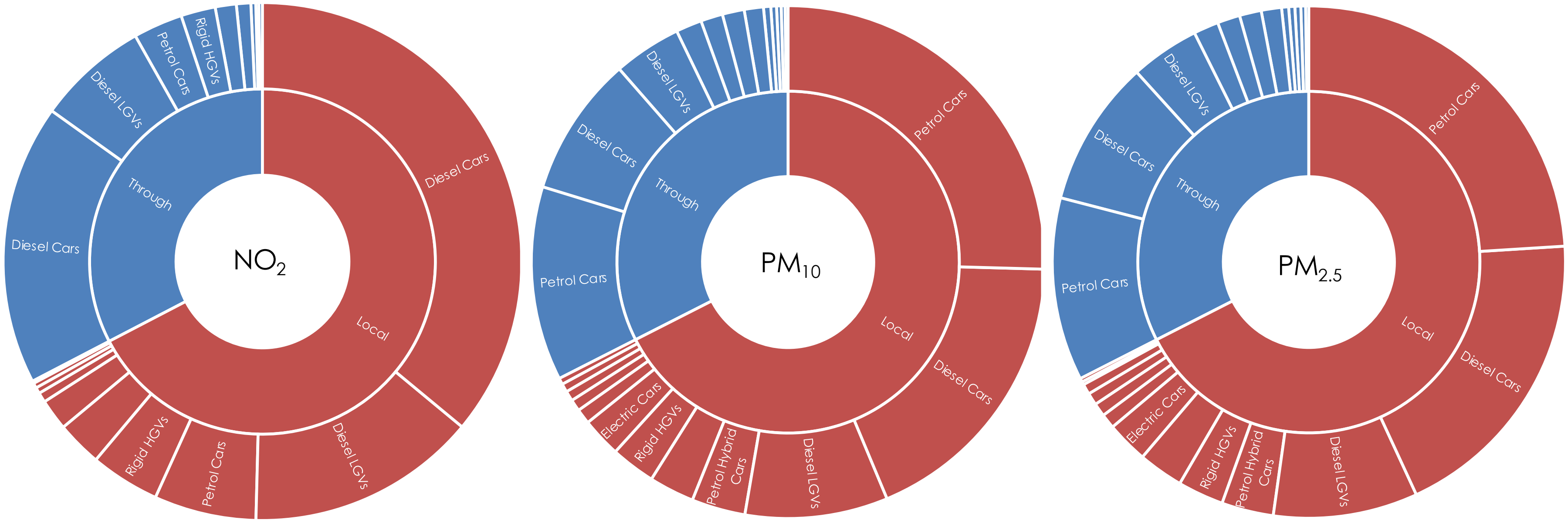

Figure A2-10: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 13 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 14

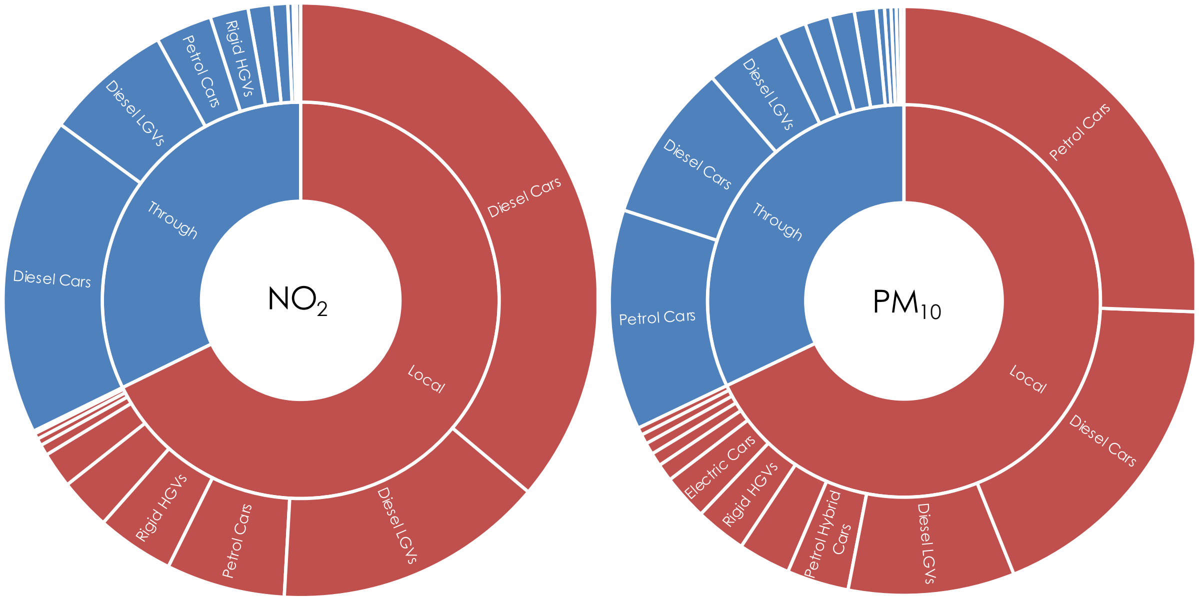

Figure A2-11: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 14 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 15

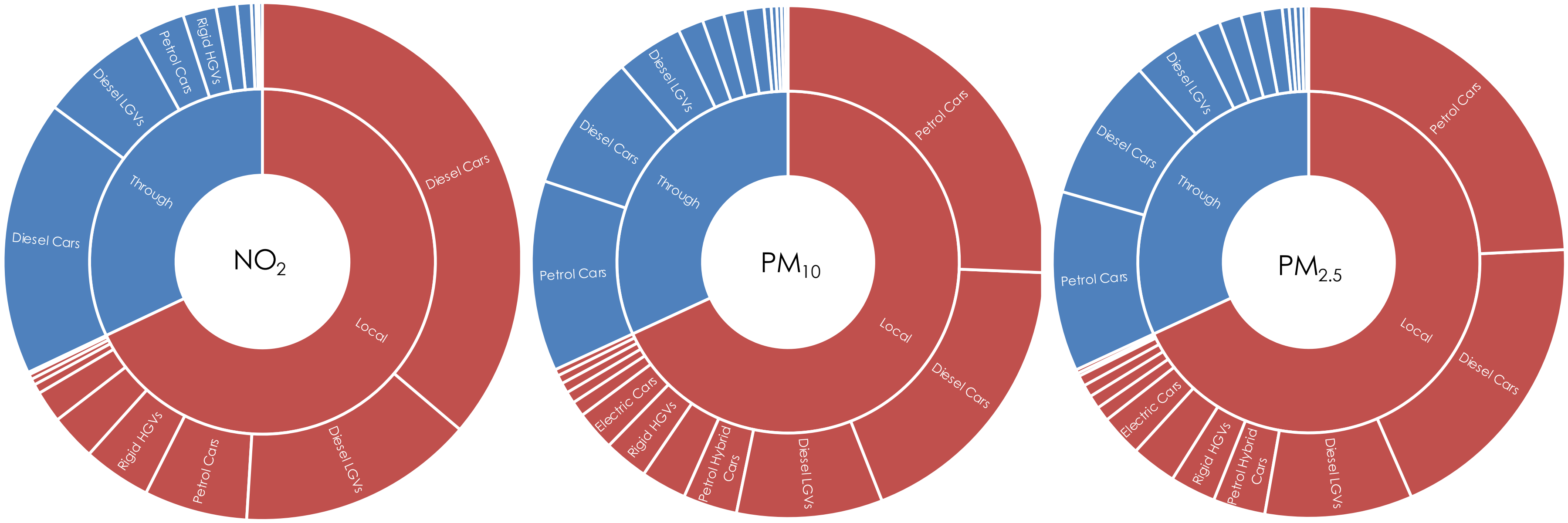

Figure A2-12: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 15 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 16

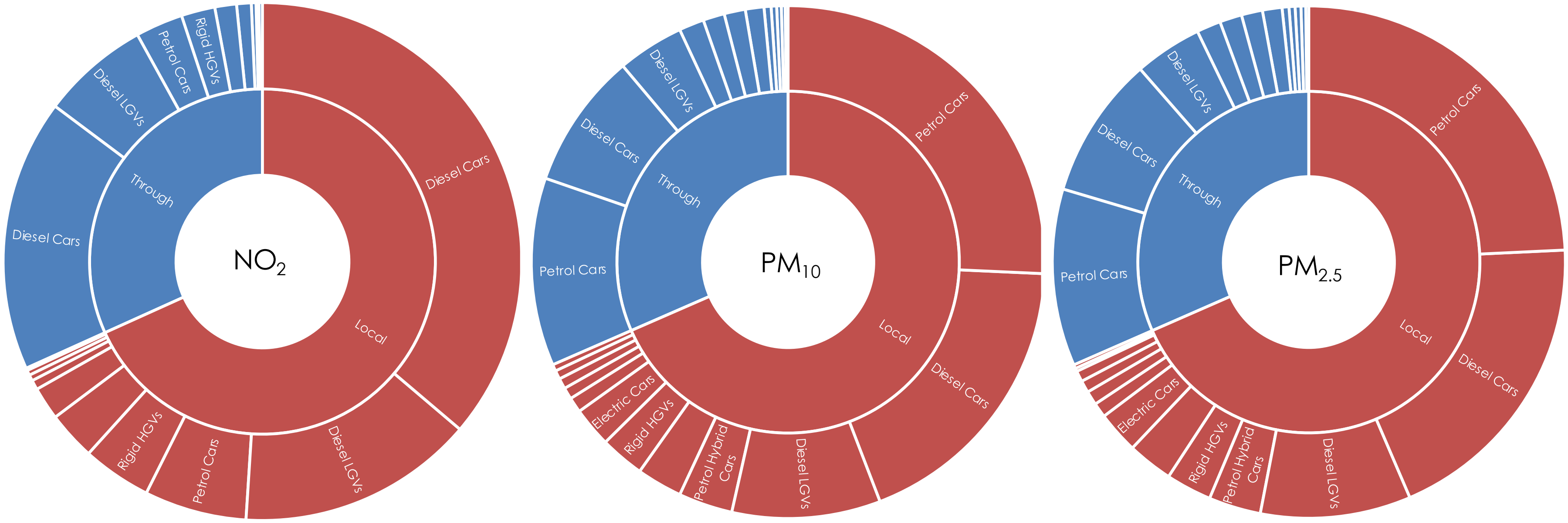

Figure A2-13: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 16 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 17

