Sevenoaks District Council

Detailed Assessment of Existing AQMAs

September 2020

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Executive Summary

Bureau Veritas have been commissioned by Sevenoaks District Council to complete a review of the Council's existing Air Quality Management Areas (AQMAs) to help inform a new Air Quality Action Plan (AQAP). The Council currently have nine AQMAs, however only seven have been reviewed due to data availability. All of the AQMAs in question have been declared in relation to traffic emissions; six of which have been designated for exceedances of the NO_2 annual mean Air Quality Strategy objective. The remaining AQMA, No.6, along the M25, has been declared due to exceedances of the PM_{10} 24-hour mean AQS objectives.

A dispersion modelling assessment has been completed whereby NO_2 and PM_{10} concentrations have been predicted across all relevant areas within the district at both specific receptor locations, and across a number of gridded areas to allow the production of concentration isopleths. This has been used to supplement local monitoring data to provide a clear picture of the pollutant conditions within the borough.

Following the completion of the analysis of both monitoring data and modelled concentrations across all of the assessed areas a number of recommendations have been made in terms of the AQMAs within Sevenoaks:

- AQMA No.1 M20 – The AQMA can be considered for revocation due to no monitored exceedances at any of the monitoring locations, nor has the model predicted exceedances at any receptor locations within the AQMA. Additional monitoring could be carried out at specific receptor locations to confirm this as there are only 2 monitoring locations currently along the stretch of the AQMA;

- AQMA No.2 M25 – As a consequence of the modelling results, additional monitoring is recommended to be carried out near the residential property at the roundabout of London Road in Westerham. Monitoring should also be carried out near to residential properties along the A224 and B2211 near to the M25. If these concentrations are shown to be compliant with the annual mean objective, then the AQMA can be revoked;

- AQMA No.3 M26 – The model predicted concentrations within 10% of the AQS objective at one location. Therefore, monitoring is recommended to be carried out close to this location (receptor ID 161), along the A224 London Road flyover. If these concentrations are shown to be compliant, then the AQMA can be revoked;

- AQMA No.4 A20T – No exceedances were predicted by the dispersion model within the AQMA. However, as no monitoring locations are present within the AQMA, it is recommended that monitoring be carried out close to residential properties on Phillip Avenue/Ladds Way/Cyclamen Road to confirm the modelled results. If no exceedances are reported, the AQMA should be revoked;

- AQMA No.6 (M25-PM10) – Based upon the modelling results, no exceedances at relevant receptor locations are expected. Therefore, this AQMA can be revoked. No further actions are required;

- AQMA No.10 (Sevenoaks High Street) – The AQMA is to remain in place, with additional monitoring carried out along the narrow section of the High Street near to the Bus Station, as well as at the closest point of relevant exposure to the A224 between the junctions to South Park and Lime Tree Walk. This is to ascertain whether there are any exceedances of the 1-hour NO_2 objective, as well as whether the AQMA should be extended along part of the A224;

- AQMA No.13 (A25) – The AQMA is to remain in place, whilst potentially being reduced in size west of Westerham and east of Seal where no exceedances are predicted. Additional monitoring could be carried out to confirm this at residential properties along these stretches. Monitoring should be carried out out near to the junction of London Road to the A25 Market Square in Westerham, as well as on the north-western side of the southern roundabout in Riverhead in order to determine whether there are any exceedances of the 1-hour NO_2 objective.

The next steps upon completion of this Technical Note are to develop, through consideration of merit, a defined set of achievable measures to be drawn forward into the revised action plan document.

1 Introduction

Bureau Veritas have been commissioned by Sevenoaks District Council (the Council) to complete a detailed assessment in order to review the designation of the Council's existing Air Quality Management Areas (AQMAs), and to help inform a new Air Quality Action Plan (AQAP). The Council's last published AQAP was in 2009, and the details presented within this assessment are to be used to develop an updated AQAP.

The Council currently have nine AQMAs. With the exception of AQMA No.6, these have been designated for exceedances of the NO_2 annual mean Air Quality Strategy (AQS) objective, where AQMA No.6 has been declared only for exceedances of the PM_{10} 24-hour mean AQS objective. AQMA No.8 (Swanley Town Centre) and AQMA No. 14 (Junction of Birchwood and London Roads, Swanley) have not been included in this assessment due to no traffic data being available at the time of the assessment being carried out. Department for Transport (DfT) traffic counts are not available for the roads in these AQMAs, and traffic surveys have not been able to be carried out due to the restrictions as part of Covid-19 pandemic, resulting in decreased levels of traffic which are not likely to be representative of normal conditions.

Details of the AQMAs included within this assessment are as follows, and maps detailing the locations of the AQMAs are presented in Figure 1.1 to Figure 1.6:

- AQMA No.1 M20 – the area following the M20 throughout the borough extending 80m either side of the motorway centreline;
- AQMA No.2 M25 – the area following the M25 throughout the borough extending 200m either side of the motorway centreline between J5 and 6, 80m between J3 and 5, and 140m between J2 and 3;
- AQMA No.3 M26 – the area following the M26 throughout the borough extending 40m either side of the motorway centreline;
- AQMA No.4 A20T – the area following the A20T throughout the borough extending 40m either side of the motorway centreline;
- AQMA No.6 (M25-PM10) – the area encompassing part of the M25 motorway, west of Junction 5;
- AQMA No.10 (Sevenoaks High Street) – the area encompassing Sevenoaks High Street; and
- AQMA No.13 (A25) – the entire length of the A25 from the border with Tonbridge and Malling in the East to the border with Tandridge on the West.

1.1 Scope of Report

The assessment seeks, with reasonably certainty, to predict the magnitude and geographical extent of any exceedances of the AQS objectives, providing the Council with updated modelling data that can be utilised for the development and/or update to AQAP measures.

The areas considered as part of this study are illustrated in the figures shown under each AQMA heading within this report. The following are the main objectives of this report:

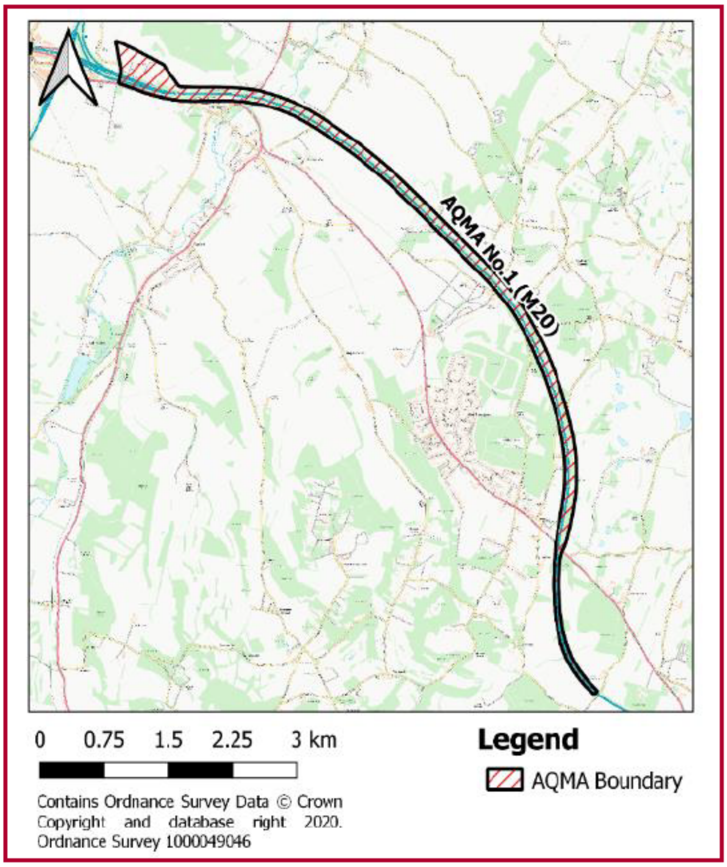
- To assess the air quality at selected locations (receptors) at the façades of locations of relevant exposure, representative of worst-case exposure within, and close to the existing AQMA boundaries, based on modelling of emissions from road traffic on the local road network;
- To determine the geographical extent of any potential exceedance of the annual mean AQS objective for NO_2, and in regards to the AQMA No.6 the 24-hour AQS objective for PM_{10};
- To determine the relative contributions of various source types to the overall pollutant concentrations through the completion of a source apportionment study; and

- To put forward recommendations as to the extent of any changes to the current AQMA boundary and any changes to the declaration of the specific AQMAs.

The approach adopted in this assessment to assess the impact of road traffic emissions on air quality utilised the atmospheric dispersion model ADMS-Roads, focusing on emissions of oxides of nitrogen (NO_x), which comprise of nitric oxide (NO) and NO_2, and also on PM_{10}.

In order to provide consistency with the Council's own work on air quality, the guiding principles for air quality assessments as set out in the latest guidance and tools provided by Defra for air quality assessment (LAQM.TG(16)[1]) have been utilised.

Figure 1.1 – AQMA No.1 (M20)



[1] Local Air Quality Management Technical Guidance LAQM.TG(16), April 2016, published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

Figure 1.2 – Map of AQMA No.2 (M25)

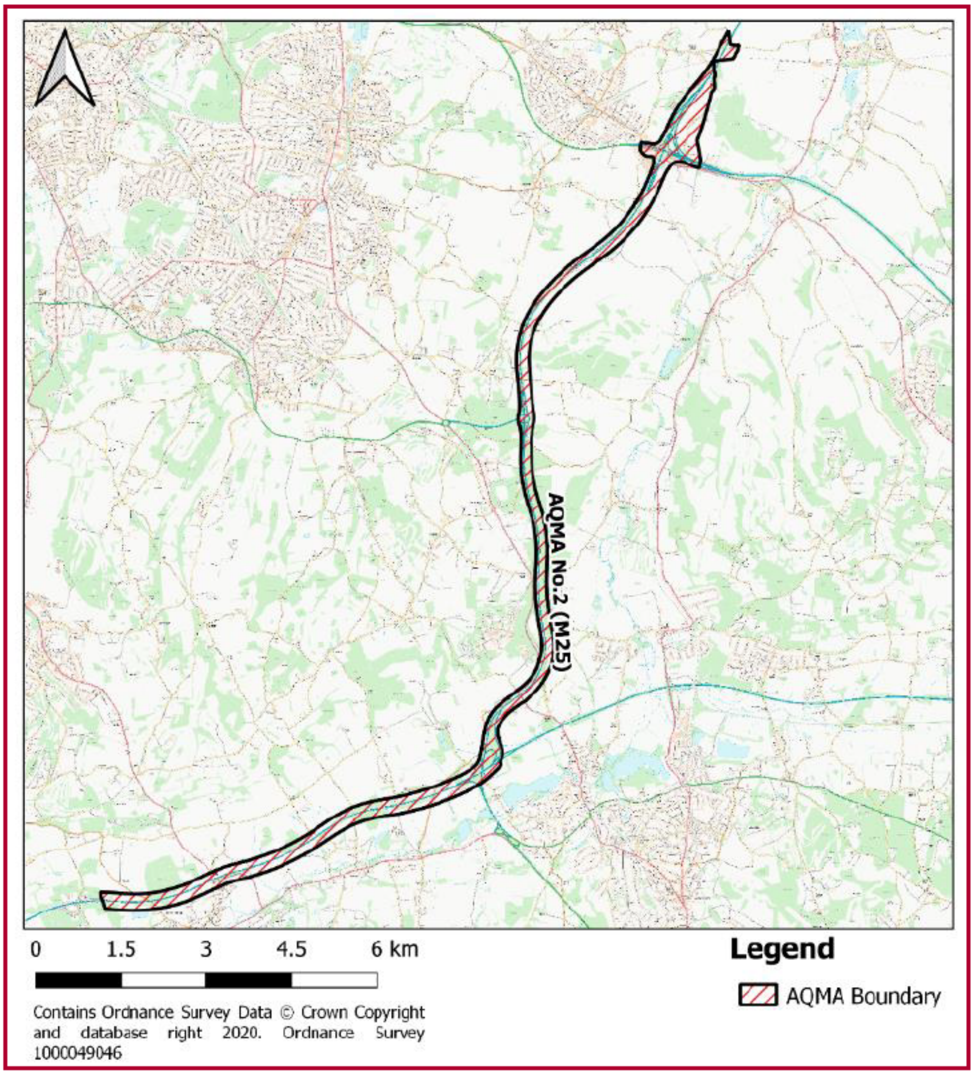


Figure 1.3 – Map of AQMA No.3 (M26) and AQMA No.13 (A25), East of Sevenoaks Bypass

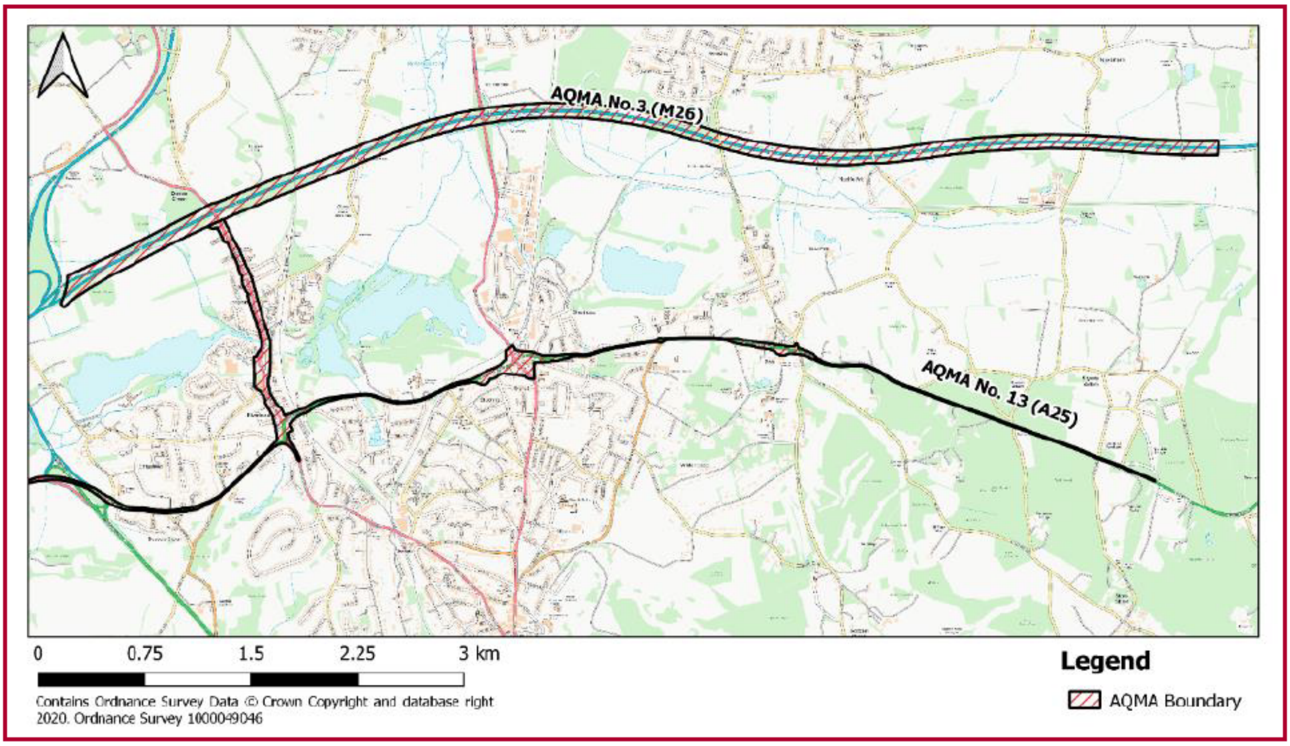


Figure 1.4 – AQMA No.4 (A20(T))

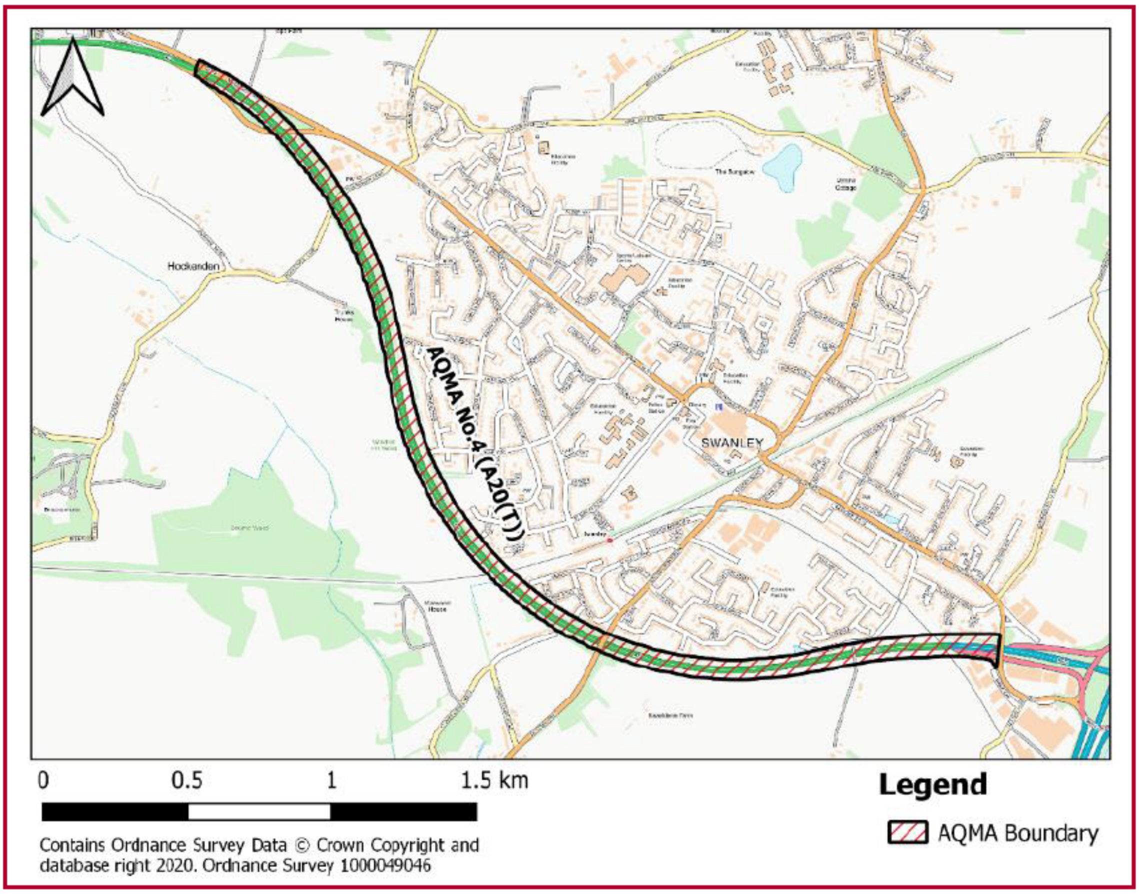


Figure 1.5 – Map of AQMA No.6 (M25-PM10) and AQMA No.13 (A25), West of Sevenoaks Bypass

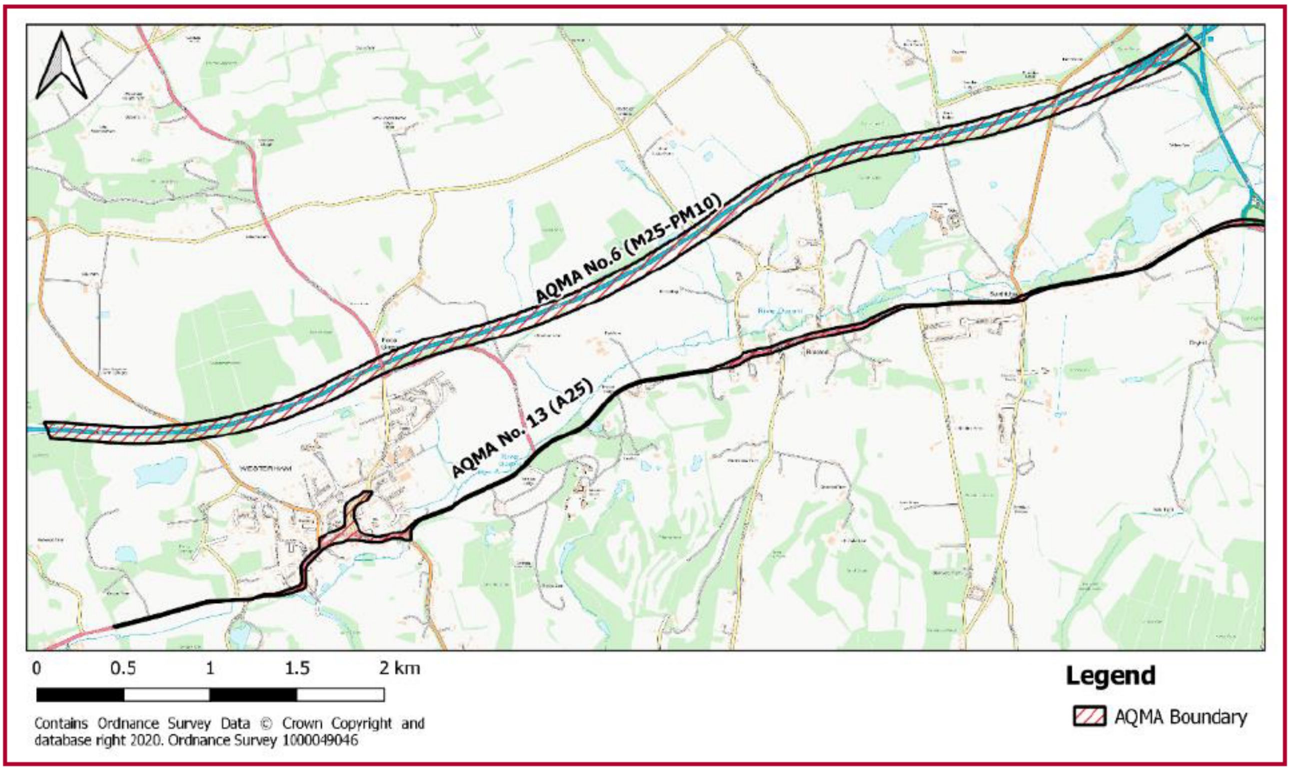
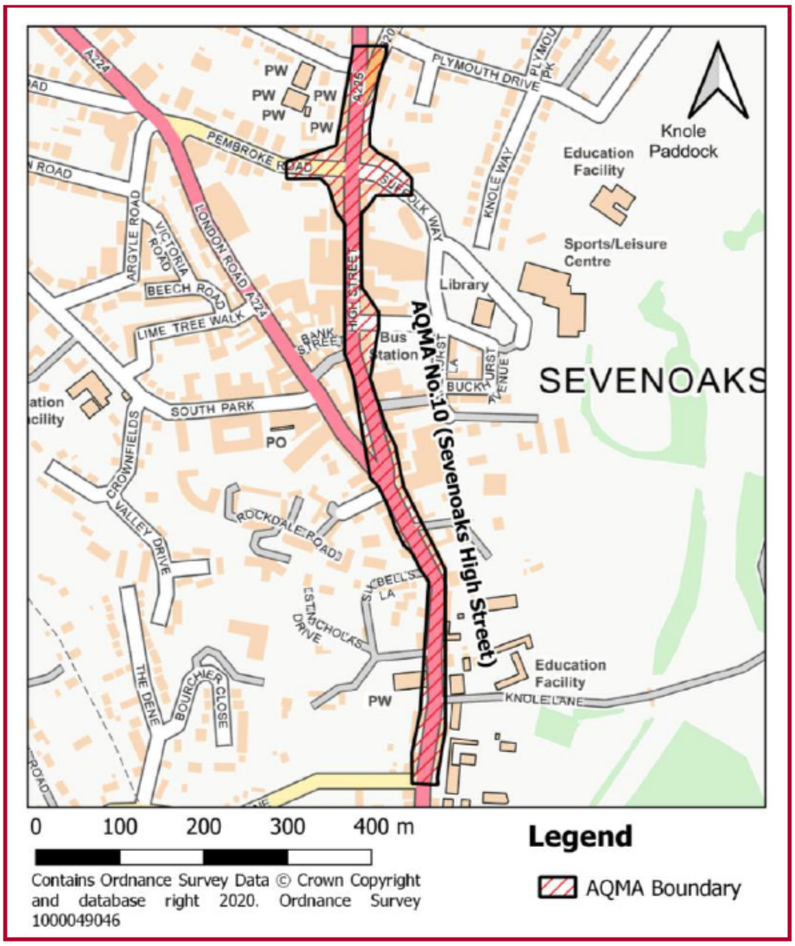


Figure 1.6 – Map of AQMA No.10 (Sevenoaks High Street)



2 Assessment Methodology

Atmospheric modelling to predict the pollutant concentrations emitted from road traffic sources was carried out using ADMS Roads version 5.0.0.1, developed by Cambridge Environmental Research Consultants (CERC). The approach used was based upon the following:

- Prediction of NO_2 and PM_{10} (where relevant) concentrations to which existing receptors may be exposed to, and a comparison with the relevant AQS objectives;
- Quantification of relative NO_2 contribution of sources to overall NO_2 pollutant concentration; and
- Determination of the geographical extent of any potential exceedances in regards to the existing AQMA boundaries and proposed boundary changes stated in the previous assessment.

Pollutant concentrations have been predicted within a base year of 2018, with model inputs relevant to the assessment based upon the same year.

2.1 Traffic Inputs

Traffic flows for the road links included within the model have been sourced from the DfT traffic count online resource[2]. This data source provides an average annual daily traffic (AADT) flow for the relevant road link in terms of a number of vehicle types; cars, LGVs (light goods vehicles), HGVs (heavy goods vehicles), buses and coaches, and motorcycles.

The traffic data utilised within the dispersion modelling, both the location of the DfT count points and the count point specific data are presented in Appendix A.

It is important to note that some of the traffic data used is based on estimates either from nearby links or estimated from the most recent manual counts. Traffic data, which has been estimated from manual counts that were carried out over 3 years ago, have been highlighted in Appendix A. This may lead to some uncertainty in the accuracy of the traffic data. Additionally, traffic surveys were unable to be carried out to provide more accurate traffic data in these areas as a result of the restrictions put in place by the UK Government due to the Covid-19 pandemic. It was deemed that any traffic surveys carried out at this time would be un-representative of normal conditions.

Traffic speeds were modelled at the relevant speed limit for each road. However, in accordance with LAQM.TG(16), where appropriate, traffic speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to occur.

The Emissions Factors Toolkit (EFT) version 9.0[3] has been used to determine vehicle emission factors for input into the ADMS-Roads model. The emission factors are based upon the traffic data inputs used within the assessment, with total vehicle flows and proportion of vehicle types taken from existing DfT data. The pre-set national values for vehicle fleet in terms of vehicle Euro Class has been utilised in the absence of a vehicle fleet specific information for the Sevenoaks area.

2.2 General Model Inputs

A site surface roughness value of 0.5m was entered into the ADMS-roads model, consistent with the suburban nature of the modelled domain. In accordance with CERC's ADMS Roads user guide[4], a minimum Monin-Obukhov Length of 30m will be used for the ADMS Roads model to reflect the urban topography of the model domain.

[2] Department for Transport, traffic count data for available road links (2020), available at https://www.gov.uk/government/collections/road-traffic-statistics

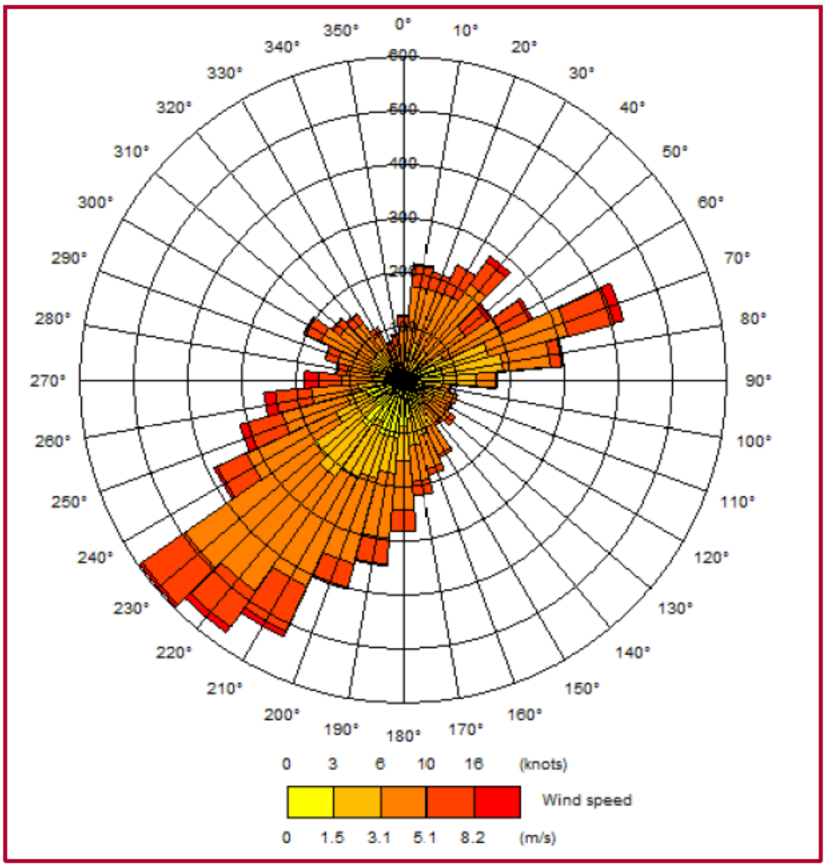
[3] Defra, Emissions Factors Toolkit (2019), available at http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

[4] CERC, ADMS-Roads User Guide Version 5 (2020)

One year of hourly sequential meteorological data from a representative synoptic station is required by the dispersion model. For the completion of the modelling 2018 meteorological data from the Gatwick airport weather station has been utilised within in this assessment. This particular site has been chosen due to it being the nearest site with a complete data set for 2018, and is representative of an inland suburban area alongside being at a similar elevation to the Sevenoaks District Council area.

A wind rose for this site for the year 2018 is presented in Figure 2.1.

Figure 2.1 – Wind Rose for Gatwick Airport 2018 Meteorological Data

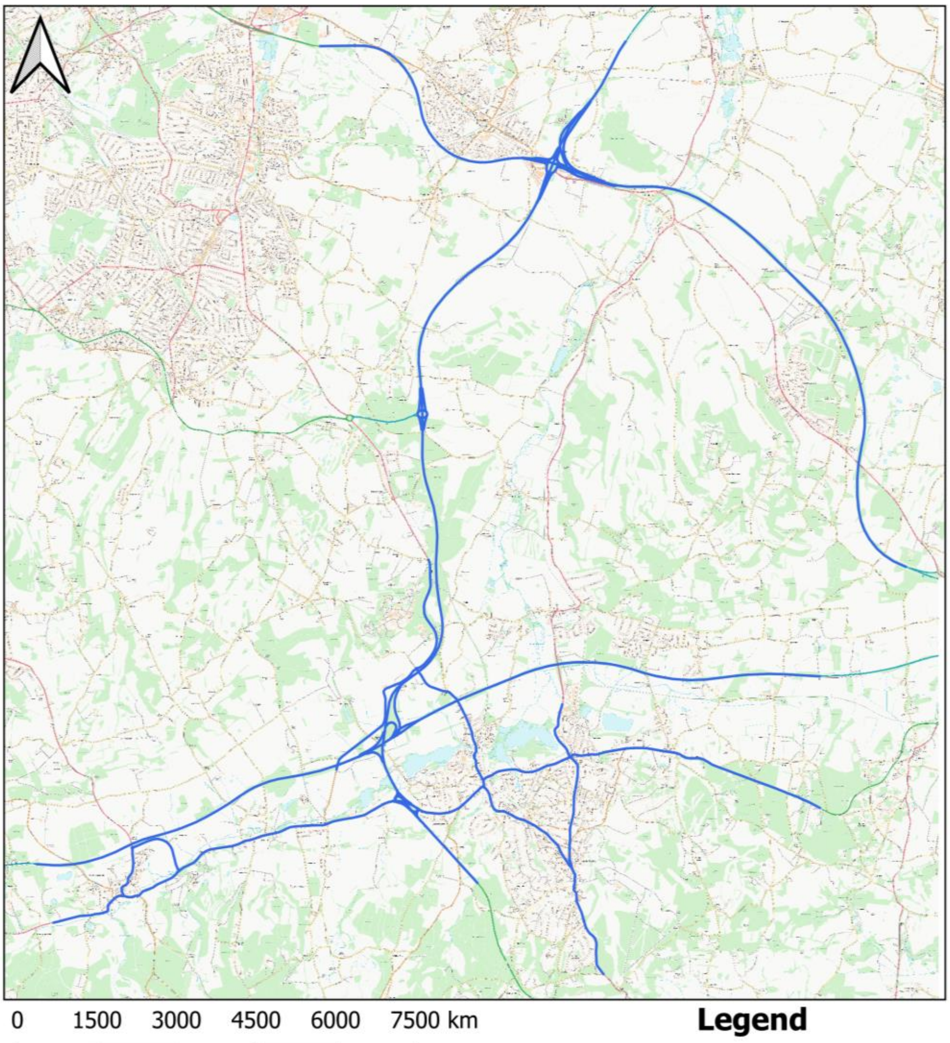


2.3 Emission Sources

A total of 253 road sources were included throughout the model domain. No point sources have been included within the model under the assumption that road traffic is the primary source of the NO_2 and PM_{10} emissions. The road links drawn are presented in Figure 2.2. Street canyons were also included along some stretches of road where the roads were surrounded by buildings/walls on both sides. Areas of street canyons are shown in Figure 2.3. No variation in the gradient of the road sources was included, and remained at the default 0%, assuming the area is flat.

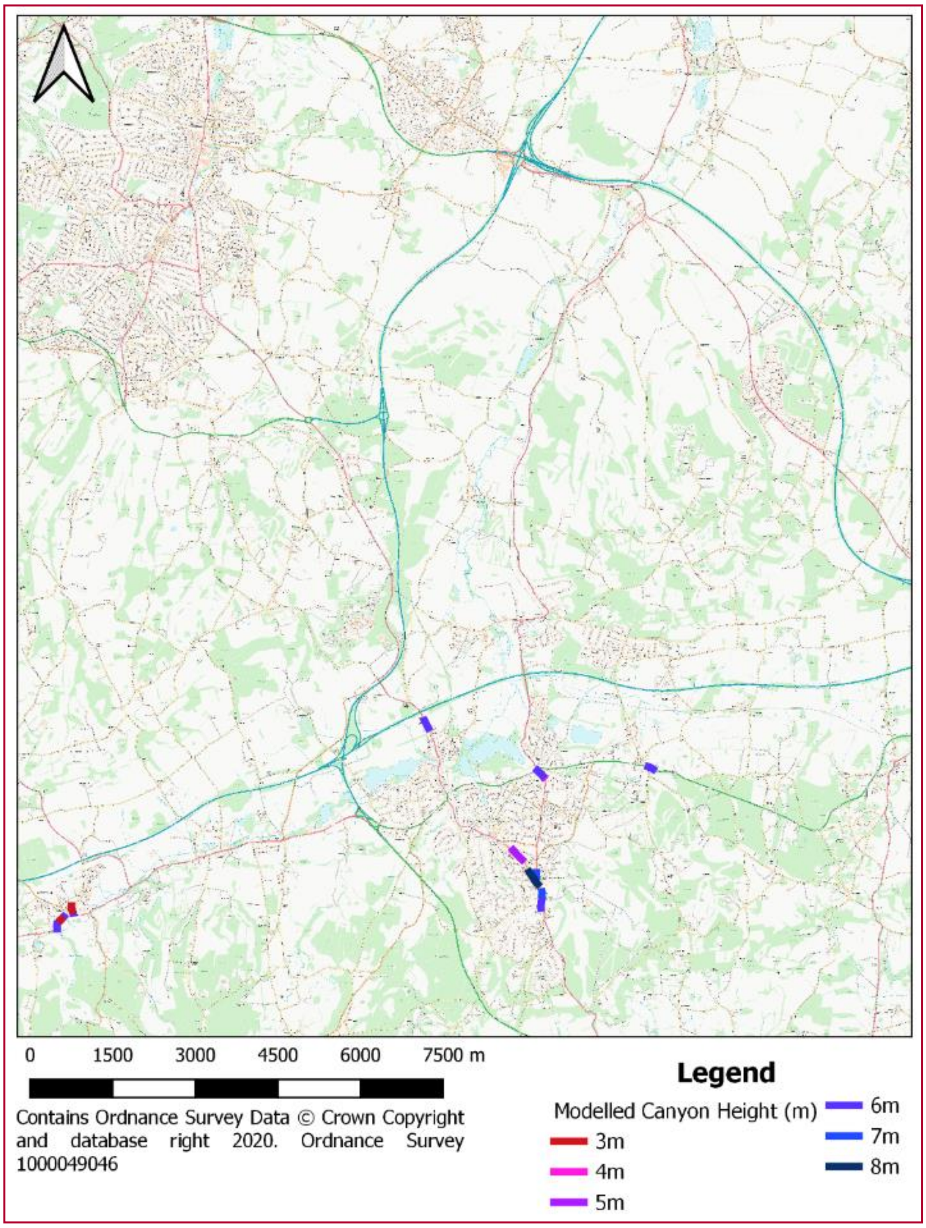
The roads were drawn along the primary and main roads throughout Sevenoaks District Council, ensuring to include those running through the AQMAs. These were however restricted due to where available traffic data was located.

Figure 2.2 – Modelled Road Sources



Contains Ordnance Survey Data © Crown Copyright and database right 2020. Ordnance Survey 1000049046

Figure 2.3 – Modelled Canyons and Canyon Height



2.4 Sensitive Receptors

335 discrete receptors were included within the assessment to represent locations of relevant exposure. The locations were identified through the completion of a desktop study. In addition, concentrations were also modelled across regular gridded area's set across the AQMAs, with a spatial resolution between the receptors of between 55m x 30m, and 40m x 110m. A receptor height of 1.5m was used for all gridded receptors modelled. The gridded receptor model was split into 5 separate domains, with the maximum resolution being along the section covering the M25, running between the connecting junctions to the M26 and M20. These were supplemented with additional receptor points added close to the modelled road links, using the intelligent gridding tool in ADMS-Roads.

The majority of the discrete receptors (306) were included at a height of 1.5m to represent ground level exposure, whereas 44 receptors were included at an increased height of between 3m to 8m to represent exposure at buildings with residential usage on the first and second storey levels, as well as elevated properties uphill from the roads.

2.5 Model Outputs

Background pollutant values for 2018 derived from the Defra background maps database[5] have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_x and PM_{10}.

To avoid duplication of the road source contribution from 'Motorway Roads' and 'Trunk A Roads' in the modelling and assessment process, these source sectors have been removed from the overall background concentrations reported. This has been completed using the Defra NO_x Sector Removal Tool[6] v7.0.

Sevenoaks District Council carries out monitoring of NO_2 at a number of background monitoring sites using both an automatic monitor and diffusion tubes. For modelling purposes, the Defra Background maps have been used as opposed to the available background monitoring data due to there not being sufficient monitoring sites to have a representative cover of the modelling domain.

The background concentrations used within this assessment are presented in Appendix C.

For the prediction of annual mean NO_2 concentrations for the modelled scenarios, the output of the ADMS-Roads model for road NO_x contributions has been converted to total NO_2 following the methodology in LAQM.TG(16), using the NO_x to NO_2 conversion tool developed on behalf of Defra. This assessment has utilised the current version of the NO_x to NO_2 conversion tool, version 7.1[7]. The road contribution is then added to the appropriate NO_2 background concentration value to obtain an overall total NO_2 concentration. Annual mean PM_{10} road contributions were also output from the model and processed in a similar manner, i.e. combined with the relevant background annual mean PM_{10} concentrations to obtain an overall total PM_{10} concentration. As per the methodology stated in LAQM.TG(16), the below equation has been used to calculate an estimate of the number of potential exceedances of the PM_{10} 24-hour mean objective from the annual mean concentration.

$$Number\ of\ 24\text{-}hour\ mean\ exceedances = -18.5 + 0.00145 \times annual\ mean^3 + \left(\frac{206}{annual\ mean}\right)$$

2.5.1 Verification

Verification of the model has been carried out using a number of local authority NO_2 passive monitoring locations, in accordance with the methodology detailed within LAQM.TG(16). A total of 49 roadside diffusion tubes and one continuous roadside monitor are located throughout Sevenoaks District Council, however 10 of these (DT29, 39, 40, 41, 83, 93, 94, 95, BC4-6 and CM2) are not located on a modelled road, so therefore have not been included in verification. Details of the remaining 40 tubes are presented in Table B.1. The locations and heights of these tubes have been adjusted and validated where required via a desktop study.

An initial verification was carried out using all 40 sites, with the results being presented in Table B.2. It was identified that using this model wide verification factor resulted in many sites significantly over or under predicting (outside of the ±25% acceptance level). The model could not be adjusted and improved any further and it was therefore determined that this inaccuracy was likely due to the size of the model domain resulting in a verification factor that is attempting to be representative of both motorway and non-motorway environments. Therefore, it was decided that separate verification factors were required to cover different geographical areas throughout the model. Details of these verifications are provided in Appendix B. The final verification factors applied are:

- Motorway Verification – 1.075
- Westerham Verification – 3.742
- Model Wide (ex. Motorway and Westerham) – 3.258

As with the modelled road NO_x emissions, the modelled PM_{10} road emissions have also had a verification factor applied to them. Roadside PM_{10} concentrations are monitored at the Bat & Ball automatic monitoring site, therefore, verification of modelled PM_{10} concentrations has been completed in addition to the NO_x

[5] Defra Background Maps (2020), http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

[6] Defra NO_2 Adjustment for NO_x Sector Removal Tool (2019), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

[7] Defra NO_x to NO_2 Calculator (2019), available at https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

verification. Following the verification of PM_{10} modelled results, all results presented within the assessment for all receptors are those calculated following the process of model verification using the adjustment factor of 1.878. Full details of the model verification completed can be found in Appendix B.

2.5.2 Source Apportionment

To help inform the development of measures as part of the action plan stage of the project, a source apportionment exercise was undertaken for the following vehicle classes.

- Petrol, Diesel and Alternative Fuelled (electric, bioethanol and liquefied petroleum gas) Cars;
- Petrol, Diesel and Alternative Fuelled LGVs;
- HGVs;
- Bus and Coaches; and
- Motorcycles.

This provides vehicle contributions of NO_x as a proportion of the total NO_x concentration, which will allow the Council to develop specific AQAP measures targeting a reduction in emissions from specific vehicle types. As there has been no locally defined fleet information, national averages in terms of euro class proportions of different vehicles has been utilised. The national averages for England are the pre-set values set within the latest version of the EFT that has been used to derive specific emission rates.

It should be noted that emission sources of NO_2 are dominated by a combination of direct NO_2 (f-NO_2) and oxides of nitrogen (NO_x), the latter of which is chemically unstable and rapidly oxidised upon release to form NO_2. Reducing levels of NO_x emissions therefore reduces concentrations of NO_2. As a consequence, the source apportionment study has considered the emissions of NO_x, which are assumed to be representative of the main sources of NO_2.

With regards to the discrete receptor locations, consideration has been given to the following groups of receptors located within, and within 20m of the boundary, of each designated AQMA. Where receptors are located within two separate AQMAs, they have only been included within one AQMA assessment. The source apportionment study has evaluated the following receptor combinations:

- The average NO_x contributions across all modelled locations. This provides useful information when considering possible action measures to test and adopt. It will however understate road NO_x concentrations in problem areas;
- The average NO_x contributions across all locations with modelled NO_2 concentration greater than 40µg/m^3. This provides an indication of source apportionment in problematic areas (i.e. only where the annual mean AQS objective is exceeded). As such, this information should be considered with more scrutiny when testing and adopting action measures; and
- The NO_x contributions at the receptor with the maximum road NO_x and NO_2 contribution. This provides a comparison to the previous two groups, with the identification of the most prominent vehicle source at receptor with the highest predicted NO_2 concentration.