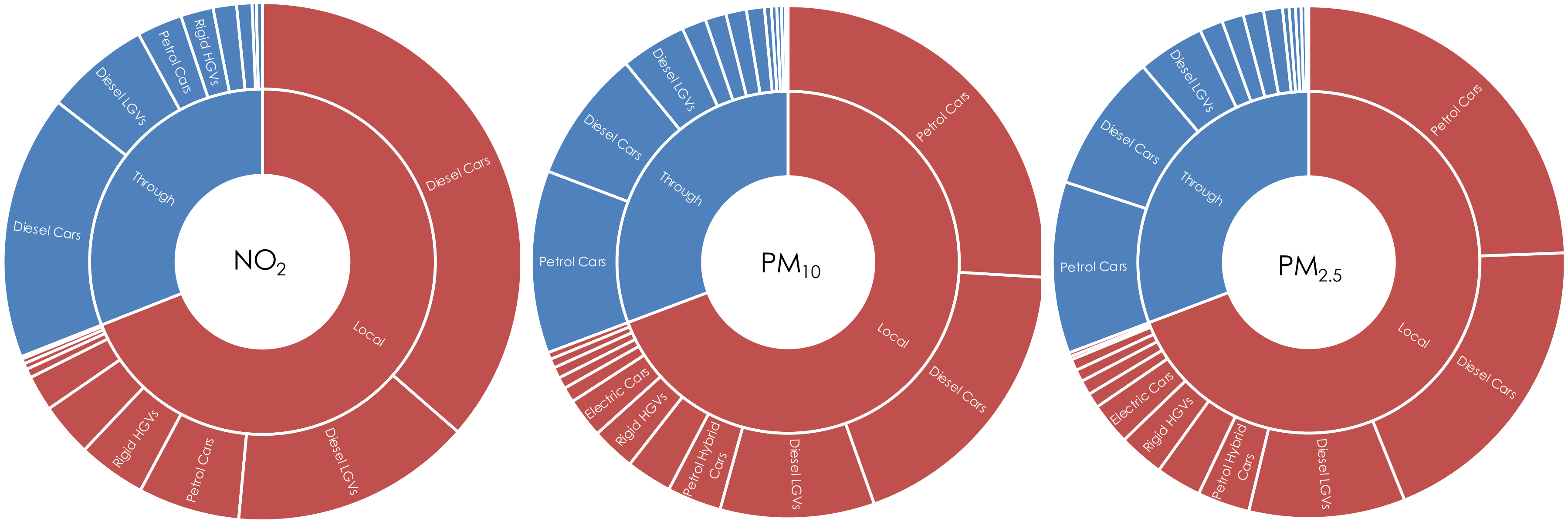

Figure A2-14: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 17 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 18

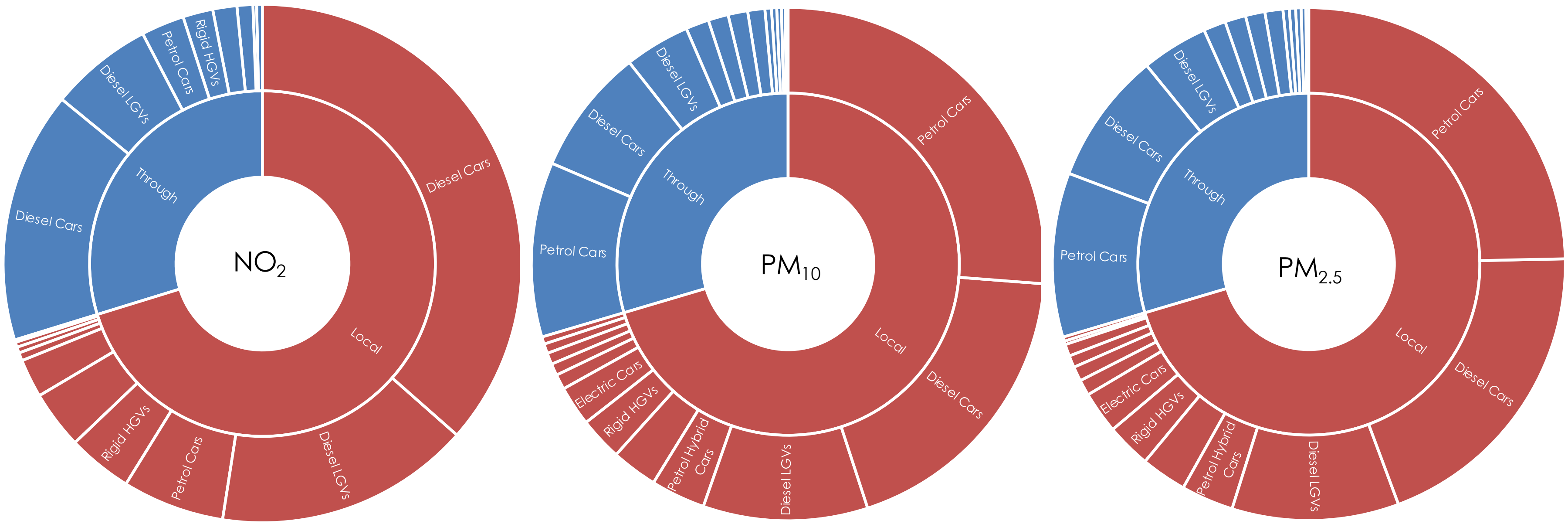

Figure A2-15: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 18 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 19

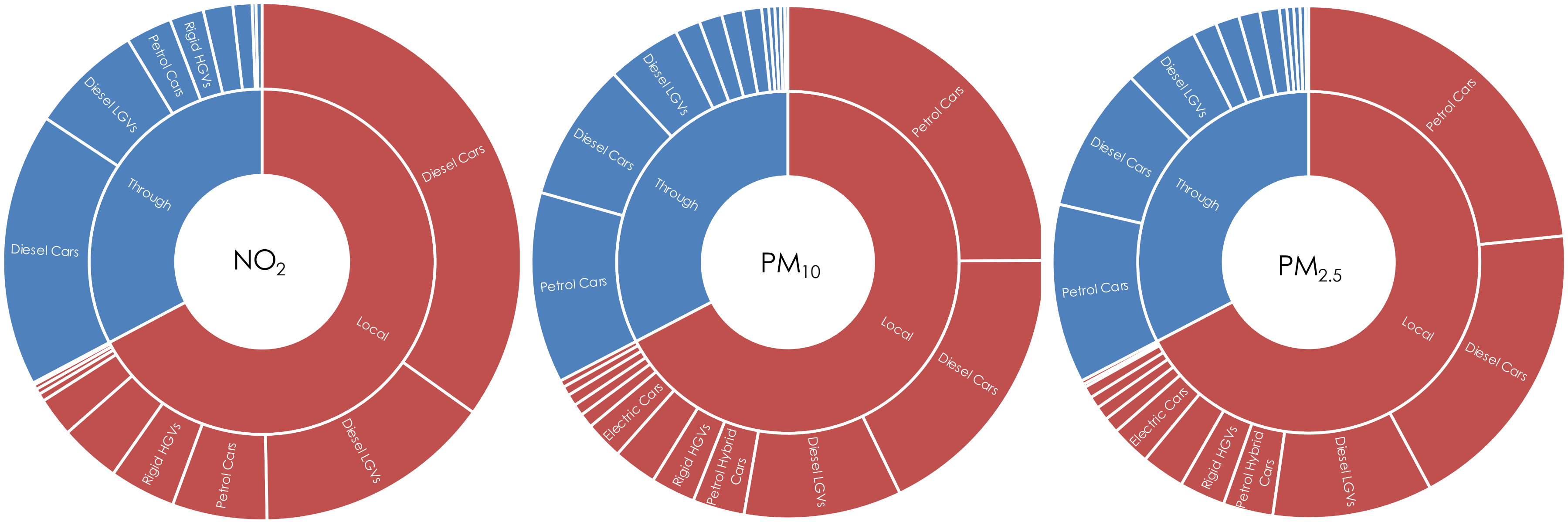

Figure A2-16: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 19 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 21