3 Modelling Results

The following section provides a detailed assessment for each AQMA, comparing both the monitoring completed within the AQMA over a five year period with the modelled concentrations of annual mean NO_2. In reference to AQMA No.6, 24-hour PM_{10} concentrations have been evaluated. Details of each monitoring location and the monitoring results have been taken from the 2019 Annual Status Report[8] completed by the Council. For each AQMA, recommendations have been put forward in terms of the current determination of the specific AQMA, in relation to potential changes to the designation or boundary. Furthermore, additional analysis of receptor locations outside the existing AQMAs has been completed to assess if there are any areas outside declared AQMAs where annual mean concentrations of NO_2 are predicted to be in exceedance of the annual mean objective.

In line with the standardised LAQM reporting, the tabulated results present any exceedances of the annual mean AQS objective of 40µg/m^3 in bold, and any predicted concentrations in exceedance of 60µg/m^3 have been underlined. Additionally, annual mean concentrations that are within 10% of the objective have been presented in italics in order to ensure that any uncertainty in relation to the predicted modelling concentrations is taken into consideration for any recommendations made in terms of AQMA designation, amendment or revocation.

Contour results have also been produced for each designation within the AQMAs, with concentration isopleths presented at both 40µg/m^3 and 36µg/m^3 (within 10% of the 40µg/m^3 objective).These have been produced from a gridded results layer covering the model domain. In addition, ADMS-roads automatically places a high number of additional receptors close to each modelled road link to increase the spatial resolution of the receptors.

In addition, the NO_x source apportionment results for each AQMA which have been split across the vehicle classifications detailed in Section 2.5, are presented in both tabulated and pie charts formats. This allows a cross comparison between the main vehicular sources to be completed across each AQMA, and will aid the development of measures specific to each AQMA.

3.1 AQMA No.1 M20

3.1.1 Council Monitoring Data

AQMA 1 is currently designated for exceedances of the annual mean NO_2 AQS objective. The current boundary incorporates the eastern stretch of the M20 within the Council's boundary, from the junction of London Road to Button Street. Currently there are two diffusion tubes monitoring annual mean NO_2 concentrations located within, and near to, the current AQMA boundary. These are presented in Figure 3.2, and the monitoring results from the previous five years are shown in Table 3.1.

DT81 is located within boundary of AQMA No.1, and it can be seen that there have consistently been no exceedances of the annual mean NO_2 objective over the last five years. DT26 however has reported an exceedance for the last five years, but is located just outside of the AQMA boundary on the A20. DT26 has also consistently reported the highest concentration out of the two monitoring locations for the past five years; however, this is likely to be due to influences of emissions from both the A20 and the M20.

Following the application of distance correction to predict annual mean NO_2 concentrations at the closest point of relevant exposure for sites that are exceeding or within 10% of the AQS objective, as detailed within Table 3.2, DT26 was well below the annual mean NO_2 objective value in 2018.

[8] Seveonaks District Council (2019), 2019 Air Quality Annual Status Report

Table 3.1 – Current NO_2 Monitoring Within, or in Close Proximity to AQMA No.1

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m³)[1]				
						2014	2015	2016	2017	2018
DT81	R	553416	167615	0.6	2.5	32	32.2	32.9	30.9	28.6
DT26	R	554217	167252	18.4	2	**42.3**	**41.7**	**45.8**	**41.8**	**42.7**

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m³.
When **underlined**, NO_2 annual mean exceeds 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside

Table 3.2 – Current NO_2 Monitoring Within AQMA 1, Distance Corrected

Site	Site Type	Distance to Kerbside (m)	Distance from Kerbside to Relevant Exposure (m)	Monitored Concentration 2018 (µg/m³)	Distance Corrected Concentration (µg/m³)
DT26	R	5	23.4	**42.7**	31.5

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m³.
When **underlined**, NO_2 annual mean exceeds 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside

3.1.2 Modelled Receptors, Annual Mean NO_2

Table 3.3 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2018. 5 discrete receptor locations are positioned within the boundary of AQMA No.1, with 7 being located in close proximity. None of these locations have predicted exceedances of the annual mean NO_2 objective, and they all have a concentration predicted to be below 10% of the AQS objective.

Figure 3.3 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that all receptors have a predicted concentration of less than 36µg/m³. The maximum reported concentration out of these receptors is at receptor ID 342, with a predicted concentration of 24.9µg/m³. The nearest diffusion tube monitoring location to this is DT81, which reported an annual mean NO_2 concentration in 2018 of 28.5µg/m³. The model is under predicting concentrations at this location by 14.8%, and additionally it should be noted that there are no monitoring locations located further west along the M20. It is therefore difficult to verify the concentrations at these modelled receptors, and the results should be considered with a degree of caution.

From the annual mean NO_2 concentration contour plots presented in Figure 3.4, it can be seen that the extent of the predicted exceedances of the annual mean objective are much more constrained to the M20 when compared to the existing AQMA boundary. The contour lines follow the geometry of the road, with the exceedance limit not coming into range of any residential properties in the nearby vicinity to the M20. The wind direction originating from the South West, as presented in Figure 2.1, causes the exceedance contour line to be located close to the northbound carriageway, and further from the southbound carriageway.

Table 3.3 – AQMA No.1, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
283	554296	167239	1.5	N	40	19.1	48

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
284	554837	167393	1.5	Y	40	24.0	60
342	553677	167511	1.5	Y	40	24.9	62
345	553851	167557	1.5	Y	40	20.6	52
347	557014	165831	1.5	Y	40	18.4	46
348	558198	164809	1.5	N	40	16.6	41
349	558163	164727	1.5	Y	40	19.9	50
350	558194	164200	1.5	N	40	15.4	39
351	558508	163136	1.5	N	40	16.2	41
356	558428	162388	1.5	N	40	16.2	40
345a	553499	167589	1.5	Y	40	24.0	60

3.1.3 AQMA No.1 Source Apportionment

The source apportionment completed for the modelled receptors within the boundary of AQMA No.1 incorporates the 6 receptors as detailed within Table 3.3 above. Apportionment for NO_x concentrations have been completed for the three separate groups in terms of the receptors as detailed in Section 2.5, with the results presented in Table 3.4 and Figure 3.1.

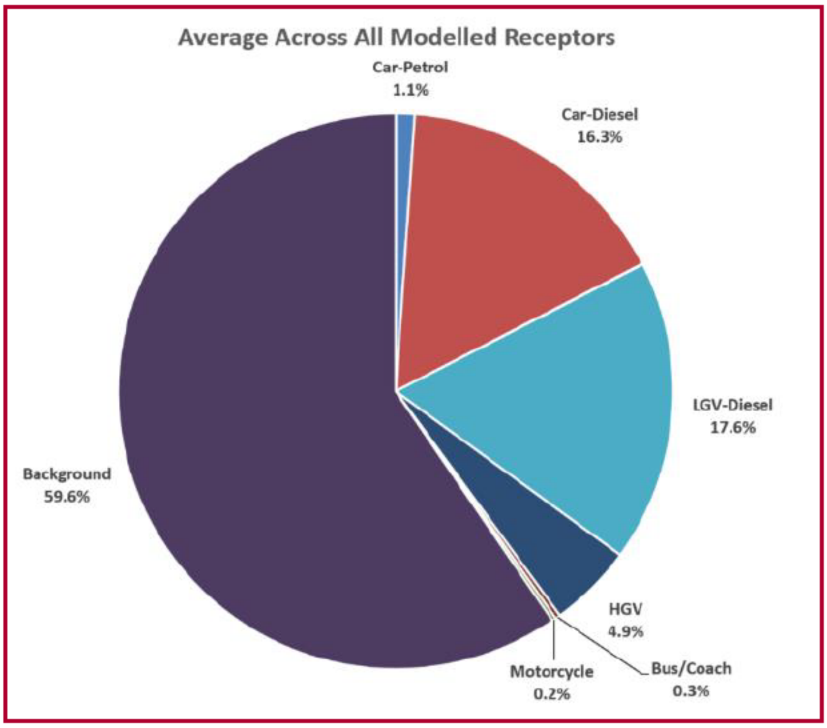
When considering the average NO_x concentration across all modelled receptors, road traffic accounts for 14.0µg/m³ (40.4%) of total NO_x concentration (34.7µg/m³). Of the 14.0µg/m³ total road NO_x, Diesel LGVs account for the greatest contribution (17.6%) of any of the vehicle types, followed by Diesel Cars (16.3%) and HGVs (4.9%). The remaining vehicle source groups (Petrol and Alternative Fuel Cars and LGVs, Bus and Coach, and Motorcycles) contribute less than 1.5% each.

The receptor with the maximum road NO_x concentration is receptor ID 342, whereby the total road NO_x was predicted to be 40.0µg/m³. At receptor, ID 342 road traffic accounts for 42.8% of total NO_x concentration (17.1µg/m³). Of the 17.1µg/m³ total road NO_x, the separate vehicle apportionment remains similar to the previous assessment but with a slightly increased apportionment to Diesel LGVs and Cars, and a slightly decreased apportionment to HGVs; Diesel LGVs (18.6%), Diesel Cars (17.6%) and HGVs (4.7%), with the remaining vehicle source groups contributing less than 1.5% each.

Table 3.4 – NO_x Source Apportionment Results: AQMA No.1

Results	All Vehicles	Car			LGV			HGV	Bus and Coach	Motorcycle	Background
		Petrol	Diesel	EV/LPG	Petrol	Diesel	EV/LPG				
Average across all modelled receptors											
NO_x Concentration (µg/m³)	14.0	0.4	5.7	0.0	0.0	6.1	0.0	1.7	0.1	0.1	20.7
Percentage of Total NO_x	40.4%	1.1%	16.3%	0.0%	0.0%	17.6%	0.0%	4.9%	0.3%	0.2%	59.6%
Percentage Contribution to Road NO_x	100.0%	2.7%	40.4%	0.0%	0.1%	43.4%	0.0%	12.2%	0.7%	0.5%	-
At The Receptor With the Maximum Road NO_x Concentration (ID 342)											
NO_x Concentration (µg/m³)	17.1	0.5	7.0	0.0	0.0	7.4	0.0	1.9	0.1	0.1	22.9
Percentage of Total NO_x	42.8%	1.3%	17.6%	0.0%	0.0%	18.6%	0.0%	4.7%	0.3%	0.2%	57.2%
Percentage Contribution to Road NO_x	100.0%	3.0%	41.0%	0.0%	0.1%	43.4%	0.0%	11.0%	0.8%	0.6%	-

Figure 3.1 – NO_x Source Apportionment Results: AQMA No.1



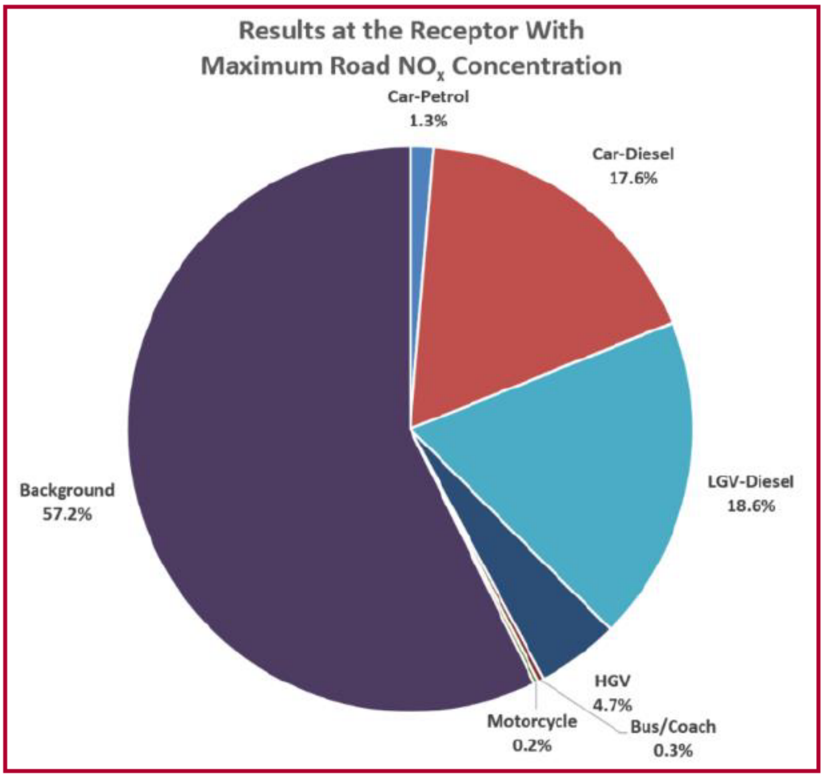


Figure 3.2 – AQMA No.1, Modelled Roads and Monitoring Locations

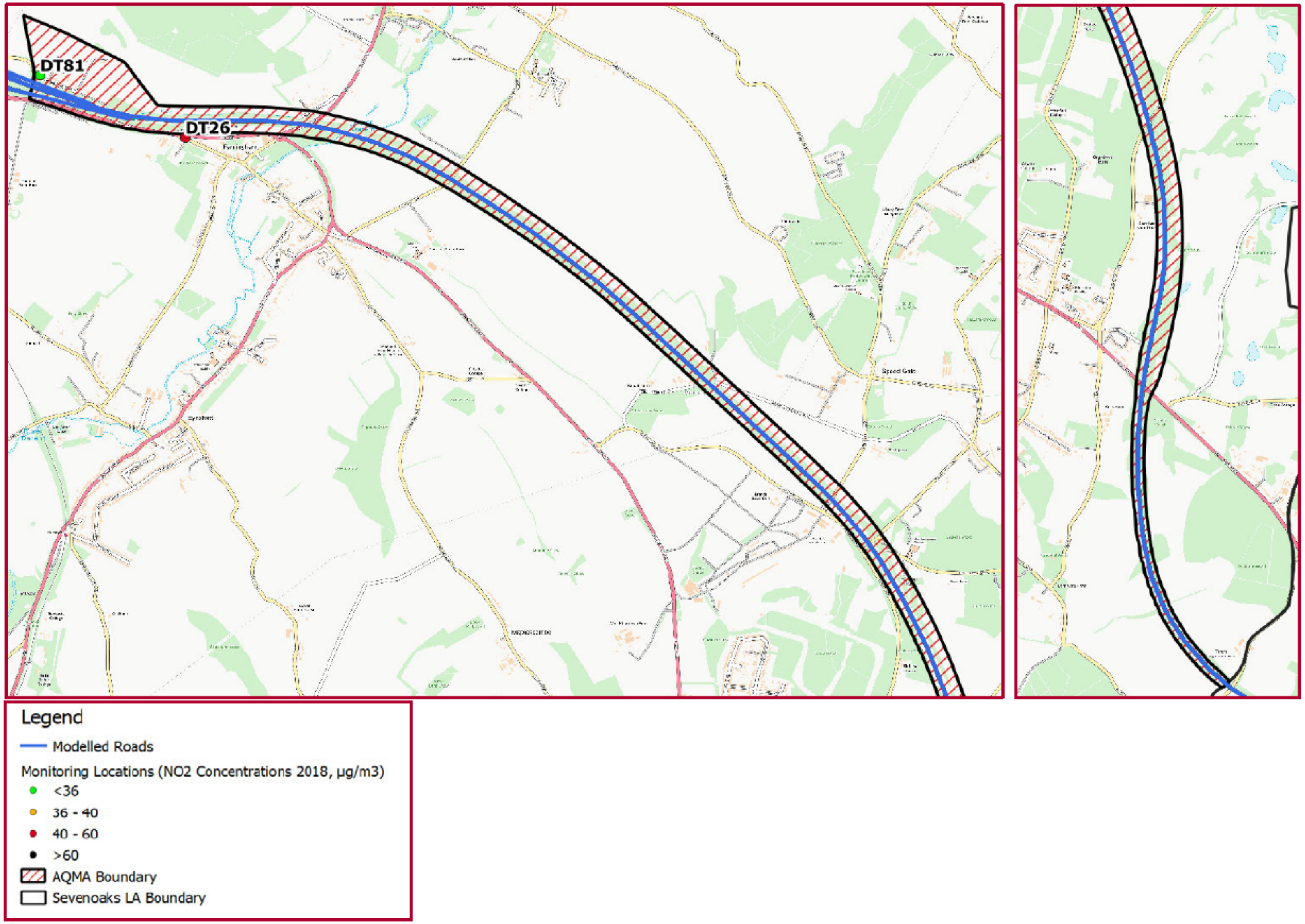


Figure 3.3 – AQMA No.1, Modelled Receptor NO_2 Concentrations

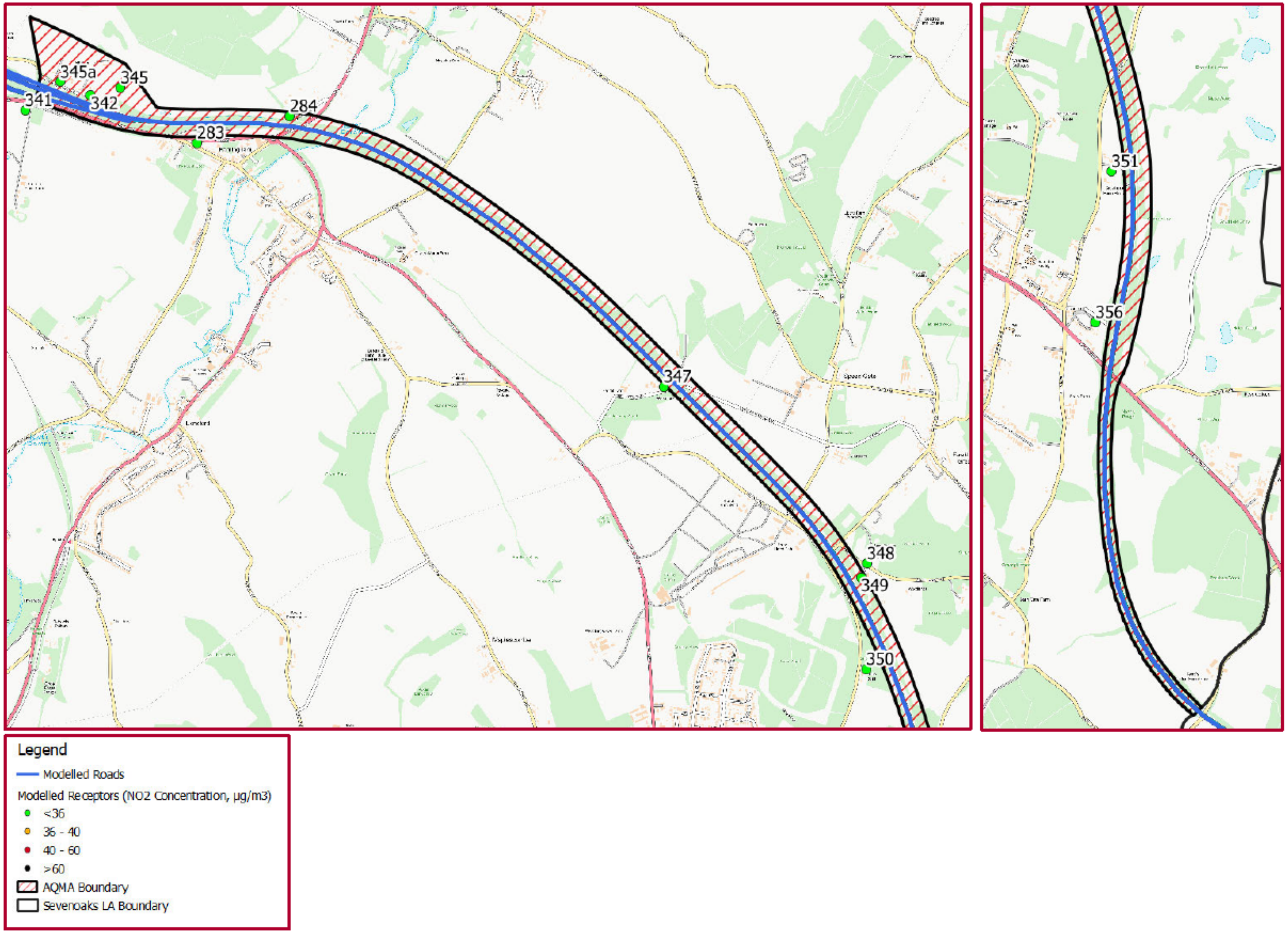
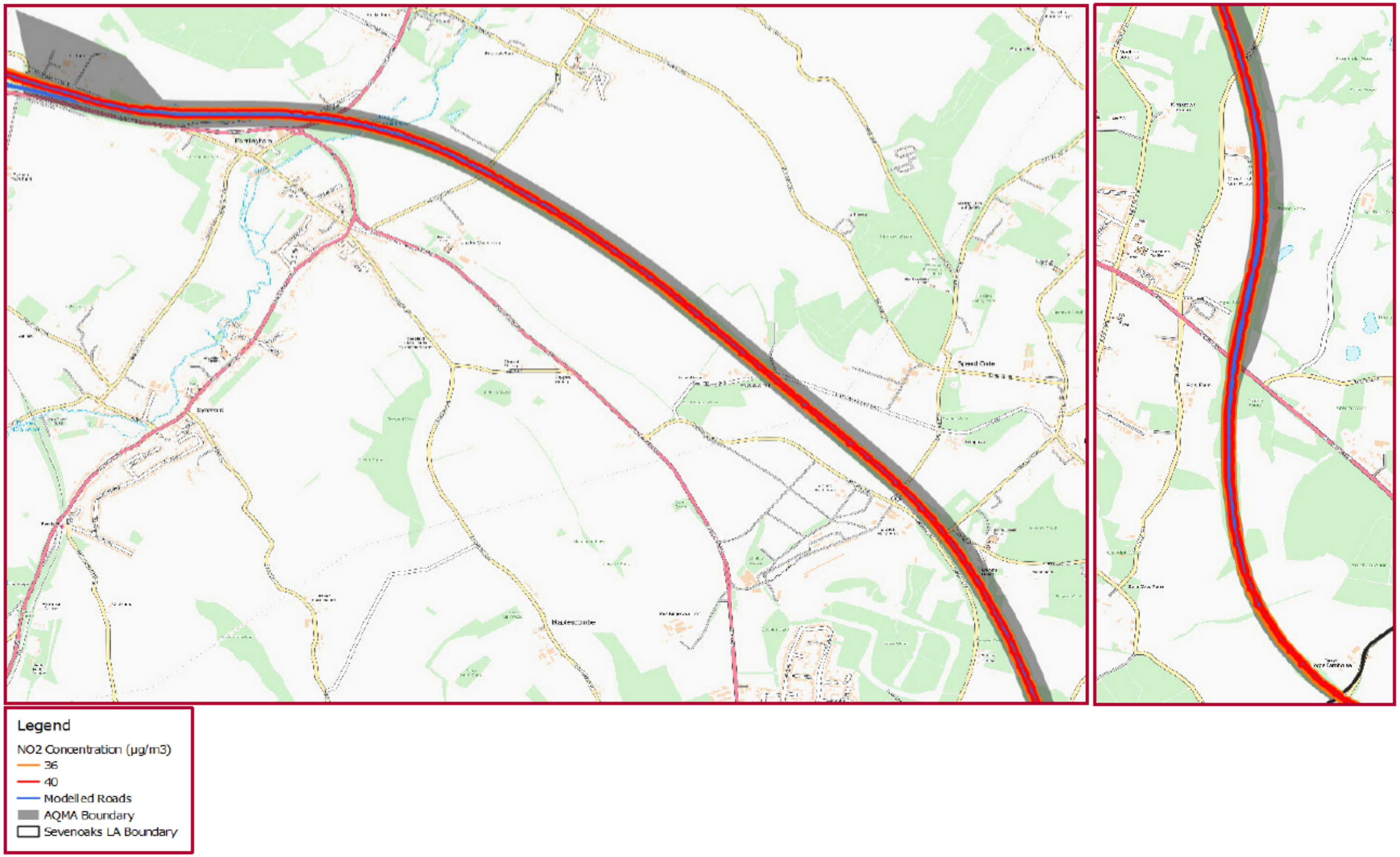


Figure 3.4 – AQMA No.1, Modelled NO_2 Concentration Isopleths



3.2 AQMA No.2 M25

3.2.1 Council Monitoring Data

AQMA No.2 is currently designated for exceedances of the annual mean NO_2 AQS objective with the current boundary incorporating all of the M25, located within Sevenoaks, but additionally the adjoining roads from the M20 and the first section of London Road leaving the junction eastwards. Currently there are three diffusion tubes monitoring annual mean NO_2 located within the current AQMA boundary, DT13 and DT14 located in the northern part of the AQMA on the B2173 and Button Street respectively. DT12 is located in the southern section of the AQMA, off Station Road and near to the M25. There is no monitoring throughout the central section of this AQMA. The current diffusion tube monitoring sites located within the AQMA are presented in Figure 3.6, and results for the previous five years are detailed in Table 3.5.