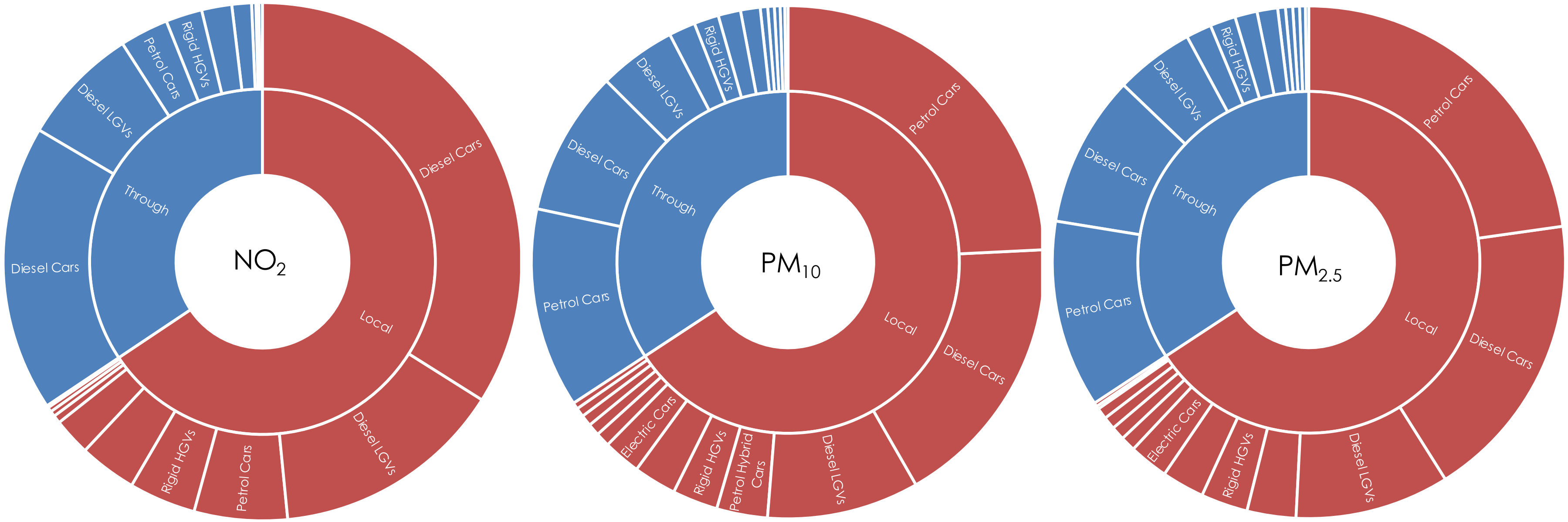

Figure A2-17: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 21 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 23

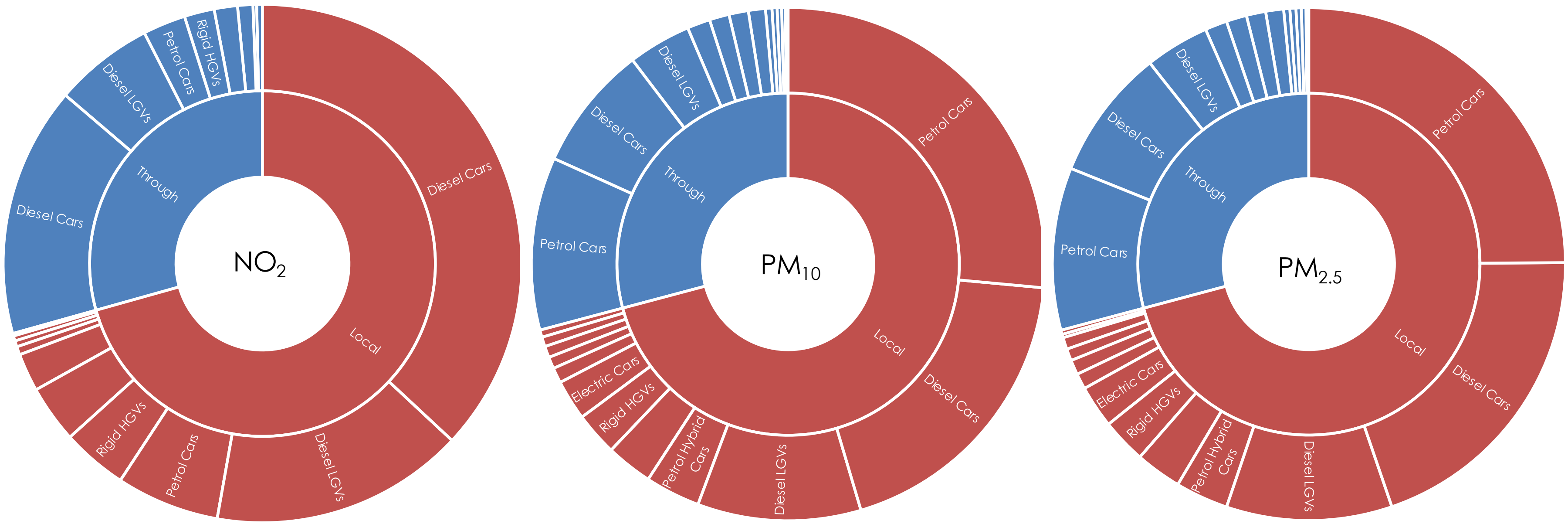

Figure A2-18: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 23 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 24

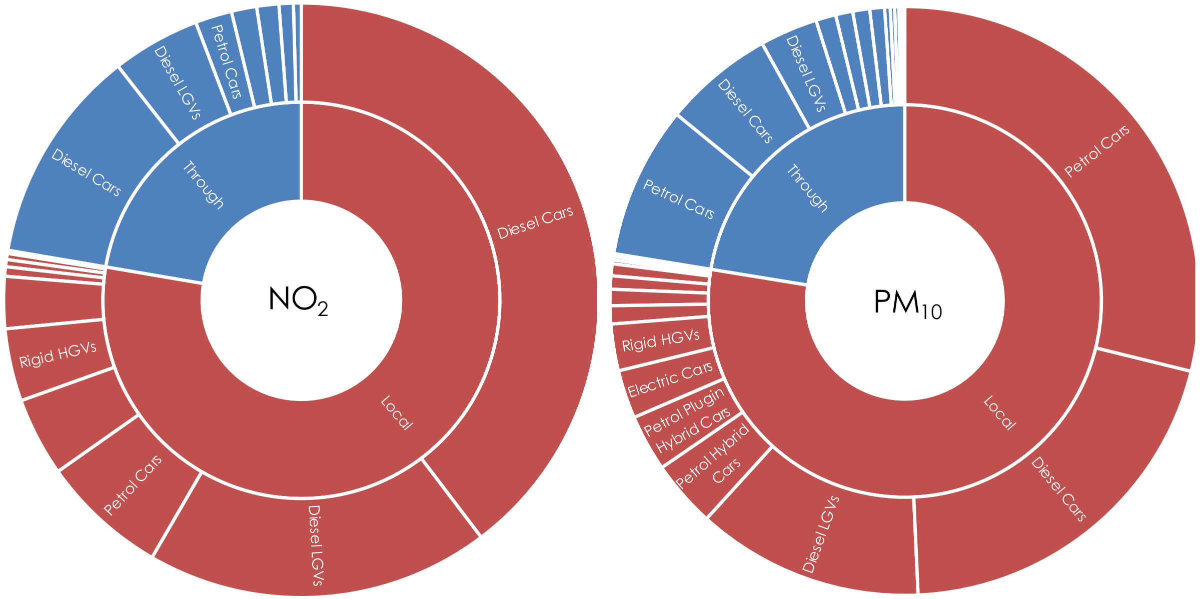

Figure A2-19: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 24 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 26

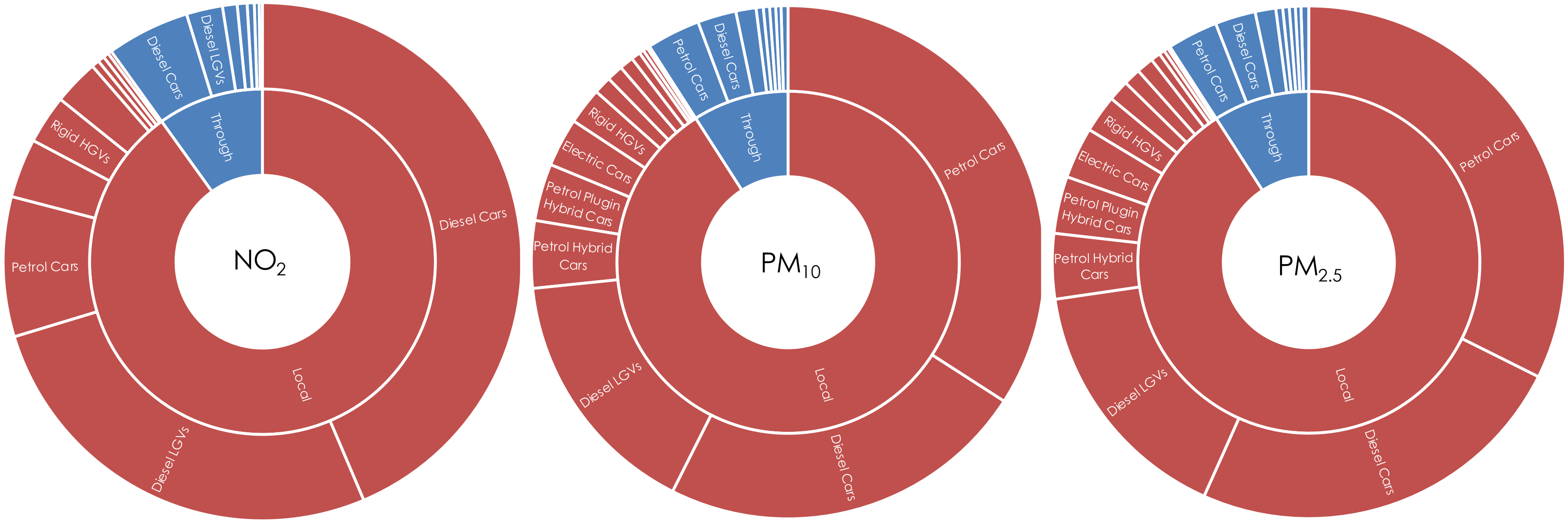

Figure A2-20: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 26 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 27

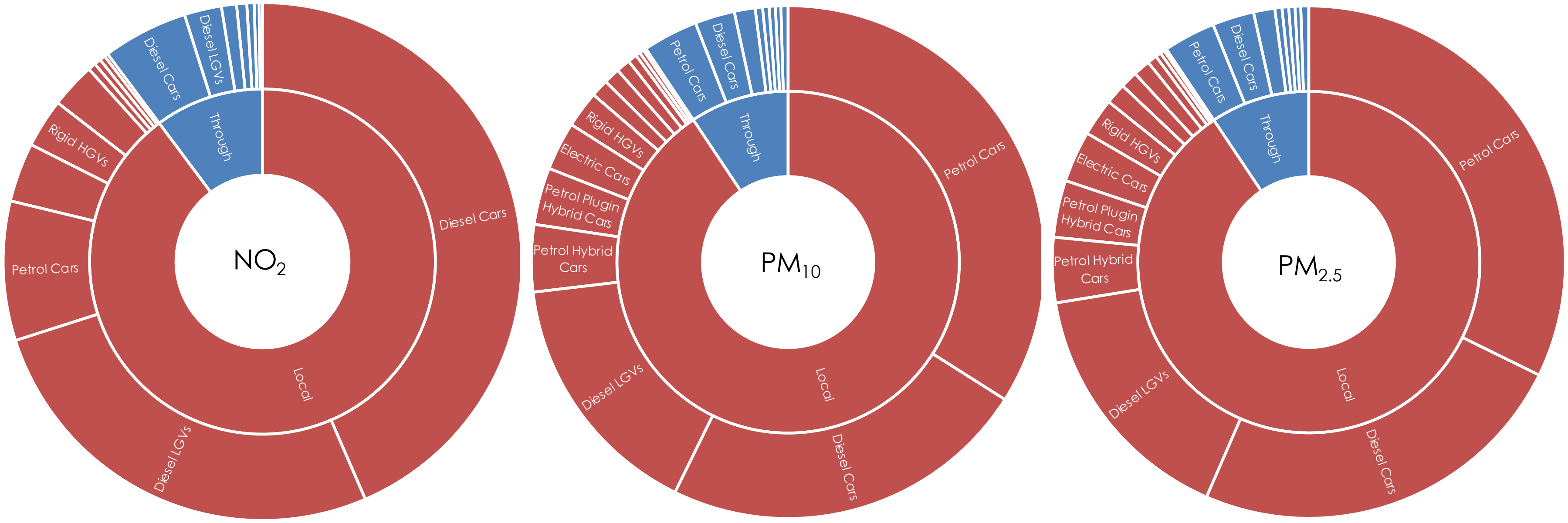

Figure A2-21: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 27 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 28

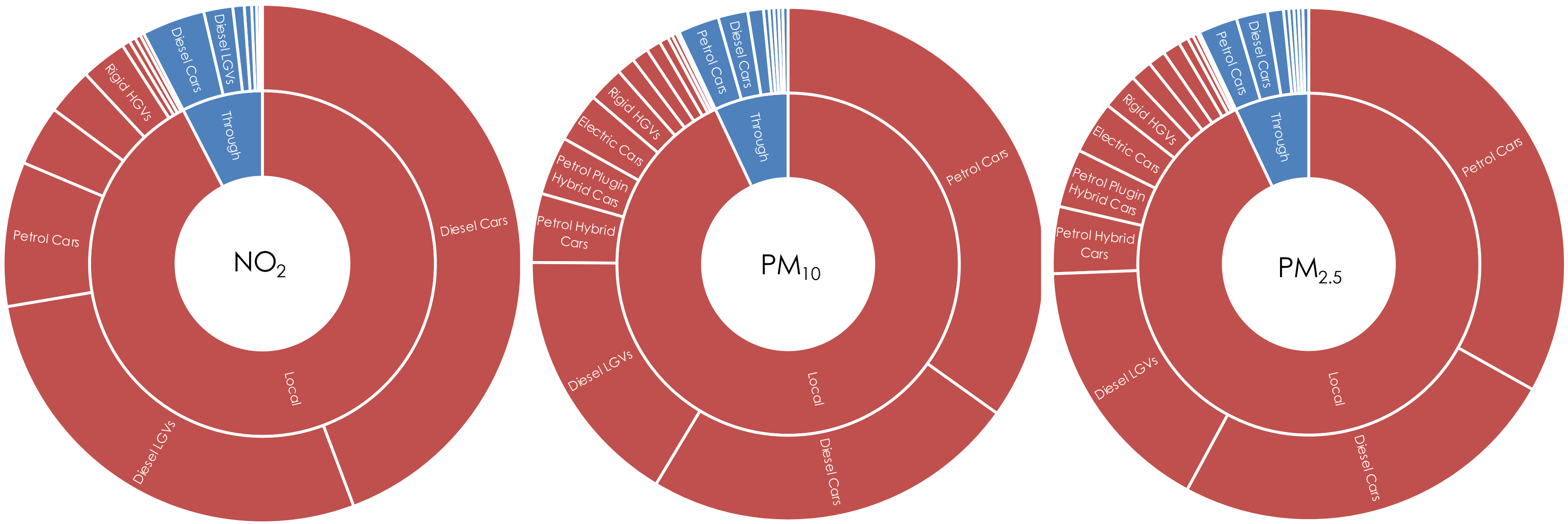

Figure A2-22: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 28 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 29

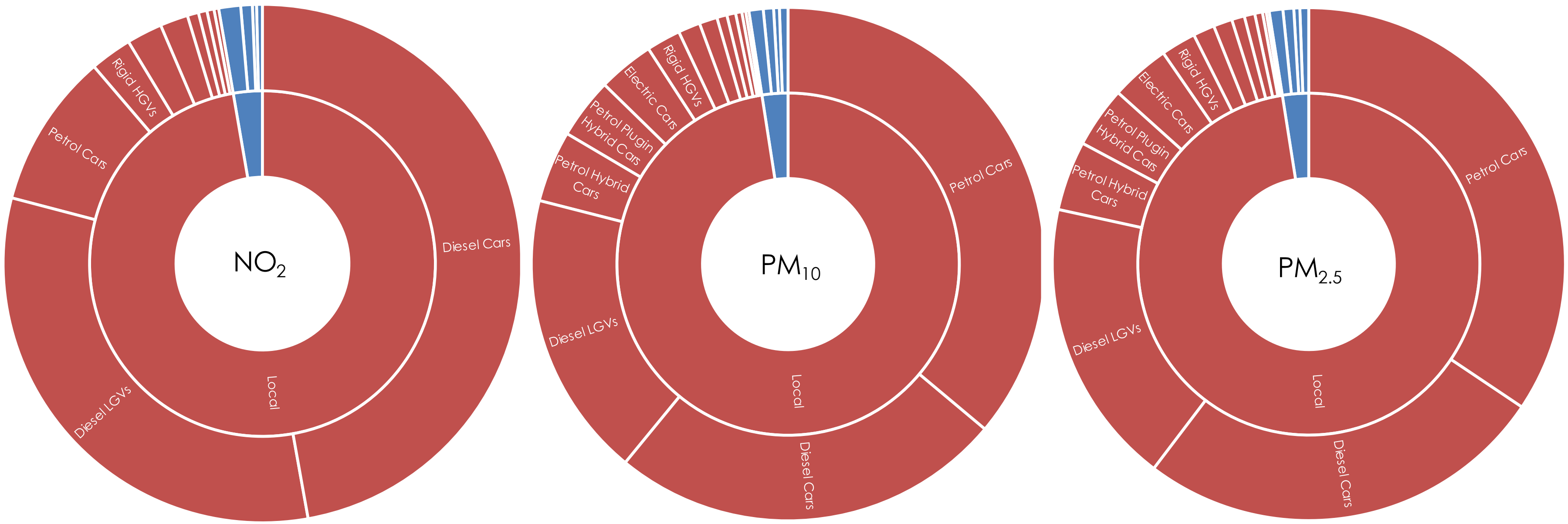

Figure A2-23: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 29 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