DT12, DT13 and DT14 are all located within the boundary of AQMA No.2 and it can be seen that there have consistently been no reported exceedances at DT13 and DT14 for the past five years. DT12 on the other hand has reported concentrations in exceedances of the AQS annual mean NO_2 objective for four years, with 2018 being the first year it reported just below but still within 10% of the objective value.

Following the application of distance correction to predict annual mean NO_2 concentrations at the closest point of relevant exposure at sites which are either exceeding or within 10% of the AQS objective, as detailed within Table 3.6, DT12 shows a predicted concentration well below the annual mean NO_2 objective in 2018.

Table 3.5 – Current NO_2 Monitoring Within, or in Close Proximity to AQMA No.2

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (μg/m³)[1]				
						2014	2015	2016	2017	2018
DT12	R	546816	155851	31	2	**43.3**	**46.5**	**43.1**	**40**	*39.8*
DT13	R	552504	167700	14.8	2.5	*37.1*	31.4	36.5	30.5	32.9
DT14	R	553107	167868	15	2.5	35.4	32.4	32.6	30.1	27.6

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40μg/m³.
When **underlined**, NO_2 annual mean exceeds 60μg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside

Table 3.6 – Current NO_2 Monitoring Within AQMA No.2, Distance Corrected

Site	Site Type	Distance to Kerbside (m)	Distance from Kerbside to Relevant Exposure (m)	Monitored Concentration 2018 (μg/m³)	Distance Corrected Concentration (μg/m³)
DT12	R	19	50	*39.8*	30.2

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40μg/m³.
When **underlined**, NO_2 annual mean exceeds 60μg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside

3.2.2 Modelled Receptors, Annual Mean NO_2

Table 3.7 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2018, as well as sensitive receptors of nearby schools (Parkwood Hall Co-operative Academy and Churchill Church of England Primary School). 11 discrete receptor locations are positioned within the boundary of AQMA No.2, with a further 17 being located in close proximity to the boundary. Only one of these receptor locations has a predicted exceedance of the annual mean NO_2 objective, receptor ID 301, with a concentration of 41.3µg/m³. All other receptor locations are predicted to be well below the objective limit value.

Figure 3.7 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that all receptors have a predicted concentration of less than 36µg/m³, with the exception of receptor ID 301. All receptors located at the schools are also reported to be below 36µg/m³. Receptor ID 301 is located near to a roundabout of the A223/London Road, where emissions from both the M25 and from vehicles accelerating and slowing down are likely to converge. This receptor has been verified using the Westerham verification factor due to it being exposed to road traffic sources other than the M25. The Westerham verification factor is greater than the Motorway factor, and therefore also results in a more conservative value. It is also important to note that the M25 is cut down into the ground, with receptor ID 301 being modelled at a height of 1.5m from modelled sources. Therefore, the model may be over predicting the concentration at receptor ID 301, as in reality the receptor is located at a greater height and distance relative to the M25.

From the annual mean NO_2 concentration contour plots presented in Figure 3.8, it can be seen that the extent of the predicted exceedances of the annual mean objective are much more constrained to the M25 when compared to the existing AQMA boundary. The contour lines follow the geometry of the road, with the exceedance limit not coming into range of any residential properties in the nearby vicinity to the M25, except for some residential properties located near to the flyover of Brastead Hill Road. Similarly to receptor ID 301, the gridded receptors have only been modelled at 1.5m heights from the modelled sources, therefore the model may have over predicted concentrations here.

Table 3.7 – AQMA No.2, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	Inside AQMA?	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
275	549594	156681	1.5	N	40	23.8	59
279	552516	167687	1.5	Y	40	24.0	60
292	547967	156407	1.5	Y	40	23.4	58
294	548596	156618	1.5	N	40	21.7	54
301	544793	154872	1.5	N	40	**41.3**	**103**
305	544411	154566	1.5	N	40	17.2	43
306	549917	158087	1.5	Y	40	32.2	81
307	549925	158165	1.5	N	40	22.6	57
308	549865	157795	1.5	Y	40	20.4	51
309	549989	157818	1.5	N	40	18.5	46
310	549532	157848	1.5	N	40	19.1	48
311	549255	156998	1.5	N	40	20.4	51
312	549348	157035	1.5	N	40	20.7	52
315	550548	158987	1.5	N	40	24.5	61
316	550539	158992	1.5	N	40	24.3	61
317	550473	159111	1.5	N	40	20.4	51
318	547257	156078	1.5	Y	40	27.9	70
319	549350	157012	1.5	N	40	21.0	53
320	548833	156714	1.5	N	40	22.9	57
321	550451	160984	1.5	N	40	20.8	52
322	550228	161900	1.5	N	40	19.8	50
323	550375	164658	1.5	Y	40	25.6	64
324	550453	164684	1.5	Y	40	20.3	51
333	553049	168270	1.5	Y	40	27.4	68
334	552941	168583	1.5	N	40	24.2	60
335	552988	168603	1.5	N	40	25.6	64
336	553410	168383	1.5	Y	40	20.2	51
338	553721	169596	1.5	Y	40	25.4	63

3.2.3 AQMA No.2 Source Apportionment

The source apportionment completed for the modelled receptors within the boundary of AQMA No.2 incorporates the 10 receptors as detailed within Table 3.7 above. Apportionment for NO_x concentrations have been completed for the three separate groups in terms of the receptors as detailed in Section 2.5, with the results presented in Table 3.8 and Figure 3.5.

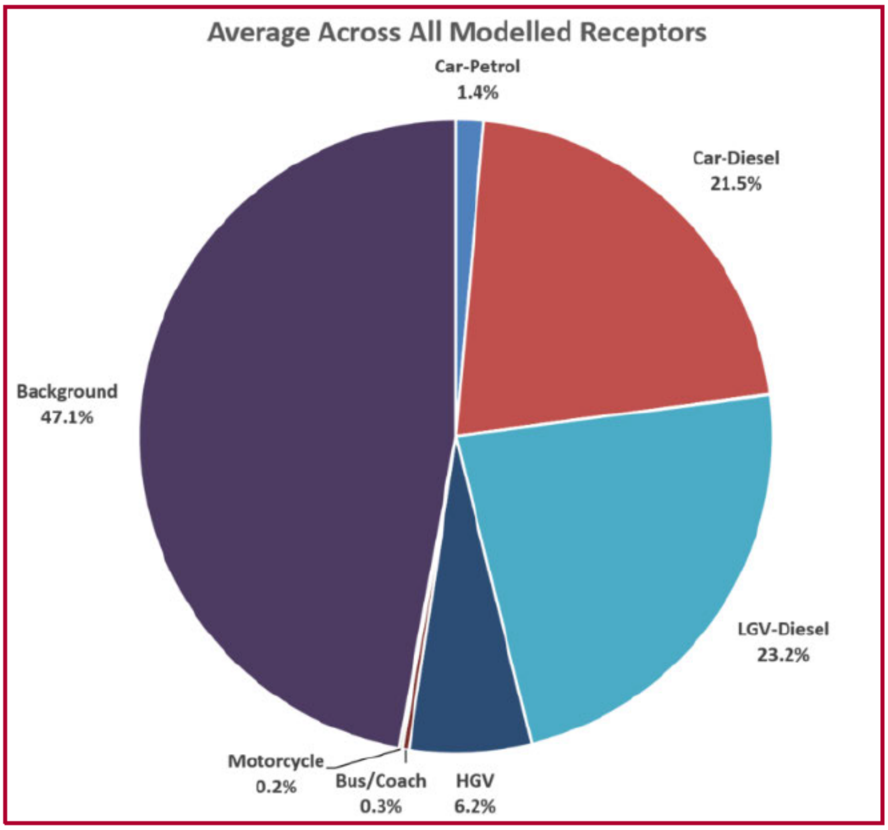
When considering the average NO_x concentration across all modelled receptors, road traffic accounts for 21.4µg/m^3 (52.9%) of total NO_x concentration (40.4µg/m^3). Of the 21.4µg/m^3 total road NO_x, Diesel LGVs account for the greatest contribution (23.2%) of any of the vehicle types, followed by Diesel Cars (21.5%) and HGVs (6.2%). The remaining vehicle source groups (Petrol and Alternative Fuel Cars and LGVs, Bus and Coach, and Motorcycles) contribute less than 1.5% each.

The receptor with the maximum road NO_x concentration is receptor ID 306, whereby the total road NO_x was predicted to be 58.0µg/m^3. At receptor ID 306 road traffic accounts for 70.9% of total NO_x concentration (41.1µg/m^3). Of the 41.1µg/m^3 total road NO_x the separate vehicle apportionment remains similar to the previous assessment but with an increased apportionment to Diesel LGVs; Diesel LGVs (31.5%), Diesel Cars (29.4%) and HGVs (7.3%), with the remaining vehicle source groups contributing less than 2.0% each.

Table 3.8 – NO_x Source Apportionment Results: AQMA No.2

Results	All Vehicles	Car			LGV			HGV	Bus and Coach	Motorcycle	Background
		Petrol	Diesel	EV/LPG	Petrol	Diesel	EV/LPG				
Average across all modelled receptors											
NO_x Concentration (µg/m^3)	21.4	0.6	8.7	0.0	0.0	9.4	0.0	2.5	0.1	0.1	19.1
Percentage of Total NO_x	52.9%	1.4%	21.5%	0.0%	0.0%	23.2%	0.0%	6.2%	0.3%	0.2%	47.1%
Percentage Contribution to Road NO_x	100.0%	2.7%	40.6%	0.0%	0.1%	44.0%	0.0%	11.8%	0.6%	0.3%	-
At The Receptor With the Maximum Road NO_x Concentration (ID 306)											
NO_x Concentration (µg/m^3)	41.1	1.2	17.1	0.0	0.0	18.3	0.0	4.2	0.3	0.1	16.9
Percentage of Total NO_x	70.9%	2.0%	29.4%	0.0%	0.1%	31.5%	0.0%	7.3%	0.4%	0.2%	29.1%
Percentage Contribution to Road NO_x	100.0%	2.9%	41.5%	0.0%	0.1%	44.4%	0.0%	10.2%	0.6%	0.3%	-

Figure 3.5 – NO_x Source Apportionment Results: AQMA No.2



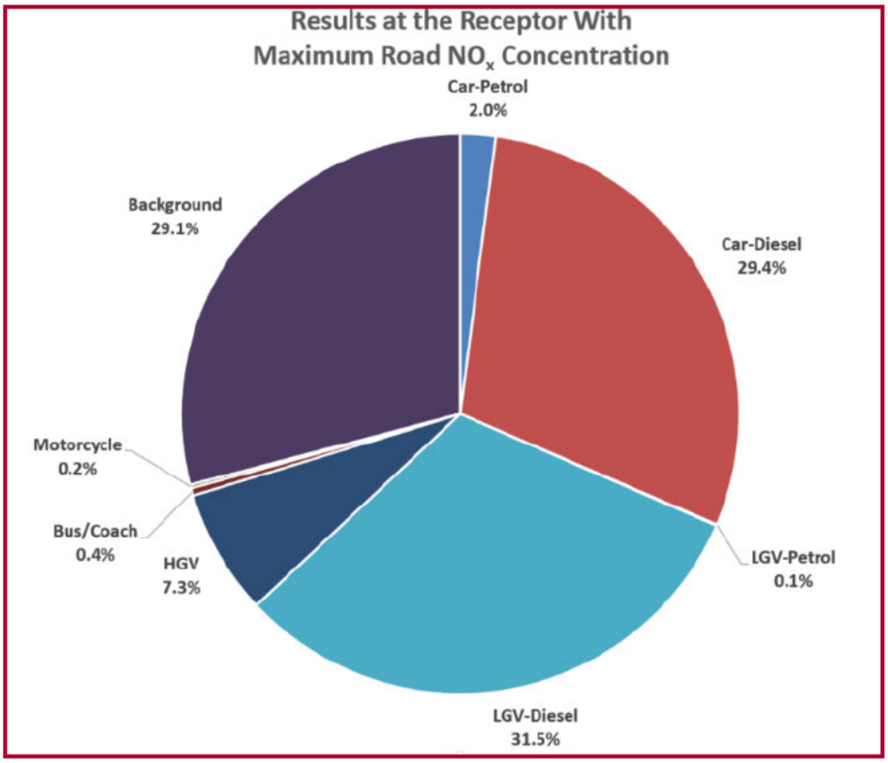


Figure 3.6 – AQMA No.2, Modelled Roads and Monitoring Locations

Figure 3.7 – AQMA No.2, Modelled Receptor Locations

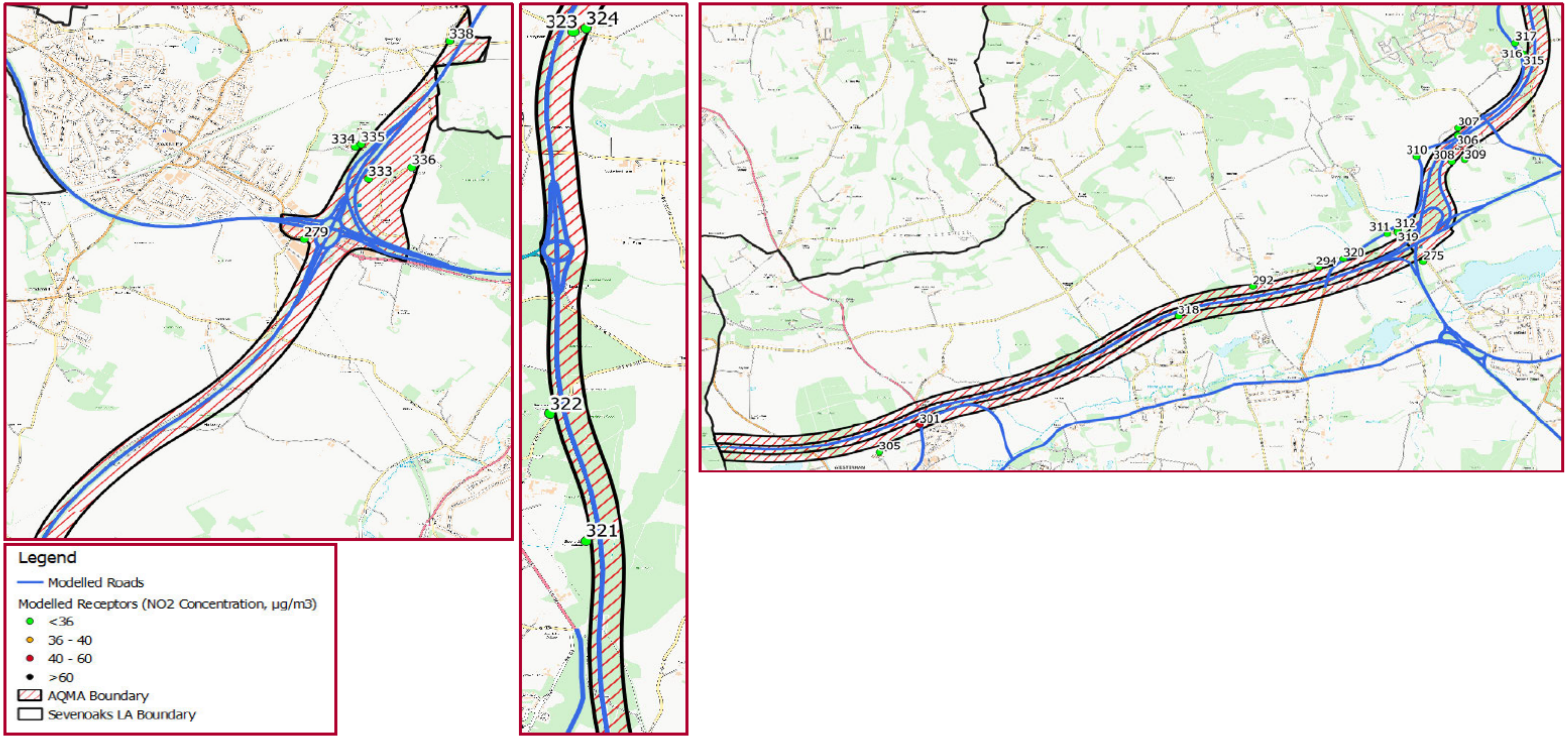
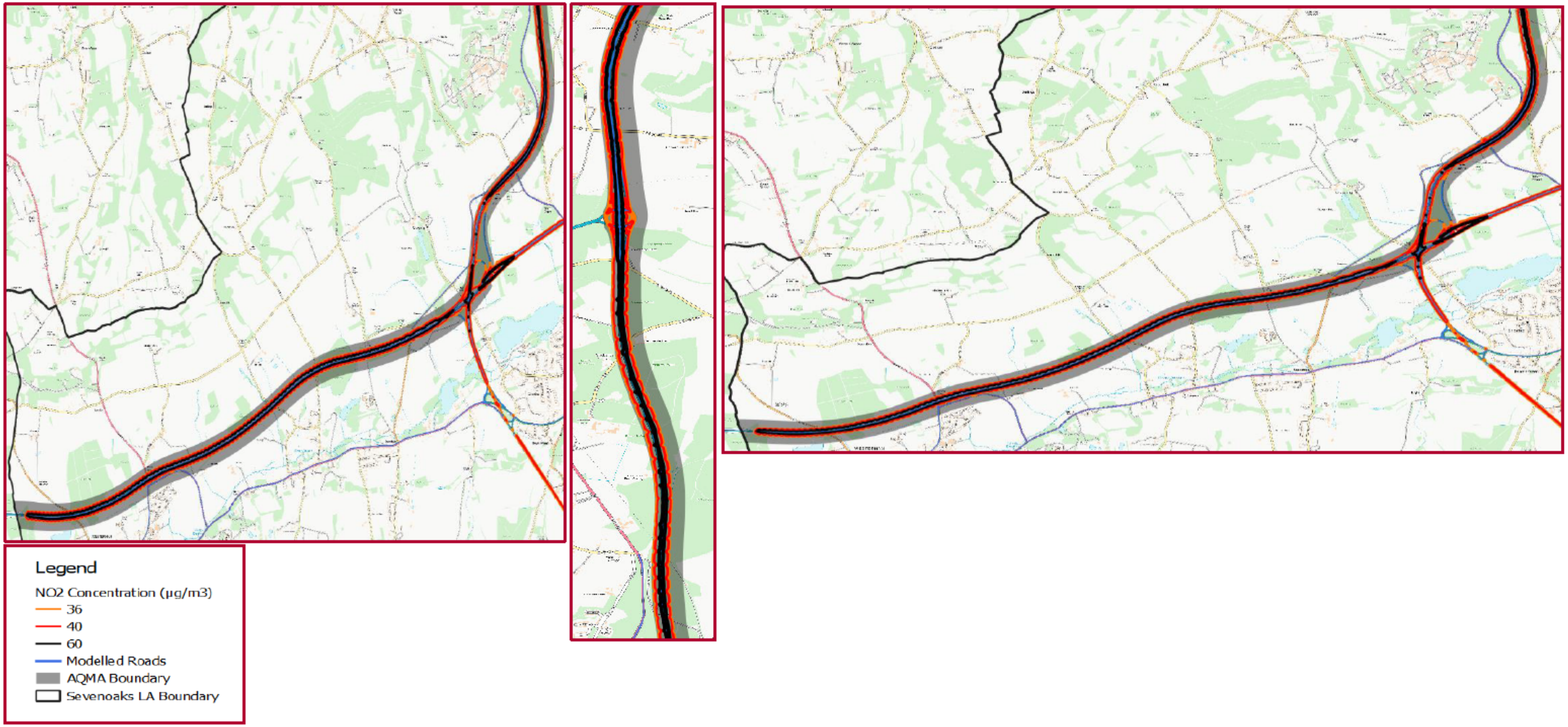


Figure 3.8 – AQMA No.2 Modelled NO_2 Concentration Isopleths



3.3 AQMA No.3 M26

3.3.1 Council Monitoring Data

AQMA No.3 is currently designated for exceedances of the annual mean NO_2 AQS objective with the current boundary incorporating all of the M26 located within Sevenoaks. Currently there are no monitoring sites measuring annual mean NO_2 concentrations within or near to the current AQMA boundary.