Receptor 31

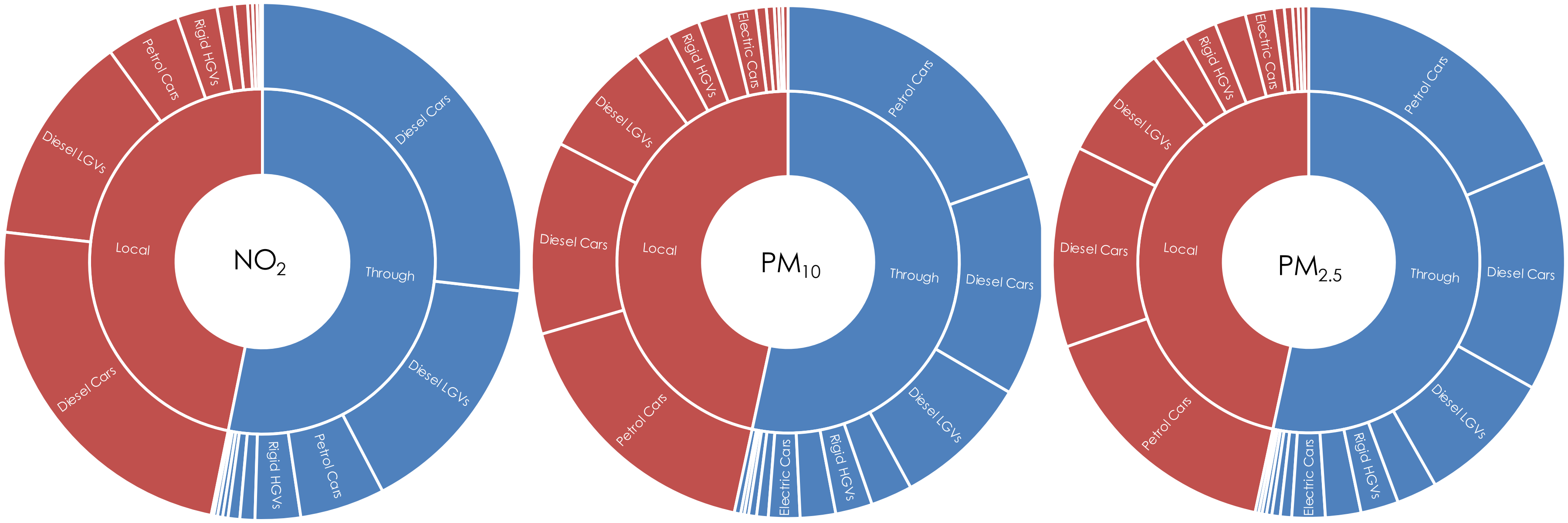

Figure A2-24: Source apportionment of road transport contributions to NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 31 in the baseline model. The inner ring of the plot shows the relative contribution from local traffic (red) and through traffic (blue), while the outer ring provides the contribution by vehicle type. The area of the plot is proportional to the contribution from the respective category.

A3 Scenario Sensitivity Tests

A3.1 Figure A3-1, Figure A3-2, and Figure A3-3 compare the modelled NO_2, PM_{10}, and $PM_{2.5}$ concentrations at Receptor 20 as outlined for the base model (2024) and 'core' scenarios presented in the main body of the report, in addition to four sensitivity tests.

A3.2 The first of the sensitivity tests (labelled 'SC5+TEMPro') provides an indication of modelled concentrations in 2035 based on natural fleet turnover (Scenario 5) but with a growth factor applied to account for increases in traffic flows between 2024 and 2035. The growth factor was derived using the TEMPro System v8.1 (DfT, 2023) for the Middle layer Super Output Areas (MSOAs) covering Storrington. While incorporating traffic growth increases the road component compared to Scenario 5 alone, the total NO_2 concentration under the 'SC5+TEMPro' sensitivity test is still substantially lower than the other 'core' scenarios. As previously discussed, the differences for PM_{10} and $PM_{2.5}$ are limited given the relatively small contribution from road sources.

A3.3 The subsequent three sensitivity tests (labelled 'SC5+SC1', 'SC5+SC2', and 'SC5+SC3') combine the modelled reduction identified between the 'core' scenarios and the 2024 baseline, but apply the relative reduction to what could be the new baseline in 2035 (Scenario 5) (i.e. Scenario 5, and not SC5+Tempro). This is an indicative demonstration of the scale of reductions that may be achieved if the behavioural measures were operational in 2035. It is not appropriate to include Scenario 4 in this way as the fleet improvements modelled for this scenario would mostly have already been realised by the natural fleet evolution in 2035. As the relative benefits from these scenarios are applied to a lower baseline, the absolute reductions in concentrations are smaller than the reductions reported for the 'core' scenarios.

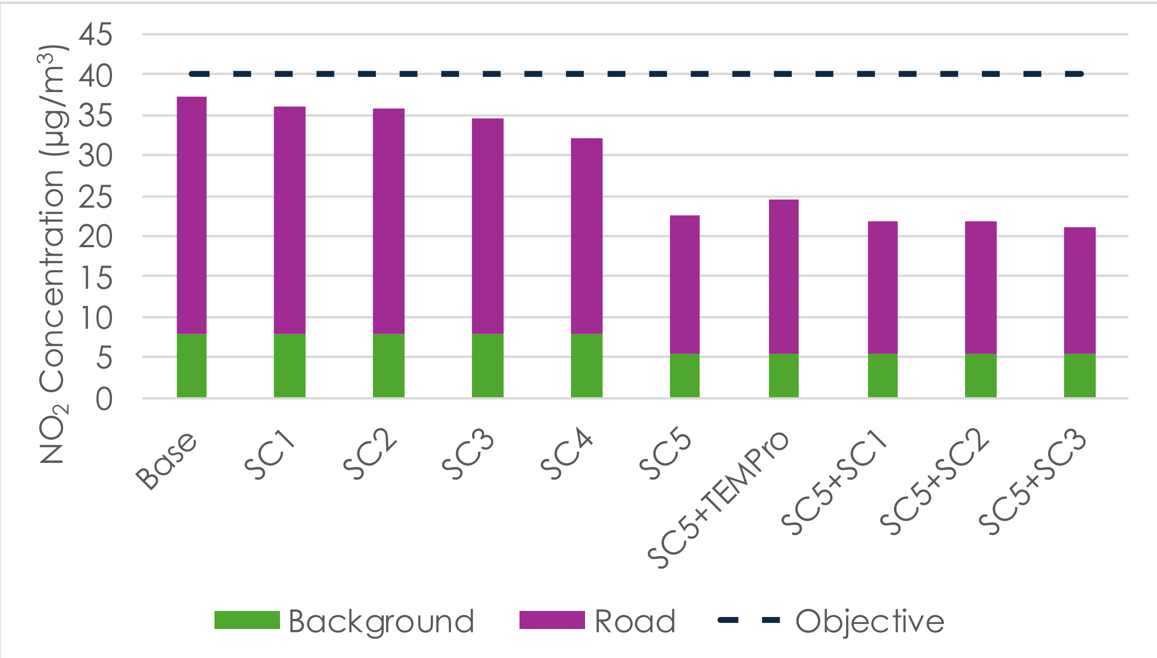

Figure A3-1: Modelled NO_2 concentrations at Receptor 20, source apportioned to show background (green) and road (purple) components for all modelled scenarios and sensitivity tests

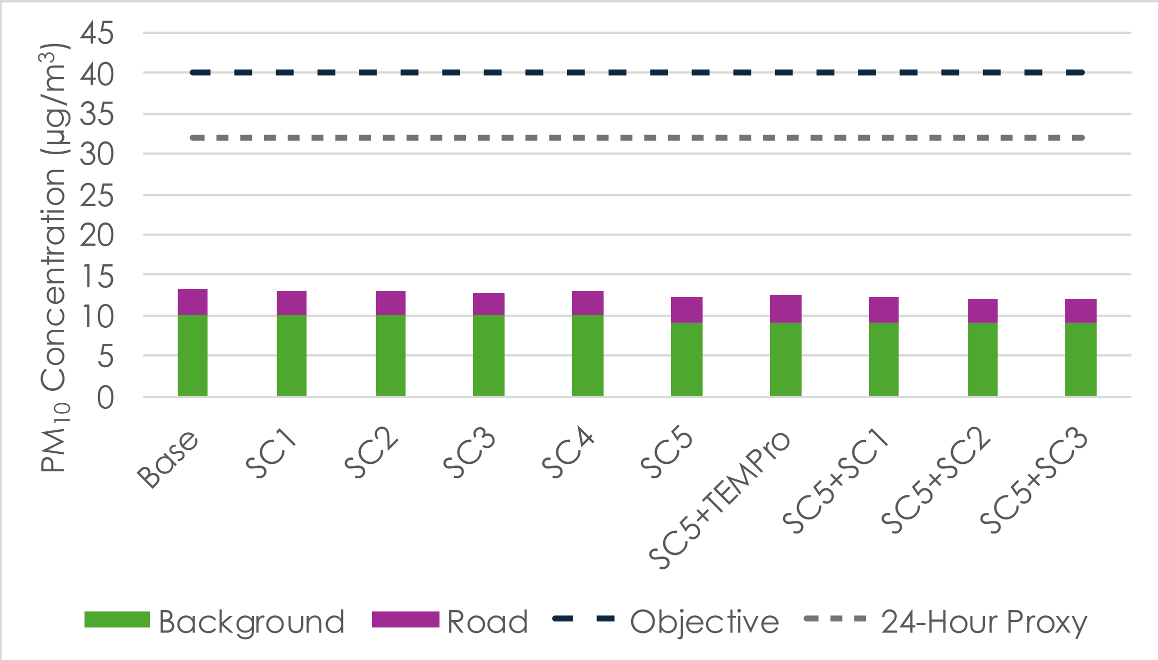

Figure A3-2: Modelled PM_{10} concentrations at Receptor 20, source apportioned to show background (green) and road (purple) components for all modelled scenarios and sensitivity tests

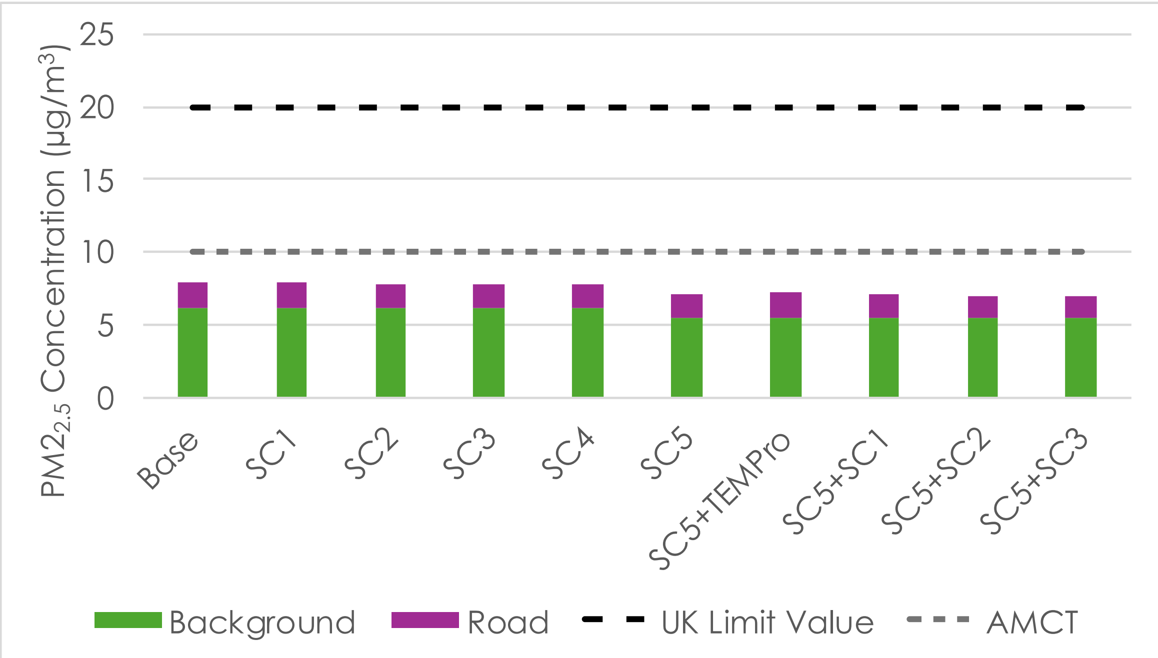

Figure A3-3: Modelled $PM_{2.5}$ concentrations at Receptor 20, source apportioned to show background (green) and road (purple) components for all modelled scenarios and sensitivity tests

A4 Professional Experience

Dr Rosie Watts, BSc (Hons) MSc PhD MIEnvSc

Dr Watts joined AQC in 2024 as an Assistant Consultant. Following a degree in Physical Geography, Rosie completed an ESRC-funded PhD studying wild and prescribed fires, collaborating with industry stakeholders. During her academic career she developed an interest in air quality, including in relation to wildfire events. She is currently gaining experience undertaking a variety of assessments, ranging in scope from standalone assessments to contributions to EIA developments, across both air quality and climate change disciplines. The assessments have also ranged in subjects and techniques, including assessment of air quality impacts on both human health and ecological receptors, the use of ADMS-Roads and ADMS-6, and the preparation of BREEAM Indoor Air Quality Plan. She is a Member of the Institute of Environmental Sciences.

Dr Helen Robinson, BSc (Hons) MSc PhD MIEnvSc MIAQM

Dr Robinson is a Senior Consultant with 8 years' experience in the air quality field. She has prepared numerous qualitative and quantitative air quality reports to support planning applications, including assessment of road traffic emissions, air quality neutrality, construction dust, mineral dust, and odour. She has also worked collaboratively with local authorities to produce Annual Status Reports, Action Plans and Strategies. Prior to joining AQC she was based at the University of Birmingham, completing a BSc in Geography, MSc in Applied Meteorology and Climatology, and PhD in Air Quality. Her PhD research specialised in air quality modelling where she developed a range of tools to estimate real-time pollutant concentrations on Birmingham's road network, and to quantify the impacts of Low Traffic Neighbourhoods on residential population exposure. Additionally, she provided the air quality modelling expertise on the NERC-funded project, 'GI4RAQ' (Green Infrastructure for Roadside Air Quality), to quantitively assess the impacts of 'green' interventions in street environments.

Dr Ben Marner, BSc (Hons) PhD CSci MIEnvSc MIAQM

Dr Marner is the Director of Air Quality Modelling and Assessment at AQC and has more than 20 years' relevant experience. He has been responsible for air quality and greenhouse gas assessments of road schemes, rail schemes, airports, power stations, waste incinerators, commercial developments and residential developments in the UK and abroad. He has acted as expert witness at public inquiries, where he has presented evidence on health-related air quality impacts, the impacts of air quality on sensitive ecosystems, and greenhouse gas impacts. He has developed a range of widely-used air quality models and contributed to the development of best practice. Dr Marner has provided support and advice to foreign governments, Highways England, Transport Scotland, Transport for London, Greater London Authority, the Joint Nature Conservation Committee, the Environment Agency, and numerous local authorities. He is a Member of the Institute of Air Quality Management and a Chartered Scientist. He currently advises the UK Government on air quality as part of its Air Quality Expert Group (AQEG), where his specific area of expertise relates to air quality assessment in the development control process, and has separately provided advice on air quality issues to Defra's Chief Scientific Adviser, the UK Chief Medical Officer, and the UK Chief Planner.

A5 ANPR Survey Report

Report

Storrington Air Quality Modelling

ANPR Summary

For Horsham District Council

20 January 2026

Document Control

Project Title:	Storrington Air Quality Modelling
Project Number:	17016A
Client:	Horsham District Council
Principal Contact:	Thais Covre Delboni and Isabelle Carter
Document Title:	ANPR Summary
Document Number:	17016A-10-R01-02
Prepared By:	Dr Helen Robinson
Reviewed By:	Dr Ben Marner

Revision History

01	19/12/2025	First issue to client
02	20/01/2026	Updated weight restriction analysis

Registered Office: 3rd Floor St Augustine's Court, 1 St. Augustine's Place Bristol BS1 4UD Tel: +44(0)117 974 1086

First Floor, 3 – 7 Herbal Hill, London, EC1R 5EJ Tel: +44(0)20 3873 4780

First Floor, Patten House, Moulders Lane, Warrington WA1 2BA Tel: +44(0)1925 937 195

Nile House, Nile St, Brighton and Hove, Brighton BN1 1HW Tel: +44(0)20 3873 4780

1 Aire St, Leeds LS1 4PR Tel: +44(0)20 3873 4780

Avenue du Port, 86c Box 204, 1000 Bruxelles Tel: +44(0)20 3873 47840

1 Introduction

1.1 Air Quality Consultants Ltd (AQC) has been appointed to carry out a study of air quality in Storrington. Horsham District Council (HDC) has declared an Air Quality Management Area (AQMA) for exceedances of the annual mean nitrogen dioxide objective, covering the A284 through the town centre, between the junction with Amberley Road and the bottom of Manley's Hill. Poor air quality in the area is principally due to road traffic, which is often heavy and congested.

1.2 Monitoring data presented in HDC's 2024 Annual status Report (ASR) shows that air quality in Storrington has improved over recent years, and there have been no measured exceedances of the annual mean nitrogen dioxide objective since 2019. However, the measured annual mean concentration at the junction of Manley's Hill and School Hill (site Storrington 19n), was 37.0 $\mu g/m^3$ in 2023, which is still close to the objective level. Taking this into consideration, HDC wishes to accelerate air quality improvements and enable revocation of the Storrington AQMA.