3.3.2 Modelled Receptors, Annual Mean NO_2

Table 3.9 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2018. 5 discrete receptor locations are positioned within the boundary of AQMA No.3, with a further 6 being located in close proximity to the boundary. None of these receptor locations has a predicted exceedance of the annual mean NO_2 objective, however receptor ID 161 has a predicted concentration of 37.9µg/m^3, within 10% of the objective. It should be noted that receptor ID 161, 159 and 158 have been verified using the Model Wide (ex. Motorway and Westerham) verification factor, as these receptor locations will also be influenced by the emissions of the A224 London Road. All other receptor locations are predicted to be well below the objective limit value.

It is important to note that due to no monitoring data being collected in this AQMA it is not possible to verify the model performance in this area with absolute certainty. The concentrations in this AQMA have been verified using the Motorway verification factor (with the exception of receptor IDs 161, 159 and 158), however the nearest monitoring location use for this verification is DT12, approximately 3km away.

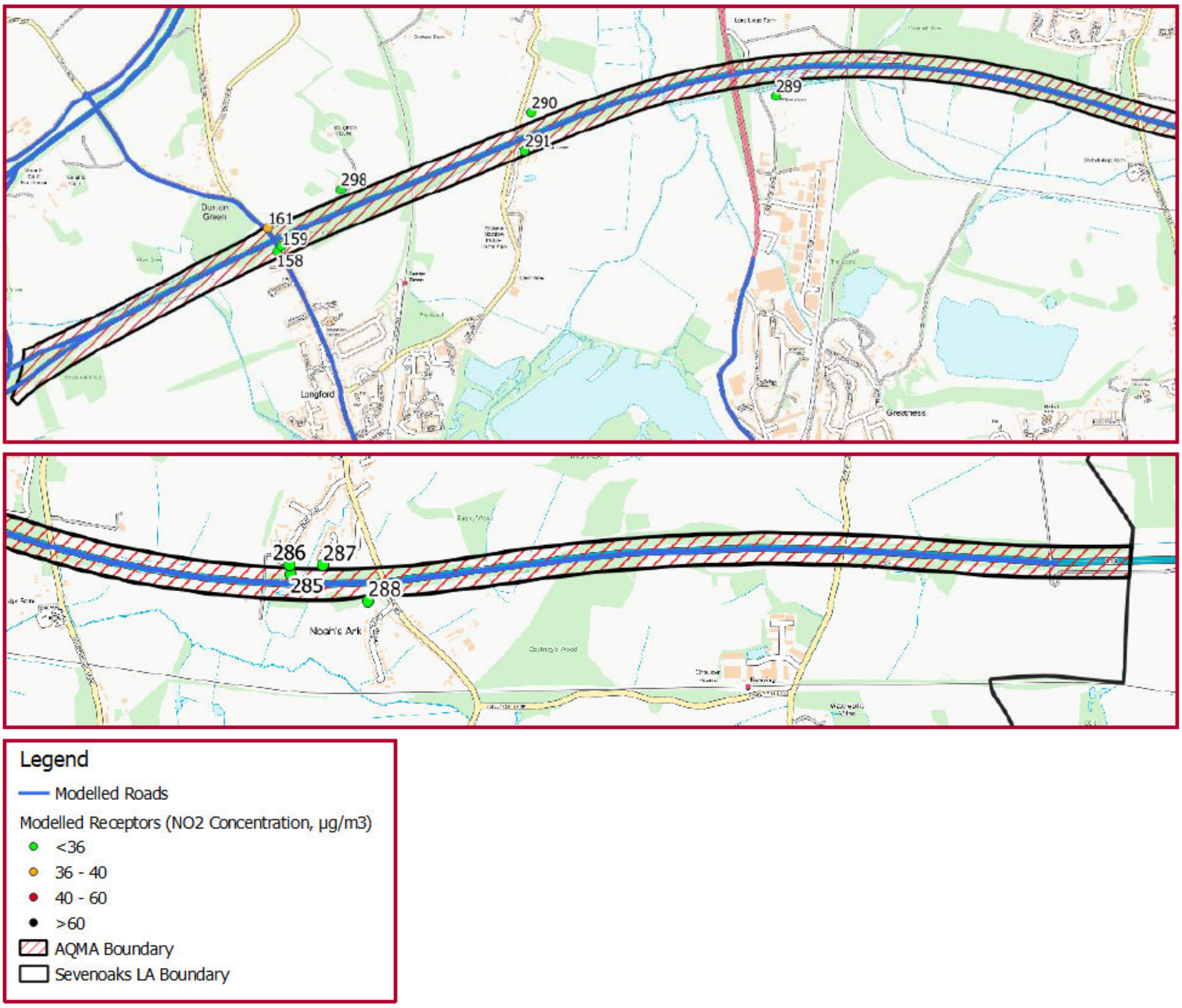
Figure 3.9 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that all receptors have a predicted concentration of less than 36µg/m^3, with the exception of receptor ID 161.

From the annual mean NO_2 concentration contour plots presented in Figure 3.11, it can be seen that the extent of the predicted exceedances of the annual mean objective are much more constrained to the majority of the M26 when compared to the existing AQMA boundary. Where the M26 joins the M25, junction 5, the contours are much closer to the northern edge of the AQMA boundary, and do slightly cross over. The contour lines follow the geometry of the road, with the exceedance limit not coming into range of any residential properties near to the M26.

Table 3.9 – AQMA No.3, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
158	550948	157650	7.5	Y	40	32.2	80
159	550969	157672	7.5	Y	40	34.2	85
161	550910	157746	7.5	Y	40	*37.8*	*94*
285	555276	158115	1.5	Y	40	24.5	61
286	555273	158144	1.5	N	40	19.5	49
287	555383	158142	1.5	N	40	19.6	49
288	555529	158026	1.5	N	40	16.8	42
289	553003	158290	1.5	N	40	15.8	40
290	551997	158222	1.5	N	40	20.2	50
291	551971	158064	1.5	Y	40	20.3	51
298	551213	157906	1.5	N	40	20.2	51

Figure 3.9 – AQMA No.3, Modelled Roads and Receptor Locations



3.3.3 AQMA No.3 Source Apportionment

The source apportionment completed for the modelled receptors within the boundary of AQMA No.3 incorporates the 5 receptors as detailed within Table 3.9 above. Apportionment for NO_x concentrations have been completed for the three separate groups in terms of the receptors as detailed in Section 2.5, with the results presented in Table 3.10 and Figure 3.10.

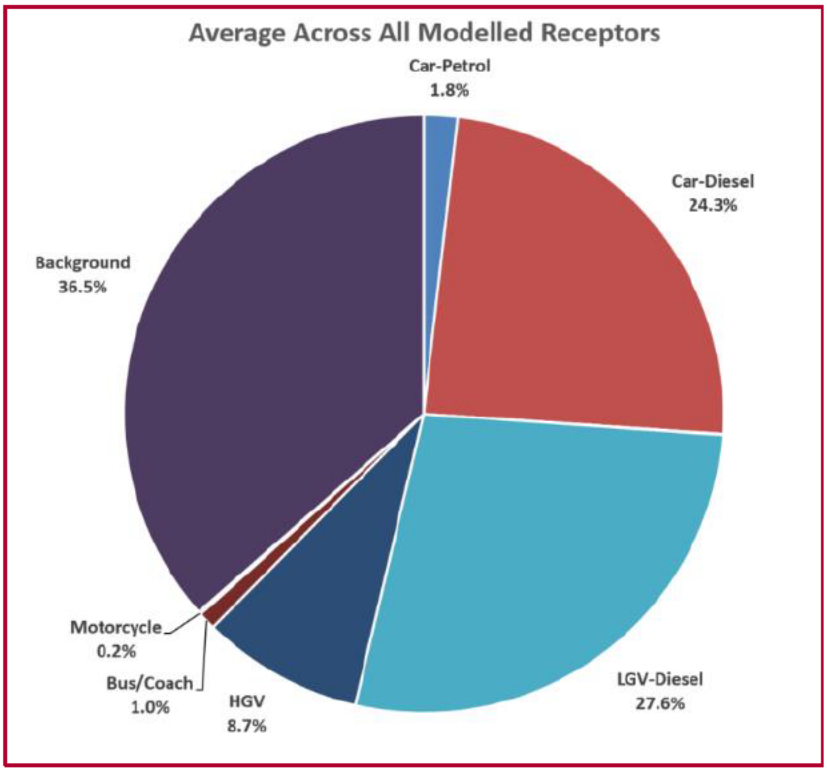
When considering the average NO_x concentration across all modelled receptors, road traffic accounts for 32.7µg/m^3 (63.5%) of total NO_x concentration (51.5µg/m^3). Of the 32.7µg/m^3 total road NO_x, Diesel LGVs account for the greatest contribution (27.6%) of any of the vehicle types, followed by Diesel Cars (24.3%) and HGVs (8.7%). The remaining vehicle source groups (Petrol and Alternative Fuel Cars and LGVs, Bus and Coach, and Motorcycles) contribute less than 2.0% each.

The receptor with the maximum road NO_x concentration is receptor ID 161, whereby the total road NO_x was predicted to be 69.7µg/m^3. At receptor ID 161 road traffic accounts for 72.1% of total NO_x concentration (50.3µg/m^3). Of the 50.3µg/m^3 total road NO_x the separate vehicle apportionment remains similar to the previous assessment but with an increased apportionment to Diesel LGVs and Cars, and a slight increased apportionment to HGVs and Petrol Cars; Diesel LGVs (30.9%), Diesel Cars (27.8%) and HGVs (9.9%), with the remaining vehicle source groups contributing less than 2.2% each.

Table 3.10 – NO_x Source Apportionment Results: AQMA No.3

Results	All Vehicles	Car			LGV			HGV	Bus and Coach	Motorcycle	Background
		Petrol	Diesel	EV/LPG	Petrol	Diesel	EV/LPG				
Average across all modelled receptors											
NO_x Concentration (μg/m³)	32.7	0.9	12.5	0.0	0.0	14.2	0.0	4.5	0.5	0.1	18.8
Percentage of Total NO_x	63.5%	1.8%	24.3%	0.0%	0.0%	27.6%	0.0%	8.7%	1.0%	0.2%	36.5%
Percentage Contribution to Road NO_x	100.0%	2.9%	38.2%	0.0%	0.1%	43.4%	0.0%	13.7%	1.5%	0.2%	-
At The Receptor With the Maximum Road NO_x Concentration (ID 161)											
NO_x Concentration (μg/m³)	50.3	1.5	19.4	0.0	0.0	21.5	0.0	6.9	0.8	0.1	19.4
Percentage of Total NO_x	72.1%	2.2%	27.8%	0.0%	0.1%	30.9%	0.0%	9.9%	1.1%	0.2%	27.9%
Percentage Contribution to Road NO_x	100.0%	3.0%	38.6%	0.0%	0.1%	42.8%	0.0%	13.7%	1.6%	0.2%	-

Figure 3.10 – NO_x Source Apportionment Results: AQMA No.3



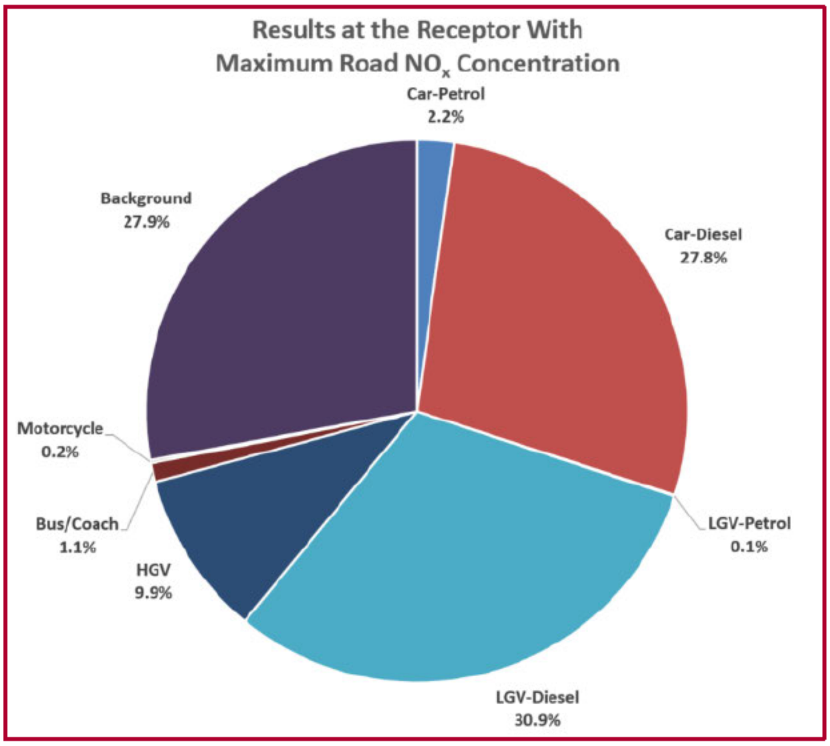
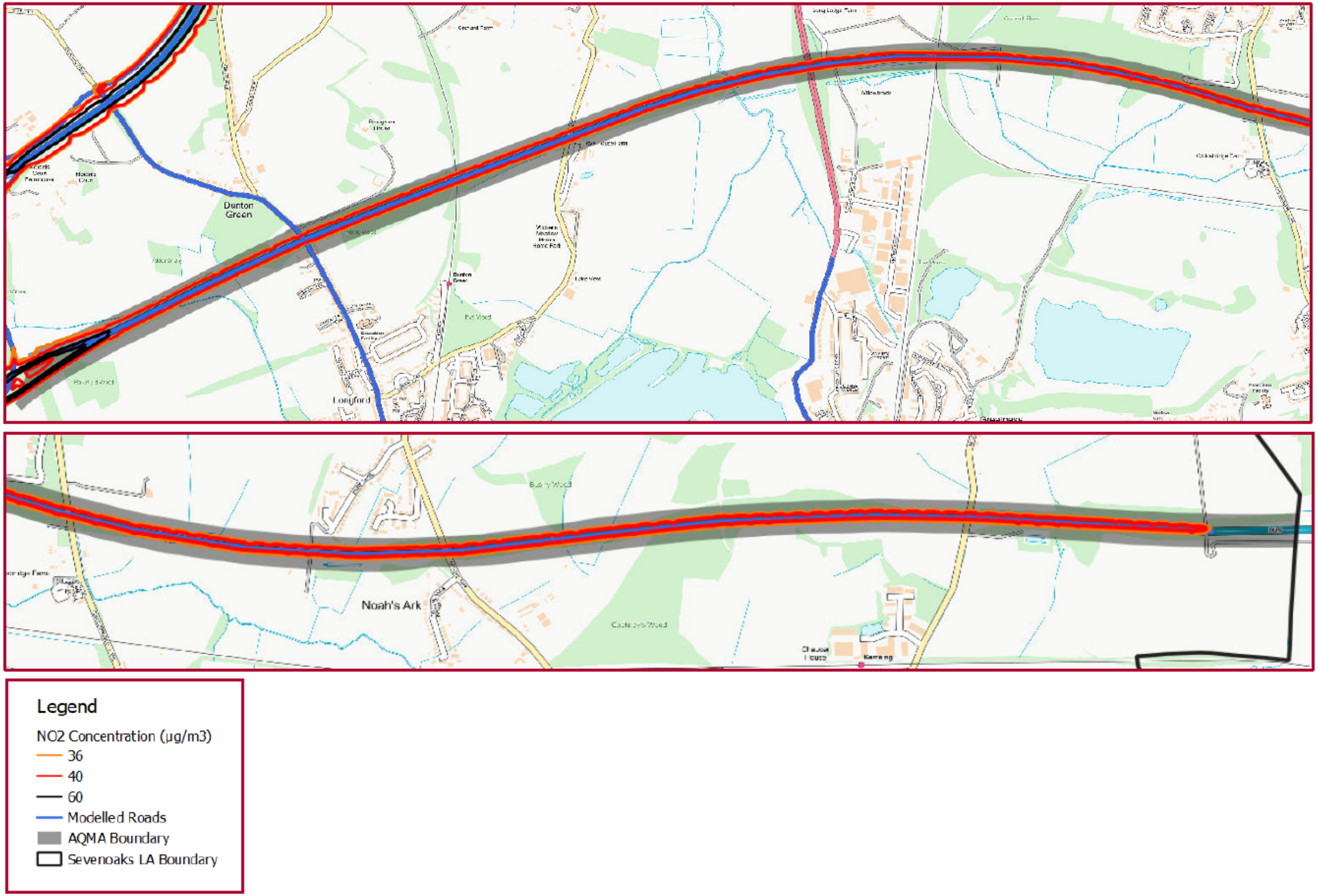


Figure 3.11 – AQMA No.3 Modelled NO_2 Concentration Isopleths



3.4 AQMA No.4 A20(T)

3.4.1 Council Monitoring Data

AQMA No.4 is currently designated for exceedances of the annual mean NO_2 AQS objective with the current boundary incorporating all of the A20 located within Sevenoaks. Currently there are no monitoring sites measuring annual mean NO_2 concentrations within or near to the current AQMA boundary.

3.4.2 Modelled Receptors, Annual Mean NO_2

Table 3.11 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2018. 7 discrete receptor locations are positioned within the boundary of AQMA No.4, with a further 4 being located in close proximity to the boundary. None of these receptor locations have a predicted concentration in exceedance of the annual mean NO_2 objective, nor are there any within 10% of the objective.

It is important to note that due to no monitoring data being collected in this AQMA it is not possible to verify the model performance in this area with absolute accuracy. The concentrations in this AQMA have been verified using the Motorway verification factor, and the nearest monitoring location is DT14, located approximately 780m away.

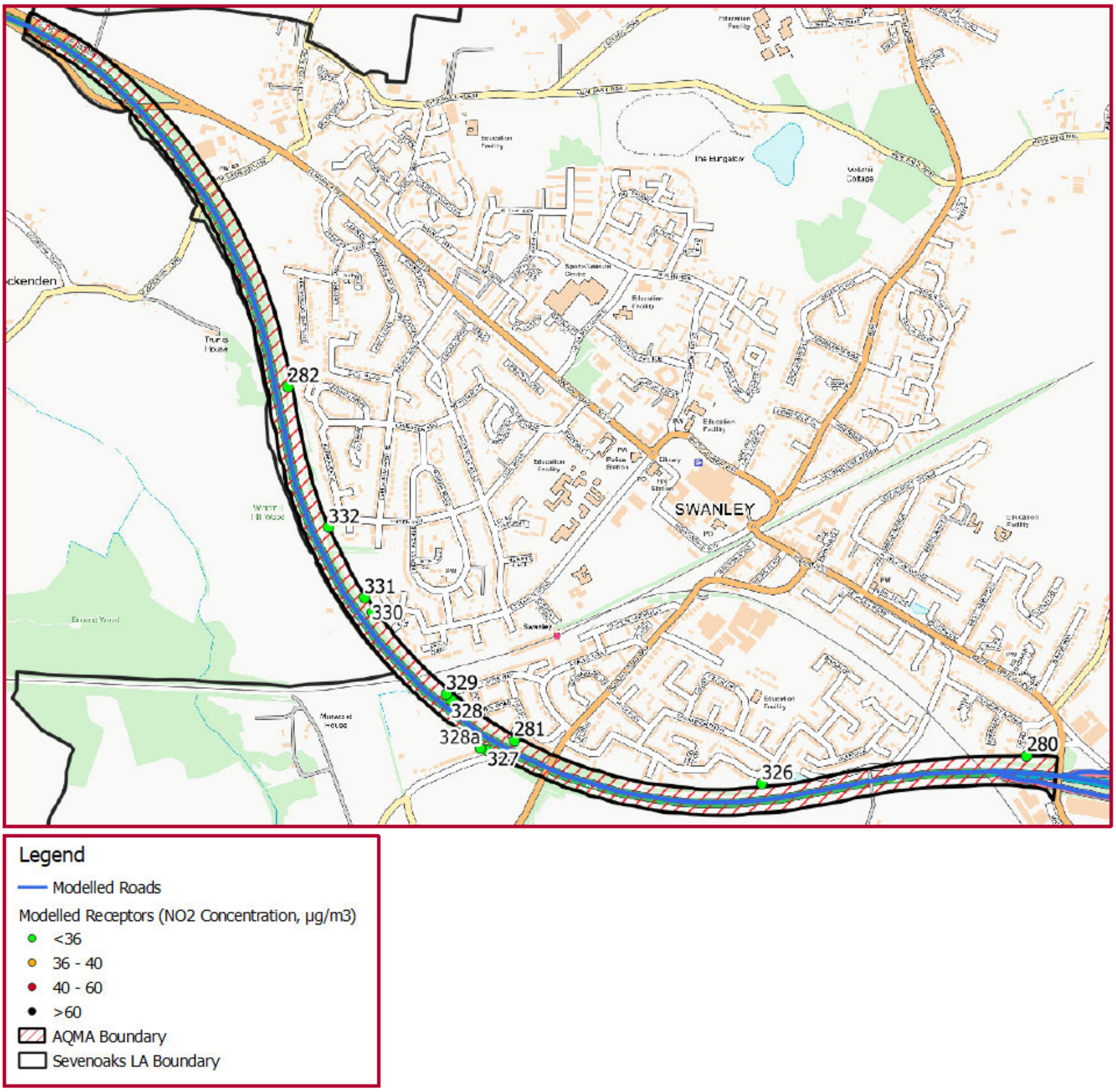
Figure 3.12 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that all receptors have a predicted concentration of less than 36µg/m^3.

From the annual mean NO_2 concentration contour plots presented in Figure 3.14, it can be seen that the extent of the predicted exceedances of the annual mean objective are slightly more constrained to the A20 when compared to the existing AQMA boundary, however for the most part it remains in-line with the boundary. The contour lines follow the geometry of the road, with the exceedance limit coming in close range to residential properties located near to the A20, in particular those near Cyclamen Road/Ladds Way. No properties come into contact with the exceedance limit contour; however, they do come into contact with the 36µg/m^3 contour.

Table 3.11 – AQMA No.4, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	Inside AQMA?	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
280	552249	167935	1.5	Y	40	26.2	65
281	550864	167976	1.5	Y	40	29.1	73
282	550254	168930	1.5	Y	40	26.8	67
326	551533	167859	1.5	N	40	26.4	66
327	550792	167949	1.5	Y	40	24.0	60
328	550694	168086	1.5	Y	40	31.7	79
329	550681	168101	1.5	Y	40	29.8	75
330	550480	168321	1.5	Y	40	28.5	71
331	550460	168361	1.5	Y	40	26.5	66
332	550363	168550	1.5	Y	40	25.1	63
328a	550774	167954	1.5	N	40	22.9	57

Figure 3.12 – AQMA No.4, Modelled Roads and Receptor Locations



3.4.3 AQMA No.4 Source Apportionment

The source apportionment completed for the modelled receptors within the boundary of AQMA No.4 incorporates the 9 receptors as detailed within Table 3.11 above. Apportionment for NO_x concentrations have been completed for the three separate groups in terms of the receptors as detailed in Section 2.5, with the results presented in Table 3.12 and Figure 3.13.

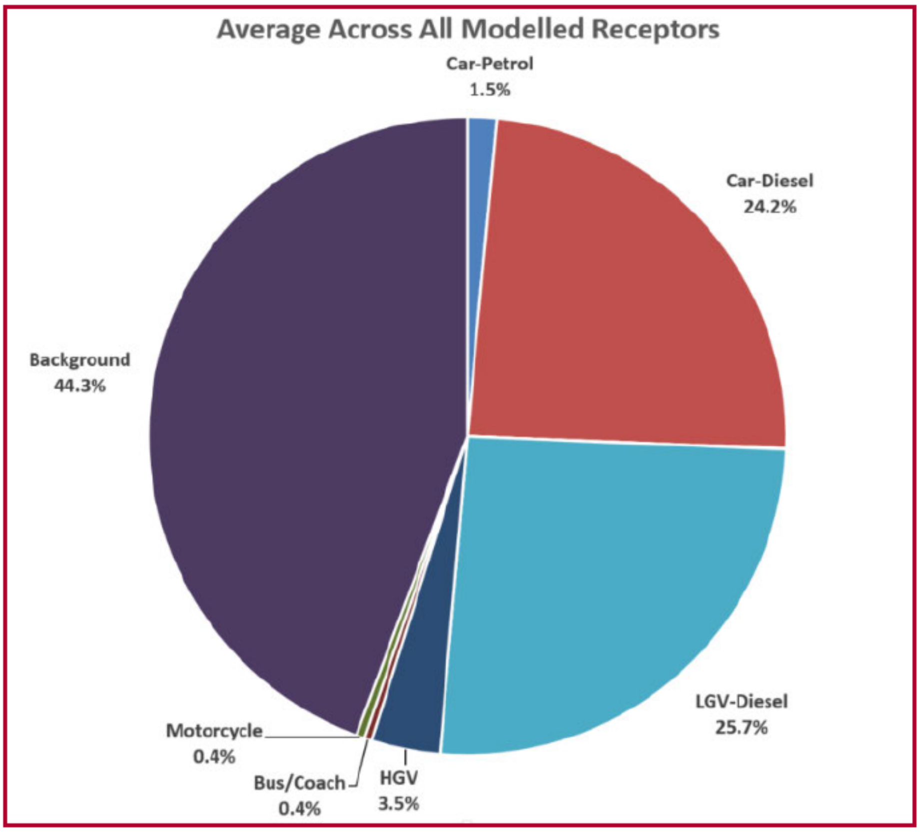
When considering the average NO_x concentration across all modelled receptors, road traffic accounts for 25.8µg/m^3 (55.7%) of total NO_x concentration (46.4µg/m^3). Of the 25.8µg/m^3 total road NO_x, Diesel LGVs account for the greatest contribution (25.7%) of any of the vehicle types, followed by Diesel Cars (24.2%) and HGVs (3.5%). The remaining vehicle source groups (Petrol and Alternative Fuel Cars and LGVs, Bus and Coach, and Motorcycles) contribute less than 2.0% each.

The receptor with the maximum road NO_x concentration is receptor ID 328, whereby the total road NO_x was predicted to be 55.3µg/m^3. At receptor ID 328 road traffic accounts for 62.3% of total NO_x concentration (34.4µg/m^3). Of the 34.4µg/m^3 total road NO_x the separate vehicle apportionment remains similar to the previous assessment but with an increased apportionment to Diesel LGVs and Cars; Diesel LGVs (28.9%), Diesel Cars (27.1%) and HGVs (3.7%), with the remaining vehicle source groups contributing less than 1.6% each.

Table 3.12 – NO_x Source Apportionment Results: AQMA No.4

Results	All Vehicles	Car			LGV			HGV	Bus and Coach	Motorcycle	Background
		Petrol	Diesel	EV/LPG	Petrol	Diesel	EV/LPG				
Average across all modelled receptors											
NO_x Concentration (µg/m³)	25.8	0.7	11.2	0.0	0.0	11.9	0.0	1.6	0.2	0.2	20.6
Percentage of Total NO_x	55.7%	1.5%	24.2%	0.0%	0.0%	25.7%	0.0%	3.5%	0.4%	0.4%	44.3%
Percentage Contribution to Road NO_x	100.0%	2.7%	43.4%	0.0%	0.1%	46.2%	0.0%	6.2%	0.7%	0.8%	-
At The Receptor With the Maximum Road NO_x Concentration (ID 328)											
NO_x Concentration (µg/m³)	34.4	0.9	15.0	0.0	0.0	16.0	0.0	2.0	0.2	0.3	20.9
Percentage of Total NO_x	62.3%	1.6%	27.1%	0.0%	0.0%	28.9%	0.0%	3.7%	0.4%	0.5%	37.7%
Percentage Contribution to Road NO_x	100.0%	2.6%	43.6%	0.0%	0.1%	46.4%	0.0%	5.9%	0.7%	0.8%	-

Figure 3.13 – NO_x Source Apportionment Results: AQMA No.4



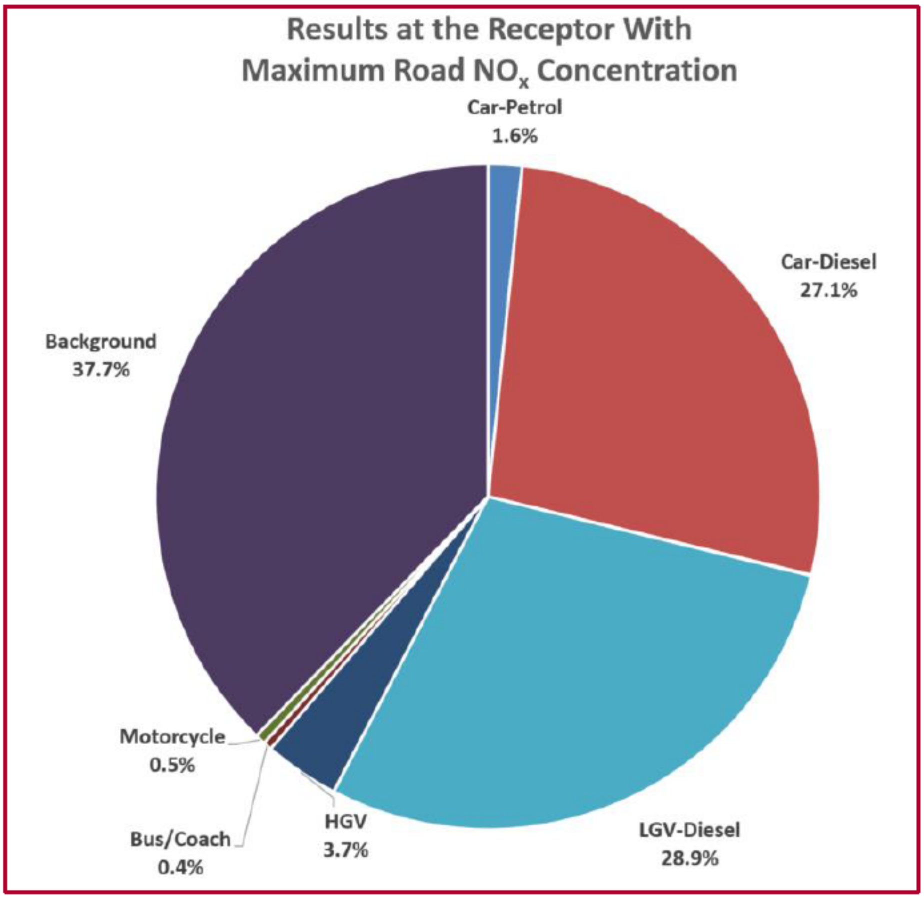
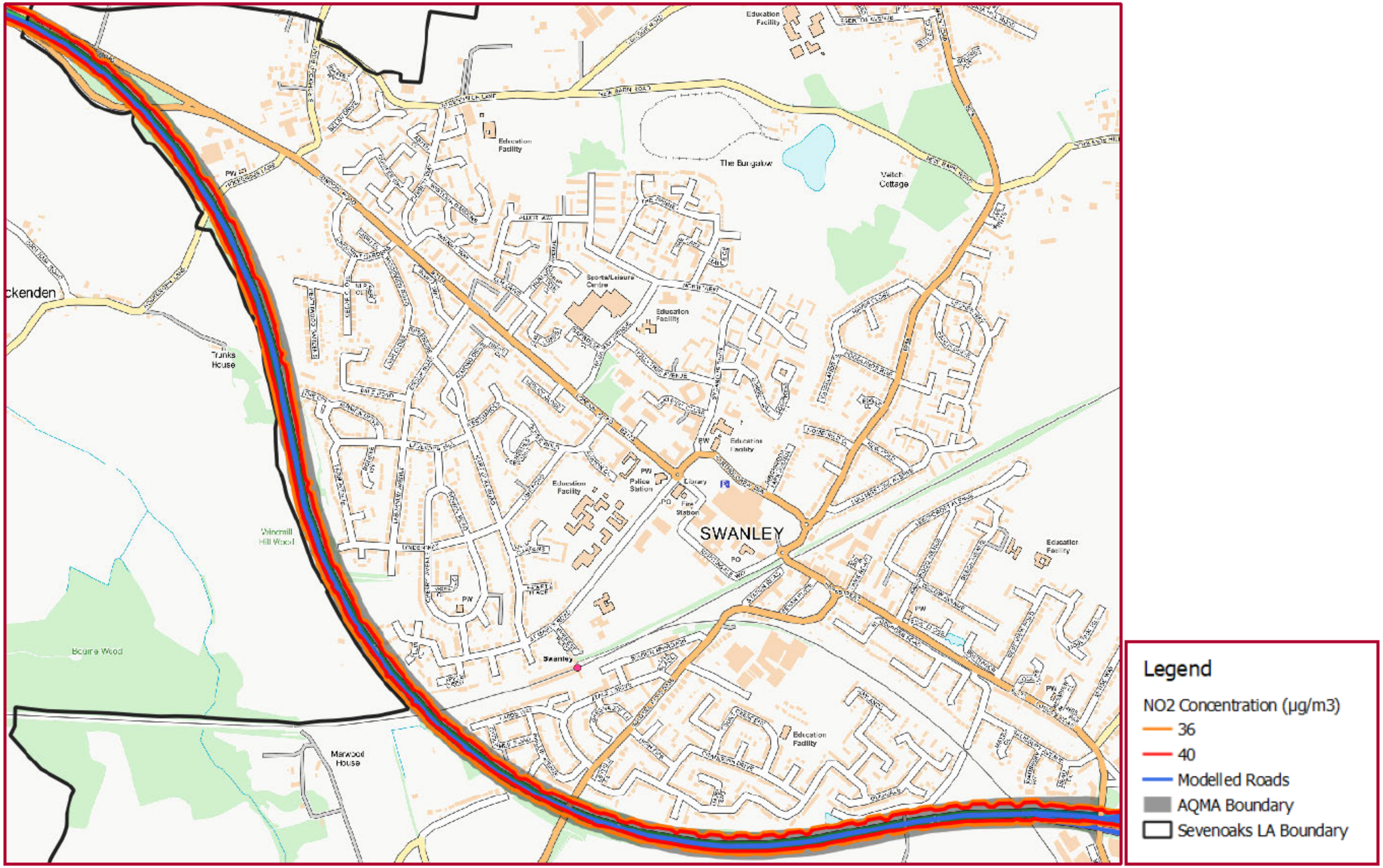


Figure 3.14 – AQMA No.4 Modelled NO_2 Concentration Isopleths



3.5 AQMA No.6 M25-PM_{10}

3.5.1 Council Monitoring Data

AQMA No.6 is currently designated for exceedances of the 24-hour mean PM_{10} AQS Objective with the current boundary incorporating eastern section of the M25 from junction 5 located within Sevenoaks. Currently there are no monitoring sites measuring either the annual or 24-hour mean PM_{10} concentrations within or near to the current AQMA boundary.

3.5.2 Modelled Receptors, 24-Hour Mean PM_{10}

Table 3.13 provides the number of estimated 24-hour mean PM_{10} concentrations exceeding 50µg/m^3 predicted at existing residential receptor locations in 2018. One discrete receptor location is positioned within the boundary of AQMA No.6, with a further 5 being located in close proximity to the boundary, inclusive of a receptor located at the Churchill Church of England Primary School. None of these receptor locations exceed the allowable 35 exceedances of the 24-hour mean PM_{10} objective, nor are there any within 10% of the objective (31 exceedances). This is also shown in Figure 3.15, which presents the modelled roads and the locations of the discrete receptors with regards to the estimated number of exceedances. The maximum estimated number of exceedances is 4, at receptor ID 318.

Additionally, Table 3.13 also shows the annual mean concentrations predicted at each receptor, in which the number of 24-hour mean exceedances have been calculated from. It can be seen that none of the receptors have a predicted annual mean PM_{10} concentration in exceedance of the AQS 40µg/m^3 objective.

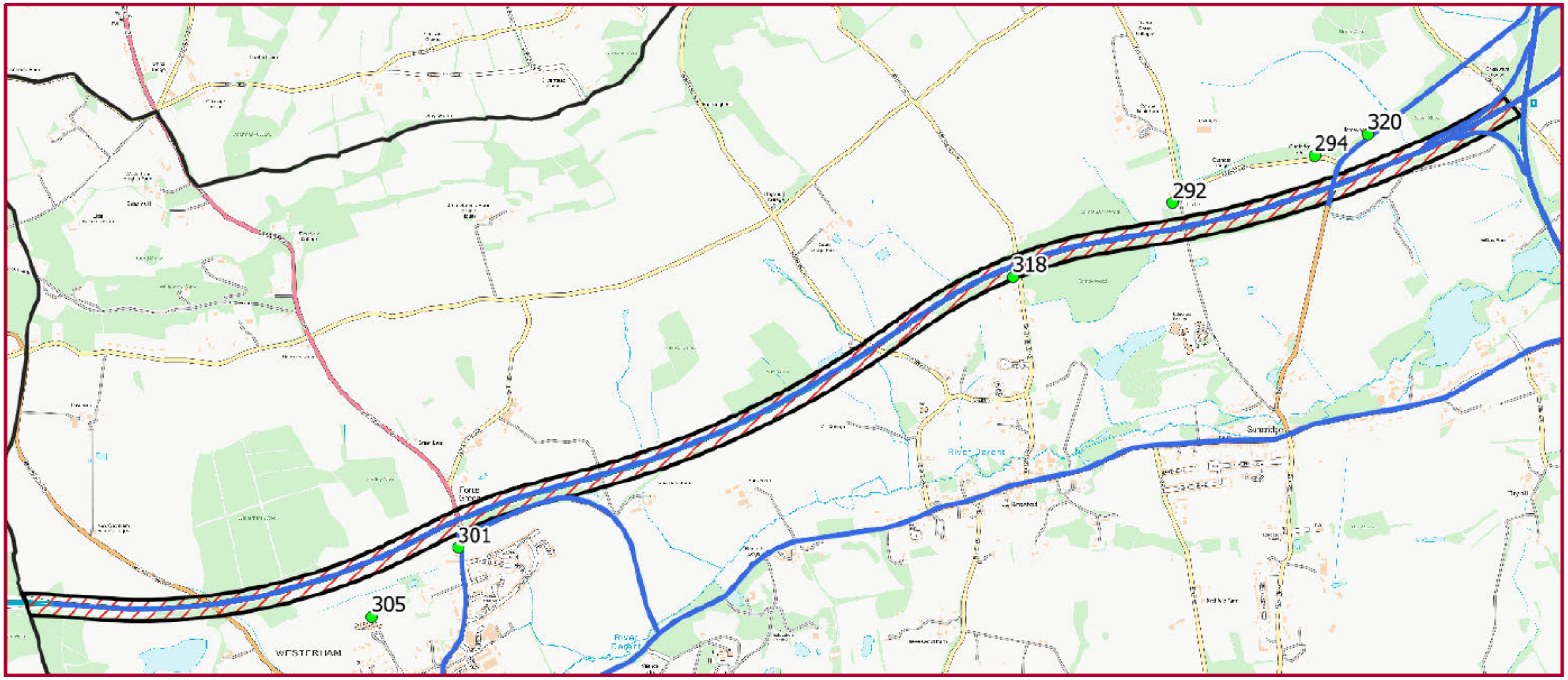
It is important to note that due to no monitoring data being collected in this AQMA it is not possible to accurately verify the model performance in this area. The PM_{10} concentrations have been verified using the PM_{10} verification factor, utilising the concentrations measured at the continuous monitor CM2, located ~3.5km from the AQMA boundary. This monitor is not representative of the conditions at the motorway, however is the only roadside monitor for PM_{10} operated by the Council. As a result, there is a degree of uncertainty surrounding the modelled PM_{10} concentrations.

From the number of exceeding 24-hour mean PM_{10} concentration contour plots presented in Figure 3.16, it can be seen that areas where there is an estimated number of exceedances greater than 35 in a year are restricted to being inside the road, and well within the constraints of the AQMA. Additionally, the contour for 10% of the objective (31 exceedances) also remains well constrained within the present AQMA boundary.

Table 3.13 – AQMA No.6, Summary of Modelled Receptor Results (PM_{10})

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA ?	AQS objective (Number of 24-Hour Mean PM_{10} Exceedances > 50µg/m^3)	2018 Estimated Number of 24-Hour Mean PM_{10} Exceedances > 50µg/m^3	2018 Annual Mean PM_{10} (µg/m^3)
292	547967	156407	1.5	N	35	3	19.6
294	548596	156618	1.5	N	35	3	19.4
301	544793	154872	1.5	N	35	3	19.6
305	544411	154566	1.5	N	35	2	18.4
318	547257	156078	1.5	Y	35	4	20.4
320	548833	156714	1.5	N	35	3	19.8

Figure 3.15 – AQMA No.6, Modelled Roads and Receptor Locations

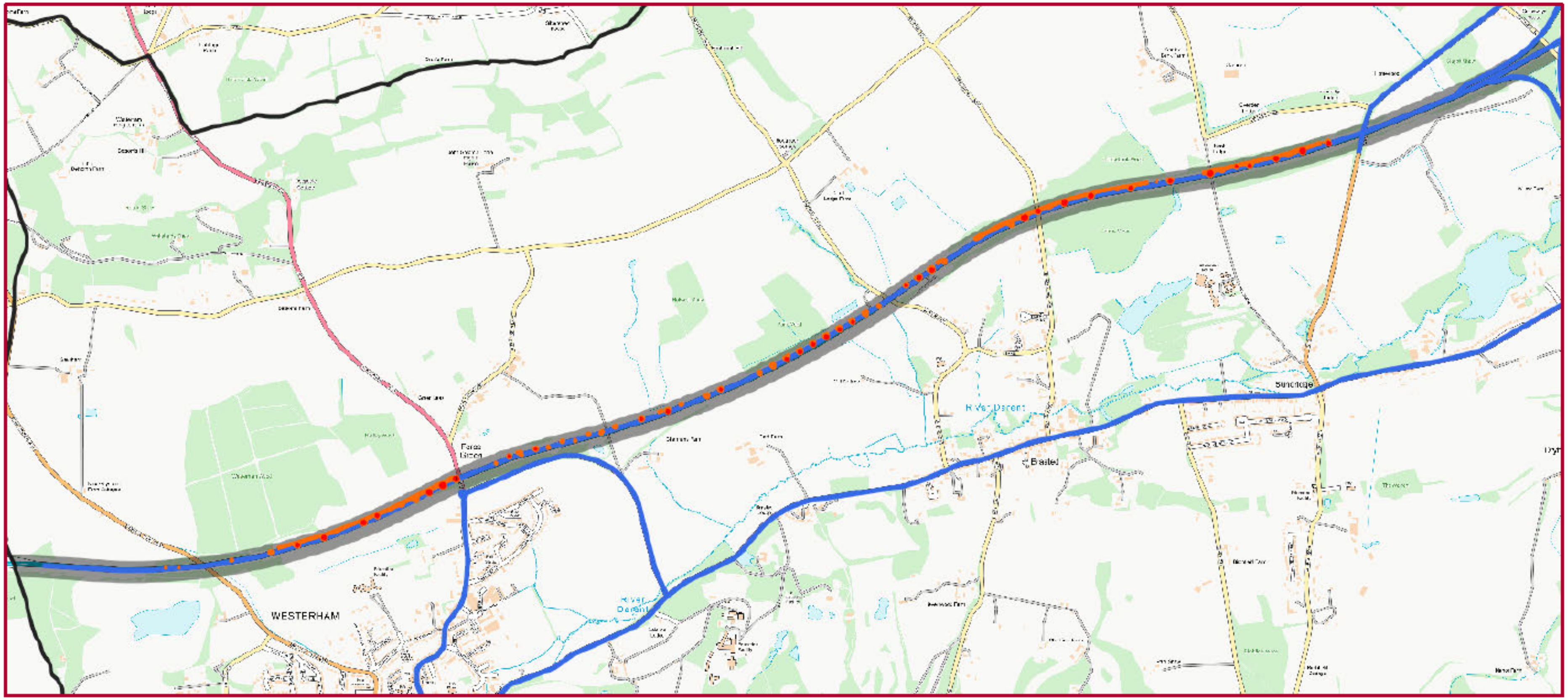


Legend

Number of Exceedances

- < 31
- 31 - 35
- > 35
- Modelled Roads
- AQMA Boundary
- Sevenoaks LA Boundary

Figure 3.16 – AQMA No.6, Modelled PM_{10} Number of Exceeding 24-Hour Concentration Isopleths



Legend

Number of Exceedances

- 31
- 35
- 40
- Modelled Roads
- AQMA Boundary
- Sevenoaks LA Boundary

3.6 AQMA No.10 Sevenoaks High Street

3.6.1 Council Monitoring Data

AQMA No.10 is currently designated for exceedances of the annual mean NO_2 AQS objective with the current boundary being located along Sevenoaks High Street, from the junction of the A225 to Oak Lane until where the A225 splits off to the B2019. It also incorporates parts of Pembroke Road and Suffolk Way at the crossroads from the A225. Currently there are four monitoring sites measuring annual mean NO_2 concentrations within the current AQMA boundary. These are presented in Figure 3.17, and the monitoring results from the previous five years are shown in Table 3.14.