1.3 One issue, around which HDC and other bodies have worked to improve air quality in Storrington, is through the prohibition of vehicles over 7.5 tonnes from turning right into School Hill from Manley's Hill, with lorries instead being directed via Water Lane. This restriction was introduced in 2019. In 2022, West Sussex County Council and Storrington & Sullington Parish Council undertook a review of the restriction, which included a CCTV traffic survey of goods vehicles entering from either end of the restriction; an additional CCTV camera was located within the restriction length. After the survey, 51 letters were sent to companies that were breaching the weight limit restriction, and more signs were installed.

1.4 HDC considers that an important contributor to traffic and congestion through Storrington is drivers travelling east-west to avoid the A27, which is often heavily congested through Lancing and Worthing, and around Arundel. The proposed Arundel bypass is (as of January 2025) not being taken forward, meaning that pressure on Storrington from this issue is likely to continue.

1.5 In light of this, HDC is considering what further measures can be taken to improve air quality in Storrington and hasten the revocation of the AQMA. Measures being considered include:

- introduction of a 40 mph or 50 mph speed limit on Amberley Road to discourage through traffic;
- implementation of a 20 mph speed limit in Storrington; and
- other schemes to promote behaviour change within Storrington that would improve the air quality and other traffic management schemes, such as traffic signs (gateways, hazard warning or advisory signs), road markings and horizontal deflections.

1.6 The overall aims of the study are to:

1) identify the amount of through traffic using roads in the town, and the types of vehicle;

2) assess compliance with the School Hill weight restriction; and

3) evaluate the air quality impacts of proposed interventions.

1.7 The work programme consists of two principal stages: an ANPR survey followed by an air quality assessment. This report summarises the outcomes of the ANPR survey.

2 ANPR Survey

Overview

2.1 The aims of the ANPR survey are:

- to identify how much traffic passing along the A283 through the Storrington AQMA is through traffic, as opposed to local traffic serving destinations within the town;
- to characterise the traffic through the AQMA in terms of vehicle type, fuel and emissions standard; and
- to identify potential breaches of the weight restriction on School Hill.

2.2 Seven ANPR cameras were deployed across Storrington for seven consecutive full days during a neutral week (5th November 2025 - 11th November 2025) by Tracsis Traffic Data Ltd. Each camera recorded vehicles travelling in both directions and formed a full cordon around the town. There was an additional ANPR camera deployed within the AQMA, but unfortunately the data from this camera could not be retrieved. The locations of the seven ANPR cameras are shown in Figure 2-1.

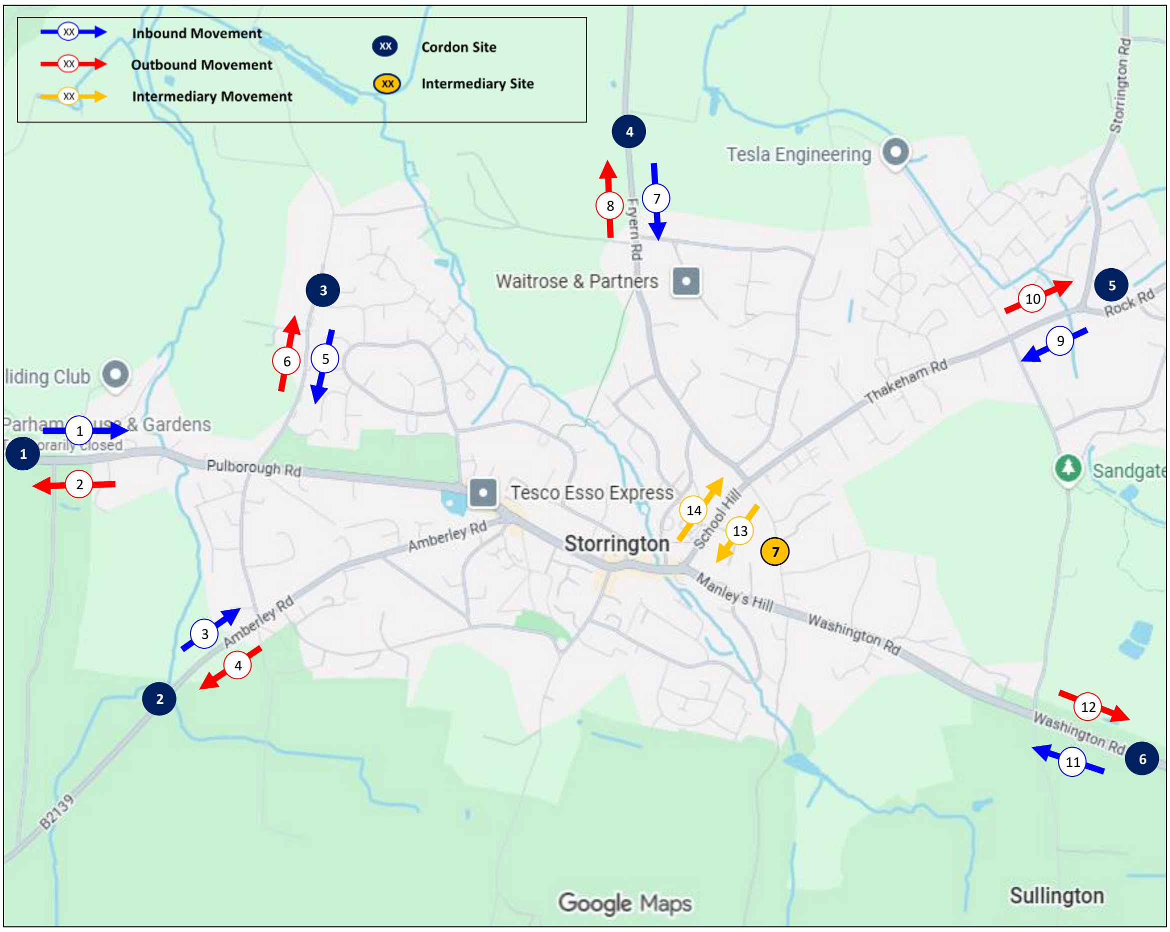

Figure 2-1: ANPR site locations and movement descriptions, as provided by Tracsis Traffic Data Ltd

2.3 A range of external factors can affect plate detection, such as damaged / obscured plates or excessive queuing / tailgating. The ANPR data provided includes metrics of total vehicle count, classified plates, and plates matched at multiple locations. The percentage capture rate, defined as the number of classified plates out of the total vehicle count, was over 90% on every day of the survey. The matched capture rate, defined as the number of classified plates that were matched at two or more locations, was also high (approximately 84%) across the survey period.

Results

Through traffic

2.4 For the purposes of this study, ‘through traffic’ is defined as those drivers travelling east-west, potentially to avoid the A27, thereby either entering at cordon site 2 and exiting at cordon site 6, or vice versa. This therefore includes vehicles which have been detected at inbound movement 3 followed by outbound movement 12, or those detected at inbound movement 11 and outbound movement 4. An additional parameter of only including trips which have a duration of 30 minutes or less is also included for comparison, and a summary of the results from the ANPR survey are presented in Table 2-1.

2.5 On average across the one-week period, 71% of vehicles using Amberley Road to enter Storrington were subsequently detected leaving Storrington via Washington Road within 30 minutes. Therefore, on an average day, it is reasonable to assume that there would be a minimum, due to potentially underestimating unclassified/unmatched plates, of 2,687 vehicles heading west-to-east through Storrington which can be classed as ‘through traffic’.

2.6 On average across the one-week period, 45% of vehicles using Washington Road to enter Storrington were subsequently detected leaving Storrington via Amberley Road within 30 minutes. Therefore, on an average day, it is reasonable to assume that there would be a minimum, due to potentially underestimating unclassified/unmatched plates, of 3,129 vehicles heading east-to-west through Storrington can be classed as ‘through traffic’.

Table 2-1: Through traffic as recorded by matched number plates from ANPR survey

Date	Day of the Week	Total Inbound 3 (Flow)	Inbound 3 → Outbound 12 (Flow)	Inbound 3 → Outbound 12 within 30 mins (Flow)	3 → 12 (%)	3 → 12 within 30 mins (%)	Total Inbound 11 (Flow)	Inbound 11→ Outbound 4 (Flow)	Inbound 11→ Outbound 4 within 30 mins (Flow)	11→4 (%)	11→ 4 within 30 mins (%)
05/11/2025	Wednesday	4306	3132	3041	72.7	70.6	7593	3545	3460	46.7	45.6
06/11/2025	Thursday	4342	3207	3128	73.9	72.0	7875	3829	3723	48.6	47.3
07/11/2025	Friday	4119	2906	2836	70.6	68.9	7780	3699	3576	47.5	46.0
08/11/2025	Saturday	3367	2531	2461	75.2	73.1	6469	3012	2937	46.6	45.4
09/11/2025	Sunday	3080	2407	2357	78.1	76.5	5448	2544	2493	46.7	45.8
10/11/2025	Monday	3962	2693	2610	68.0	65.9	6801	2972	2873	43.7	42.2
11/11/2025	Tuesday	3524	2456	2373	69.7	67.3	7153	2924	2839	40.9	39.7
7-day Average		**3814.3**	**2761.7**	**2686.6**	**72.6**	**70.6**	**7017.0**	**3217.9**	**3128.7**	**45.8**	**44.6**

Fleet Composition

2.7 As data from the ANPR camera deployed within the AQMA could not be retrieved, the number and type of vehicles travelling through the AQMA have been obtained from a camera operated by West Sussex County Council (WSCC) (no. 5574) for the same week as the ANPR survey period. These flows are summarised in Figure 2-2 and have been aligned to vehicle classes in the Emission Factor Toolkit (EFT).