DT2 is located within the boundary of AQMA No.10, and has been recording exceedances of the annual mean NO_2 objective for the past 5 years. This site is not located at relevant exposure, however following distance correction calculations it continues to exceed with a 2018 concentration predicted to be 46.2µg/m³. DT28 had reported exceedances for 3 years, and since 2016 has reported below the AQS objective, but still within 10%. Similarly, with DT27, although this site has no reported exceedances within the past 5 years, it has consistently remained within the 10%. DT29 on the other hand has reported much lower than 36µg/m³ for the past 5 years. Once distance corrected, both DT27 and DT28 have predicted concentrations below 10% of the AQS objective in 2018.

Table 3.14 – Current NO_2 Monitoring Within, or in Close Proximity to AQMA No.10

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m³)[1]				
						2014	2015	2016	2017	2018
DT2	R	553157	154415	0.9	2.0	**56.7**	**53.6**	**54.7**	**48.1**	**49.9**
DT27	R	553139	154259	2.5	2.5	*39.4*	*37.2*	*39.8*	*38.2*	*37.7*
DT28	K	553043	154890	0.8	2.5	**46**	**42.4**	**44.1**	*36.7*	*36.8*
DT29	R	553073	155026	4.4	2.5	30	27.8	31.5	28	28.2

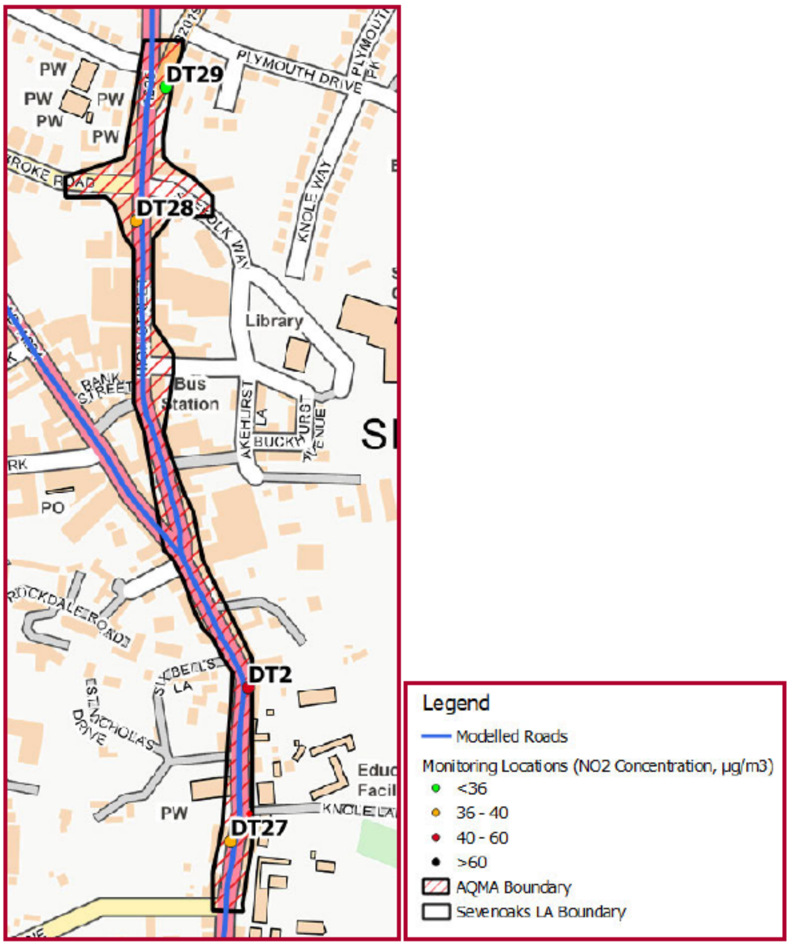
In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m³.
When **underlined**, NO_2 annual mean exceeds 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside
K = Kerbside

Table 3.15 – Current NO_2 Monitoring Within AQMA No.10, Distance Corrected

Site	Site Type	Distance to Kerbside (m)	Distance from Kerbside to Relevant Exposure (m)	Monitored Concentration 2018 (µg/m³)	Distance Corrected Concentration (µg/m³)
DT2	R	1.6	2.5	**49.9**	**46.2**
DT27*	R	1.4	3.9	*37.7*	32.0
DT28	K	2.7	3.5	*36.8*	35.2

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m³.
When **underlined**, NO_2 annual mean exceeds 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside
K= Kerbside
* = Distance to kerbside and distance corrected concentration have been adjusted from that presented in the 2018 ASR as it is believed these values are incorrect.

Figure 3.17 – AQMA No.10, Modelled Roads and Monitoring Locations



3.6.2 Modelled Receptors, Annual Mean NO_2

Table 3.16 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2018. 29 discrete receptor locations are positioned within the boundary of AQMA No.10, with a further 4 being located in close proximity to the boundary, inclusive of receptors located at Sevenoaks School. 12 of these receptor locations have a predicted concentration in exceedance of the annual mean NO_2 objective, one of which being predicted to be greater than 60µg/m^3, and a further 6 being within 10% of the AQS objective. Neither of the receptors located at Sevenoaks School are predicted to have concentrations greater than 40µg/m^3. None of the receptors located outside of the AQMA boundary reported a concentration greater than 36µg/m^3.

Figure 3.18 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that there are 2 sections of the AQMA where there are predicted to be exceedances. One of these is a narrow street canyon where the road bends near Six Bells Lane, and the other is a street canyon further up the road, along the High Street from where the A224 splits off up until the junction to Pembroke Road/Suffolk Way. Although along this second section many of the buildings are commercial, receptors have been placed at a height of 4m to represent the first floor assumed residential living space. The nearest diffusion tube monitoring locations to these sections are DT2 and DT28, which were included as part of the Model Wide (ex. Motorway and Westerham) verification factor. DT2 has a measured exceedance, whereas DT28 does not, but is within 10% of the annual mean NO_2 objective.

From the annual mean NO_2 concentration contour plots presented in Figure 3.19 it can be seen that the extent of the predicted exceedances of the annual mean objective are slightly more constrained at the ends of the AQMA. However, throughout most of the AQMA the exceedance contour line is in line with the current AQMA boundary where there are street canyons or junctions. It should be noted that the contour lines have not been drawn for the road leading towards the Bus Station, or along Suffolk Way and Pembroke Road, as these roads have not been modelled. There are residential properties located along the bend in the A225 near Six Bells Lane which come into contact with the 40µg/m^3 contour. It should also be noted that at locations where discrete receptors have been modelled at the first floor level, the contour plot will over predict the concentration as the contour is at a height of 1.5m.

The 60µg/m^3 contour is located in a very narrow section of the high street, and a NO_2 concentration of 60µg/m^3 or above suggests that there is likely to be an exceedance of the hourly objective. Additionally, receptor ID 32 is located in this area, and reports a modelled concentration of 62.3µg/m^3 when modelled at a 4m height. This area is located through a potentially busy section of the high street, therefore there is likely to be relevant exposure of the hourly objective in this area.

Table 3.16 – AQMA No.10, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	Inside AQMA?	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
12	553128	154207	1.5	Y	40	34.2	85
13	553146	154235	1.5	Y	40	*37.3*	*93*
14	553138	154264	1.5	Y	40	*38.5*	96
15	553168	154264	1.5	N	40	19.5	49
16	553168	154299	1.5	N	40	20.5	51
17	553153	154335	1.5	Y	40	29.7	74
18	553146	154391	1.5	Y	40	**52.6**	**132**
19	553154	154384	1.5	Y	40	**51.1**	**128**
20	553140	154392	1.5	Y	40	23.6	59
21	553148	154412	4	Y	40	20.4	51
22	553143	154430	1.5	Y	40	**45.8**	**115**
23	553156	154426	1.5	Y	40	32.0	80
24	553146	154450	1.5	Y	40	**44.2**	**110**
25	553128	154482	1.5	Y	40	**45.1**	**113**
26	553115	154486	1.5	Y	40	**45.8**	**115**
27	553126	154511	1.5	Y	40	22.7	57
28	553089	154525	4	N	40	18.6	46
29	553107	154537	4	Y	40	20.7	52
30	553054	154730	4	Y	40	**46.3**	**116**
31	553074	154653	4	Y	40	**41.4**	**104**
32	553051	154691	4	Y	40	**62.3**	**156**
33	553055	154707	4	Y	40	**46.6**	**117**
34	553044	154755	4	Y	40	*39.0*	*98*
35	553057	154764	4	Y	40	33.4	83
36	553056	154801	4	Y	40	*36.7*	*92*
37	553041	154808	4	Y	40	*36.1*	*90*
38	553057	154882	4	Y	40	*37.1*	*93*
39	553090	154590	4	Y	40	**42.2**	**106**
40	553041	154910	4	Y	40	**41.6**	**104**
41	553061	154957	1.5	Y	40	28.9	72
42	553041	154944	5	Y	40	20.0	50
43	553043	154999	1.5	Y	40	25.7	64
44	553051	155080	1.5	N	40	27.4	69

Figure 3.18 – AQMA No.10, Modelled Receptor Locations

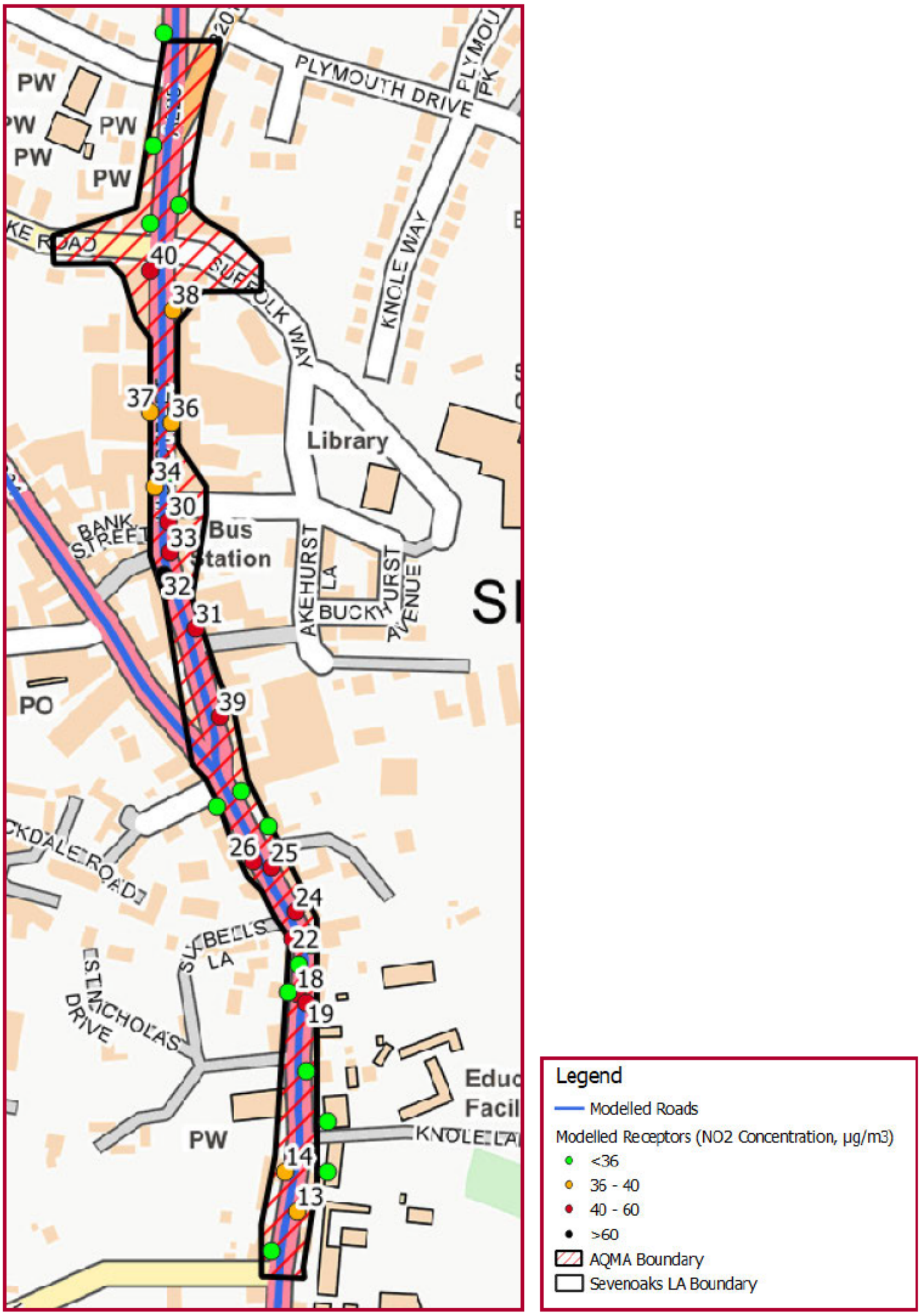
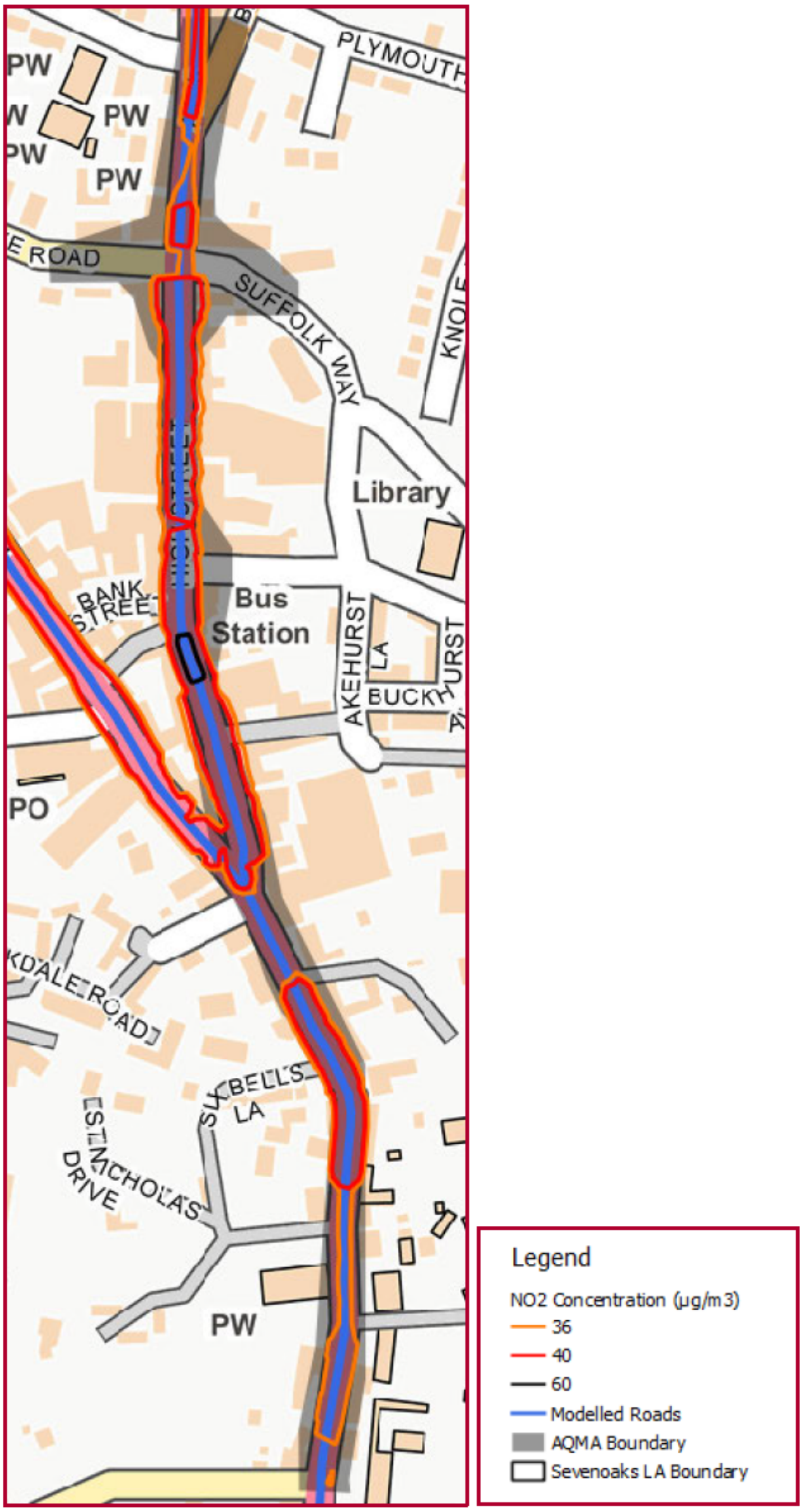


Figure 3.19 – AQMA No.10 Modelled NO_2 Concentration Isopleths



3.6.3 AQMA No.10 Source Apportionment

The source apportionment completed for the modelled receptors within the boundary of AQMA No.4 incorporates the 9 receptors as detailed within Table 3.16 above. Apportionment for NO_x concentrations have been completed for the three separate groups in terms of the receptors as detailed in Section 2.5, with the results presented in Table 3.7 and Figure 3.20

When considering the average NO_x concentration across all modelled receptors, road traffic accounts for 54.6µg/m^3 (76.6%) of total NO_x concentration (71.3µg/m^3). Of the 54.6µg/m^3 total road NO_x, Diesel Cars account for the greatest contribution (42.5%) of any of the vehicle types, followed by Diesel LGVs (18.9%) and Petrol Cars (6.1%). The remaining vehicle source groups (Petrol LGVs, Alternative Fuel Cars and LGVs, HGVs, Bus and Coach, and Motorcycles) contribute less than 5.0% each.

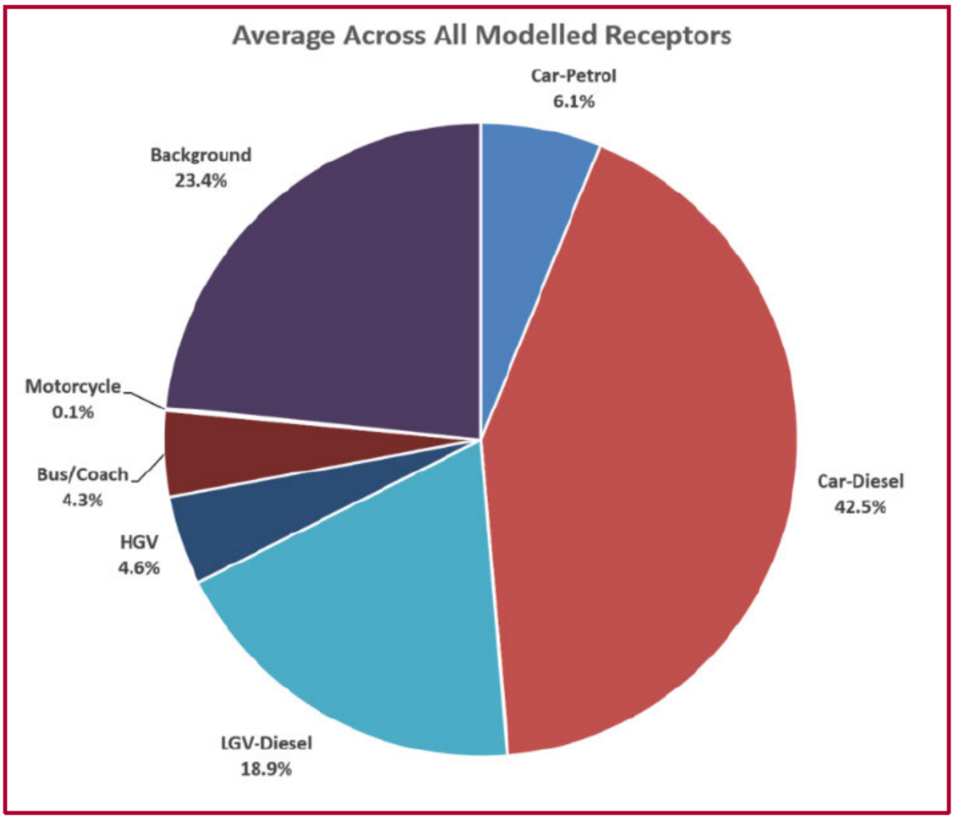
In terms of the average NO_x concentration at receptors with NO_2 concentration greater than 40µg/m^3, for the assessment of AQMA No.10 this removes 17 receptors from the analysis therefore the results are not affected significantly. Road traffic accounts for 78.6µg/m^3 (82.5%) of total NO_x concentration (95.3µg/m^3). Of the 78.6µg/m^3 total road NO_x the separate vehicle apportionment remain very similar, Diesel Cars (45.9%), Diesel LGVs (20.2%) and Petrol Cars (6.6%) with again the remaining vehicle source groups contributing less than 5.0% each.