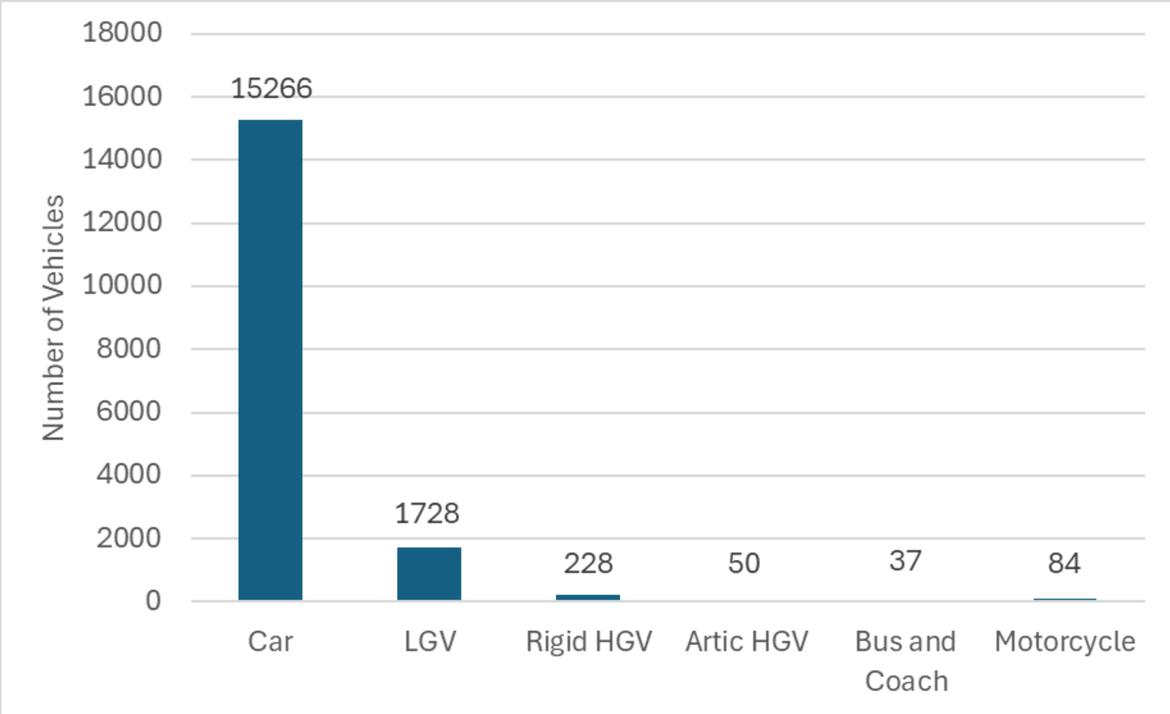

Figure 2-2: Average daily vehicle flow through the Storrington AQMA as recorded by WSCC camera no. 5574 and categorised for use within the EFT.

2.8 To add further granularity to the above to provide information on the Euro standard of vehicles travelling through the AQMA, trip information for matched registration plates from the ANPR survey have been utilised.

2.9 Figure 2-3 summarises the distribution of Euro classes, indicating the age of vehicle fleet and hence emissions, of vehicle travelling through the AQMA. The 'OGV1' class is synonymous with the 'Rigid HGV' class in Figure 2-2, while the 'OGV2' class is synonymous with the 'Artic HGV' class in Figure 2-2. Public Service Vehicles (PSVs) are those that operate for hire or reward (payment or payment in kind) that can carry 9 or more passengers or operate a smaller vehicle that carries passengers and charges separate fares for the journey. Therefore the 'PSV' category in Figure 2-3 is synonymous with the 'Bus and Coach' category in Figure 2-2.

2.10 It is evident that the majority of cars are Euro 6 (65%) followed by Euro 5 (20%) and Euro 4 (11%). LGVs follow a similar distribution as cars. The vast majority of OGV2 vehicles are Euro 6 (99%). The PSV fleet has some of the oldest vehicles, notably consisting of 19% Euro 3 vehicles, 27% Euro 5 vehicles, and only 50% Euro 6 vehicles.

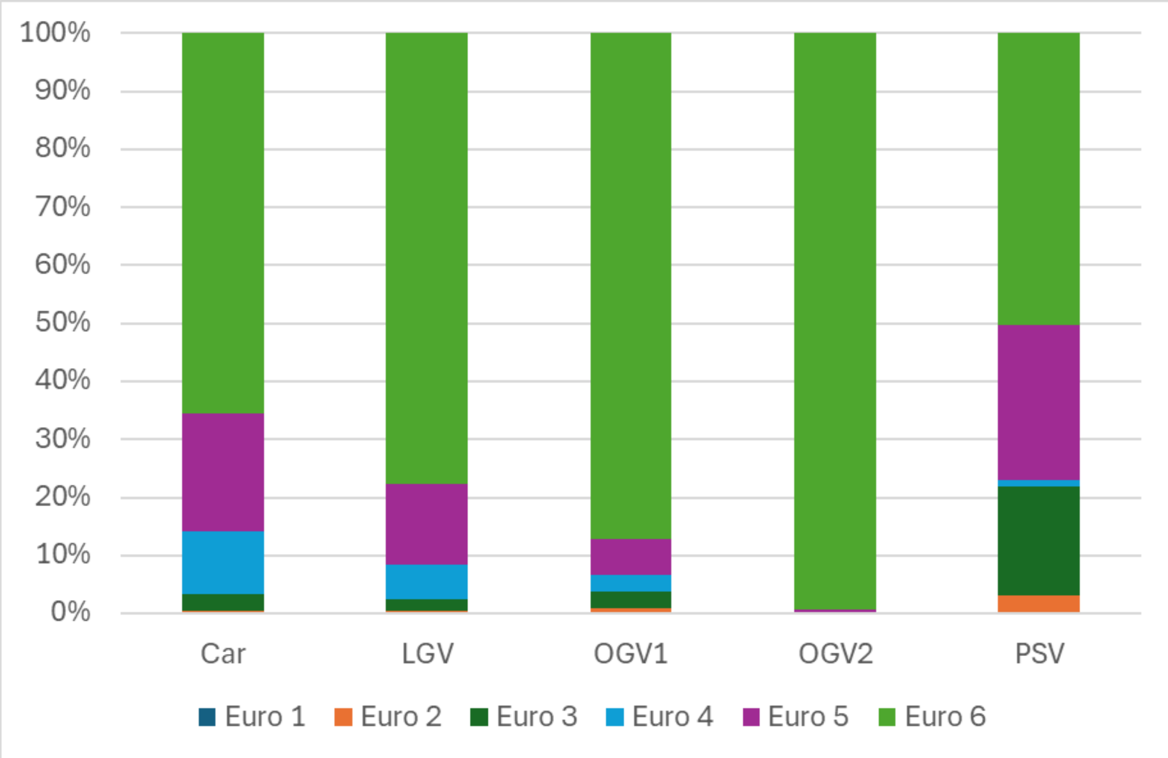

Figure 2-3: Euro fleet proportions of vehicles travelling through the AQMA

School Hill Weight Restriction

2.11 Breaches of the School Hill weight restriction are defined as vehicles classified as 'Other Goods Vehicles' (OGVs) with a weight greater than 7.5 tonnes[1] that are matched at either:

- an 'inwards' movement from the south, east or west (i.e. movements 11, 3, 1, or 5) followed by movement 14 (i.e. travelling up School Hill); or
- are registered at movement 13 (i.e. travelling down School Hill) and subsequently matched at an 'outward' movement after the weight restriction (i.e. movement 12, 4, 2, or 6).

Table 2-2: Vehicle counts of OGVs >7.5 tonnes breaching the weight restriction on School Hill

Date	Day	Total Breaches	Breaches travelling up School Hill	Breaches travelling down School Hill
05/11/2025	Wednesday	16	11	5
06/11/2025	Thursday	21	16	5
07/11/2025	Friday	12	9	3
08/11/2025	Saturday	2	1	1
09/11/2025	Sunday	0	0	0
10/11/2025	Monday	14	9	5
11/11/2025	Tuesday	18	15	3
Weekday Average		**16**	**12**	**4**

2.12 Table 2-2 shows that on an average weekday there were 16 vehicles per day which were classified as breaching the weight restriction on School Hill. Of these movements, the majority of breaches were from vehicles travelling up School Hill (12) compared to vehicles travelling down School Hill (4). On Saturday and Sunday there were significantly fewer breaches of the weight restriction.

[1] Maximum Gross Weight as listed in the DVLA database

Logika
GROUP

London • Bristol • Warrington • Leeds • Brighton • Brussels