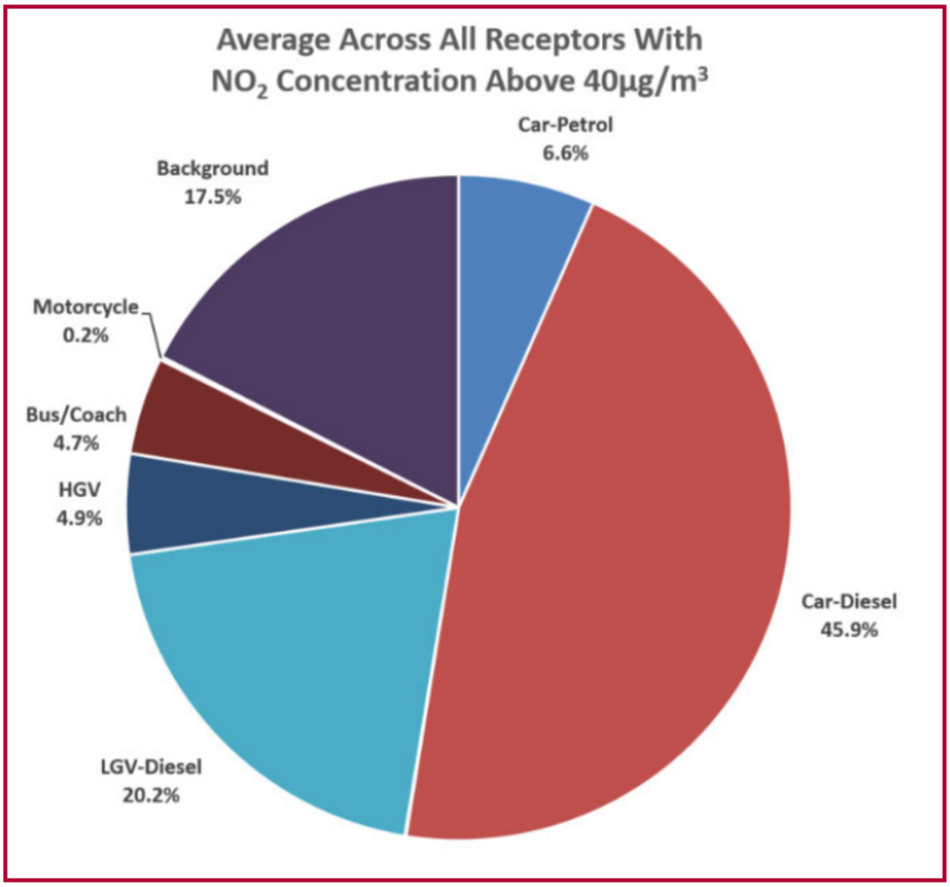
The receptor with the maximum road NO_x concentration is receptor ID 32, whereby the total road NO_x was predicted to be 138.6µg/m^3. At receptor ID 32 road traffic accounts for 88% of total NO_x concentration (121.9µg/m^3). Of the 121.9µg/m^3 total road NO_x the separate vehicle apportionment remains similar to the previous assessment but with an increased apportionment to Diesel Cars; Diesel Cars (51.3%), Diesel LGVs (19.2%) and Petrol Cars (7.63%). The apportionment to Bus/Coaches also increased to 5.7%, with the remaining vehicle source groups contributing less than 5.0% each.

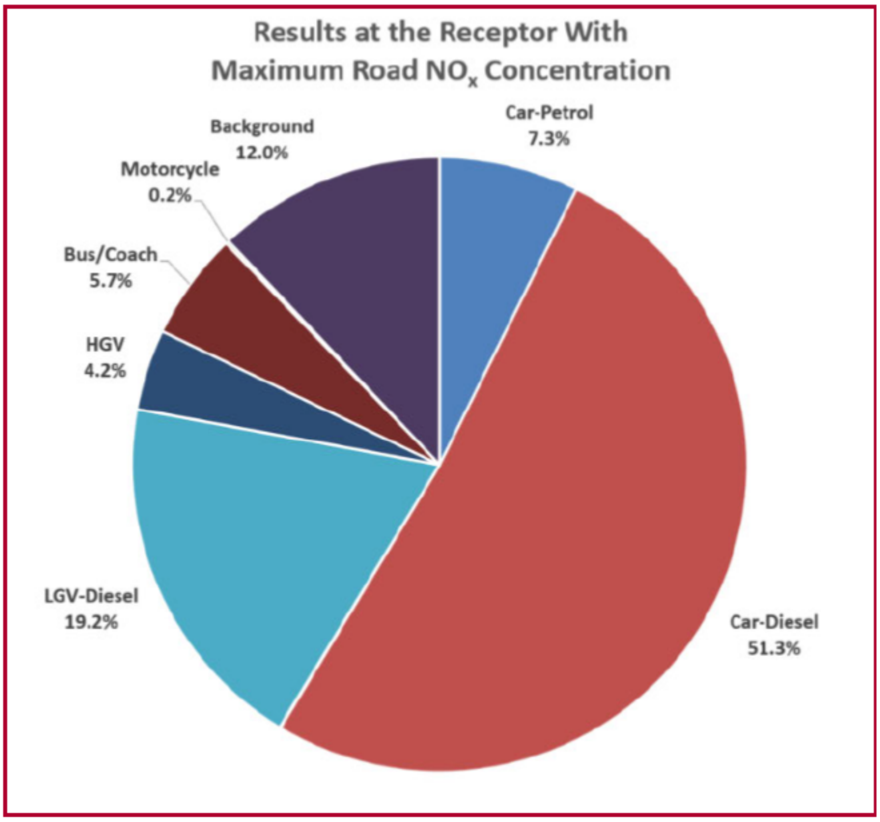
Table 3.17 – NO_x Source Apportionment Results: AQMA No.10

Results	All Vehicles	Car			LGV			HGV	Bus and Coach	Motorcycle	Background
		Petrol	Diesel	EV/LPG	Petrol	Diesel	EV/LPG				
Average across all modelled receptors											
NO_x Concentration (µg/m^3)	54.6	4.4	30.3	0.0	0.0	13.4	0.0	3.2	3.1	0.1	16.7
Percentage of Total NO_x	76.6%	6.1%	42.5%	0.0%	0.0%	18.9%	0.0%	4.6%	4.3%	0.1%	23.4%
Percentage Contribution to Road NO_x	100.0%	8.0%	55.5%	0.0%	0.1%	24.6%	0.0%	5.9%	5.7%	0.2%	-
Average Across All Receptors With NO_2 Concentration exceeding the AQS Annual Mean Objective											
NO_x Concentration (µg/m^3)	78.6	6.3	43.8	0.0	0.0	19.2	0.0	4.6	4.5	0.1	16.7
Percentage of Total NO_x	82.5%	6.6%	45.9%	0.0%	0.0%	20.2%	0.0%	4.9%	4.7%	0.2%	17.5%
Percentage Contribution to Road NO_x	100.0%	8.0%	55.7%	0.0%	0.1%	24.4%	0.0%	5.9%	5.7%	0.2%	-
At The Receptor With the Maximum Road NOx Concentration (ID 32)											
NO_x Concentration (µg/m^3)	121.9	10.2	71.1	0.0	0.1	26.6	0.0	5.9	7.8	0.2	16.7
Percentage of Total NO_x	88.0%	7.3%	51.3%	0.0%	0.0%	19.2%	0.0%	4.2%	5.7%	0.2%	12.0%
Percentage Contribution to Road NO_x	100.0%	8.3%	58.4%	0.0%	0.0%	21.8%	0.0%	4.8%	6.4%	0.2%	-

Figure 3.20 – NO_x Source Apportionment Results: AQMA No.10






Results at the Receptor With
Maximum Road NO_x Concentration
Car-Petrol
7.3%
Car-Diesel
51.3%
LGV-Diesel
19.2%
HGV
4.2%
Bus/Coach
5.7%
Motorcycle
0.2%
Background
12.0%

3.7 AQMA No.13 A25

3.7.1 Council Monitoring Data

AQMA No.13 is currently designated for exceedances of the annual mean NO_2 AQS objective, with the current boundary being located along the entire stretch of the A25, from the boarder of Tonbridge and Malling in the East to the border with Tandridge on the West. The boundary includes the A224 London Road heading northwards from Riverhead until it meets the M26, a section of the A224 Amherst Hill heading south from Riverhead until the junction to Montreal Road, and a section of London Road heading northwards from Market Square in Westerham until it reaches the junction to Quebec Avenue. Currently there are 26 monitoring sites measuring annual mean NO_2 concentrations within or in close proximity to the current AQMA boundary. These are presented in Figure 3.22 (the numbers on each section indicates their relative location on Figure 3.23 which shows the full extent of the AQMA), and the monitoring results from the previous five years are shown in Table 3.18. Distance corrected values for sites with reported 2018 concentrations in exceedance, or within 10% of the AQS objective are presented in Table 3.19.

DT6, DT7, DT31, DT32, DT33, DT85 and DT87 are all located within the boundary of AQMA No.13 and have all reported exceedances of the annual mean NO_2 objective for the past 5 years. DT7 and DT33 are located in a street canyon along the A25 High Street in Seal, with DT33 being located directly opposite a junction. DT7 is located at a site close to relevant exposure, however following distance correction both sites report concentrations below, but within 10% of the AQS objective (DT7 – 39.7µg/m^3, DT33 – 38.2µg/m^3). DT31 and DT32 are located at the junction of the A25 Seal Road to the A225, with DT31 being sited on the eastern arm and DT32 being on the southern arm. Significant congestion occurs in these areas, with the southern stretch of the A225 at the junction being a street canyon. DT32 is located at a site of relevant exposure, however DT31 is located 4.4m from the nearest relevant exposure. Following distance correction calculations however, the concentration predicted at the nearest relevant receptor is still in exceedance in 2018, with a concentration of 41.2µg/m^3.

DT87 and DT6 are located near the junction of the A25 and A224 in Riverhead. DT87 is located further from the junction along Maidstone Road/Bradbourne Vale Road, where significant congestion occurs tailing back from the junction, whereas DT6 is located in the centre stretch between two mini-roundabouts. Neither sites are located directly at relevant exposure, following distance correction calculations they report concentrations below the AQS objective, 39.5µg/m^3 and 32.1µg/m^3 respectively, with DT87 remaining within 10% of the objective. Additionally in this area, DT5 and DT77 are located nearer to relevant exposure, DT77 in particular, and have reported concentrations exceeding 40µg/m^3 in previous years, but continue to report concentrations within 10% in 2018.

DT85 is located in Brasted along the A25 High Street, directly opposite the junction to Chart Lane, and is near to a site of relevant exposure. Following distance correction, there is a predicted concentration of 43.0µg/m^3 at the exposure location, therefore still in exceedance of the AQS objective. DT36 is located on the A25 Market Square running through Westerham, and has reported exceedances for 4 years, with the concentration in 2017 being slightly lower but within 10% of the AQS objective. It is positioned behind a bus stop, and opposite to a large parking area. Following distance correction to the nearest relevant exposure, it is predicted that there would be a concentration of 32.7µg/m^3, well below the AQS objective.

Table 3.18 – Current NO_2 Monitoring Within, or in Close Proximity to AQMA No.13

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m^3)[1]				
						2014	2015	2016	2017	2018
DT5	K	551414	156197	1.5	2.5	**48.2**	**42.8**	**47.0**	**42.7**	*39.3*
DT6	R	551440	156165	7.8	2.5	**47.1**	**44.1**	**47.1**	**40.2**	**41.7**
DT7	R	555092	156694	0.2	2.5	**49.5**	**44.3**	**46.8**	**42.7**	**41.3**
DT8	R	554991	156726	3.7	2.5	31.6	31.1	35.2	26.9	28.3
DT23	R	553059	156624	14.4	2.5	*38.8*	35.6	**40.5**	34.3	*39.2*
DT24	R	544415	153914	5.8	2.5	35.0	32.7	35.3	30.4	35.8

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m³)[1]				
						2014	2015	2016	2017	2018
DT25	R	544770	154000	6.3	2.5	30.1	28.3	29.8	25.9	26.1
DT31	R	553165	156685	4.4	2.5	**52.0**	**46.9**	**57.9**	**51.2**	**51.1**
DT32	R	553151	156558	0.2	2.5	**55.3**	**49.9**	**56.3**	**47.6**	**51.9**
DT33	R	555068	156711	0.9	2	**46.7**	**42.5**	**48.1**	**40.5**	**40.5**
DT34	R	549427	155691	17.3	2.5	35.3	30.9	31.7	27.5	26.1
DT35	R	554093	156798	20.3	2.5	**40.5**	*36.3*	*39.6*	32.5	33.7
DT36	K	544594	154025	4.0	2.5	**51.7**	**44.6**	**45.1**	*39.6*	**40.1**
DT42	R	551318	156373	1.9	2.5	**44.4**	*37.1*	*39.3*	35.5	34.5
DT43	R	551281	156860	3.5	2.5	33.9	28.0	34.1	29.5	28.5
DT54	R	551216	157007	9.1	2.5	*38.1*	35.6	*36.0*	33.8	32.7
DT71	R	548239	155353	7.3	2.5	32.4	29.8	33.5	30.0	31.3
DT74	R	550768	155584	16.8	2.5	*39.7*	35.5	*37.1*	35.4	35.9
DT76	R	551026	155710	40.7	2.5	*36.2*	35.6	**40.0**	33.9	*37.9*
DT77	R	551529	155967	0.3	2.5	**42.8**	**40.7**	**40.0**	*38.8*	*38.7*
DT84	R	546802	155000	5.9	2.5	34.9	32.8	35.4	31.2	32.5
DT85	R	547097	155099	0.2	2.5	**48.3**	**45.0**	**51.1**	**43.9**	**43.7**
DT86	R	550308	155593	8.8	2	*39.4*	*36.7*	**40.8**	*36.0*	34.7
DT87	R	551640	156335	3.3	2.5	**53.8**	**48.1**	**51.7**	**45.7**	**47.0**
DT88	R	552963	156583	10.8	2.5	35.1	29.1	32.9	28.7	30.3
BC4-6	R	553044	156690	30	2	N/A	N/A	N/A	28.5	26.9
CM2	R	553044	156690	30	1.8	29.0	31.8	31.0	28.0	25.0

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m³.
When **underlined**, NO_2 annual mean exceeds 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside
K= Kerbside

Table 3.19 – Distance Corrected NO_2 Concentrations in AQMA No.13

Site	Site Type	Distance to Kerb (m)	Distance from Kerb to Relevant Exposure (m)	Monitored Concentration 2018 (µg/m³)	Distance Corrected Concentration (µg/m³)
DT5	K	0.6	2.1	*39.3*	33.6
DT6	R	2.5	10.3	**41.7**	32.1
DT7	R	0.6	0.8	**41.3**	*39.7*
DT23	R	5.7	20.1	*39.2*	29.3
DT31	R	2.1	6.5	**51.1**	**41.2**
DT32	R	1.3	1.5	**51.9**	**50.8**
DT33	R	2.3	3.2	**40.5**	*38.2*
DT36	K	0.7	4.7	**40.1**	32.7
DT76	R	1.3	42	*37.9*	19.7
DT77	R	1.7	2.0	*38.7*	*37.8*
DT85	R	1.8	2.0	**43.7**	**43.0**
DT87	R	2.1	5.4	**47.0**	*39.6*

Site	Site Type	Distance to Kerb (m)	Distance from Kerb to Relevant Exposure (m)	Monitored Concentration 2018 (µg/m³)	Distance Corrected Concentration (µg/m³)
In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m³. When **underlined**, NO_2 annual mean exceeds 60µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective R= Roadside K= Kerbside					

3.7.2 Modelled Receptors, Annual Mean NO_2

Table 3.16 provides the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations in 2018 for receptors that are exceeding. The full list of modelled receptors around this AQMA is shown in Table D.1. 119 discrete receptor locations are positioned within the boundary of AQMA No.10, with a further 60 being located in close proximity to the boundary, inclusive of receptors located at Top Banana Pre-school in Seal, Sevenoaks Hospital, Knole Academy Secondary School, Dunton Green Primary School, Amherst School, Riverhead Infants' School, Rivermere Care Home, and Westerham Place Care Home. 23 of these receptor locations have a predicted concentration in exceedance of the annual mean NO_2 objective, and a further 18 being within 10% of the AQS objective. None of the receptors located at any of the sensitive receptors listed above are predicted to have concentrations greater than 36µg/m³. One receptor located outside of the AQMA boundary, ID 196, reported a concentration greater than 40µg/m³, however all others located outside of the AQAM boundary have predicted concentrations below 36µg/m³.

Figure 3.24 presents the modelled receptor locations alongside their predicted annual mean NO_2 concentrations. From this, it can be seen that there are 5 overall areas of the AQMA where there are predicted to be exceedances. One of these is Westerham, both along the A25 between the junction to the B2024 and Mill Lane, as well as where London Road joins the A25. Both of these sections of roads are narrow street canyons, where pollution is able to build up and become trapped. The maximum concentration predicted by the model here is 59.4µg/m³ at receptor ID 268 located on London Road. Another area of exceedances is in Brasted along the High Street, in particular near to junctions to Church Road and Chart Lane, however neither of these roads have been modelled. An additional exceedance is predicted eastwards of the junction to Rectory Lane. The maximum concentration predicted in this area is at receptor ID 238 (45.2µg/m³).

There are also a number of exceedances predicted around the junctions of the A25 and A224 in Riverhead. One exceedance on the western stretch of the A25 at receptor ID 196 is located just outside of the AQMA boundary, with a predicted NO_2 annual mean concentration of 41.9µg/m³. Another exceedance is predicted at receptor ID 165 (42.9µg/m³) located in the central stretch of the A25 between the two mini roundabouts, however the majority of exceeding receptors are predicted to be along the eastern stretch of the A25. The maximum of these, 44.9µg/m³, is predicted to be at receptor ID 128. The junctions all throughout this area along the A25 are heavily congested. Similarly, there are exceedances predicted at the junction between the A225 and A25 in Bat & Ball, in particular the southern and eastern stretches. The maximum predicted concentration is at receptor ID 80 (50.8µg/m³). Both of these areas in Riverhead and Bat & Ball experience heavy congestion resulting in a change in vehicle strain when accelerating and decelerating.

There are also 3 exceeding receptors located on the eastern section of the A25 leaving Seal. These are located in a street canyon whereby emissions are likely to be contained. The maximum concentration here is at receptor ID 107 (57.8µg/m³). The model is over predicting at both DT7 and DT34, by at least 25.3%, likely resulting from inaccuracies in the traffic data, or due to un-modelled influences. Therefore, the results of this area are likely over predicting and caution should be taken when considering these results.

From the annual mean NO_2 concentration contour plots presented in Figure 3.25 (with the letter code for each section referring to Figure 3.22), it can be seen that the extent of the predicted exceedances of the annual mean objective are largely constrained to the A25, in line with the current AQMA boundary. However, in some areas, particularly around junctions in Westerham, Riverhead and Bat & Ball the contours are much more constrained to the modelled road links. The exceedance contours do expand beyond the current boundary in a number of locations, including: the A25 Brasted Road (near Brasted Lodge), the A25 Main Road (west of Sundridge), the A25 Westerham Road/Worships Hill, the A25 Bardbourne Vale Road, North and South stretches of the A225 from the Bat & Ball junctions, and along London Road/the A233 in Westerham. There are 60µg/m^3 contours located throughout the AQMA, however these largely lie within the centre of roads, especially at junctions. An exception to this is at the southern roundabout in Riverhead, where the contours are shown to stretch northwards away from the road. This, and where contours are off-set from the roads, is likely in part due to meteorological conditions with the dominant wind direction originating in the south-west. Additionally, there is an area of 60µg/m^3 contours along London Road from the junction to the A25 Market Square in Westerham.

Table 3.20 – AQMA No.13, Summary of Exceeding Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
64	553159	156547	1.5	Y	40	**41.6**	**104**
73	553113	156595	1.5	Y	40	**43.5**	**109**
74	553111	156583	4	Y	40	**48.4**	**121**
79	553105	156679	1.5	Y	40	**49.2**	**123**
80	553082	156667	1.5	Y	40	**50.8**	**127**
81	553168	156689	1.5	Y	40	**40.6**	**102**
82	553131	156686	1.5	Y	40	**49.8**	**125**
107	555105	156698	1.5	Y	40	**57.8**	**145**
108	555113	156686	1.5	Y	40	**53.5**	**134**
109	555141	156682	1.5	Y	40	**49.3**	**123**
128	551573	156296	1.5	Y	40	**44.9**	**112**
129	551547	156286	1.5	Y	40	**43.9**	**110**
130	551427	156222	3	Y	40	**42.3**	**106**
165	551413	156184	1.5	Y	40	**42.9**	**107**
196	551326	156019	1.5	N	40	**41.9**	**105**
229	547513	155213	1.5	Y	40	**41.5**	**104**
235	547131	155113	1.5	Y	40	**41.6**	**104**
238	546881	155035	1.5	Y	40	**45.2**	**113**
253	544424	153924	1.5	Y	40	**58.3**	**146**
256	544379	153879	1.5	Y	40	**47.5**	**119**
257	544349	153855	1.5	Y	40	**48.8**	**122**
263	544612	154118	1.5	Y	40	**40.7**	**102**
268	544629	154066	1.5	Y	40	**59.4**	**149**

3.7.3 AQMA 13 Source Apportionment

The source apportionment completed for the modelled receptors within the boundary of AQMA No.13 incorporates the 119 receptors as detailed within Table D.1. Apportionment for NO_x concentrations have been completed for the three separate groups in terms of the receptors as detailed in Section 2.5, with the results presented in Table 3.21 and Figure 3.21.

When considering the average NO_x concentration across all modelled receptors, road traffic accounts for 42.3µg/m^3 (69.6%) of total NO_x concentration (60.8µg/m^3). Of the 42.3µg/m^3 total road NO_x, Diesel Cars account for the greatest contribution (32.6%) of any of the vehicle types, followed by Diesel LGVs (21.4%) and HGVs (8.8%). The remaining vehicle source groups (Petrol LGVs, Alternative Fuel Cars and LGVs, HGVs, Bus and Coach, and Motorcycles) contribute less than 5.0% each.

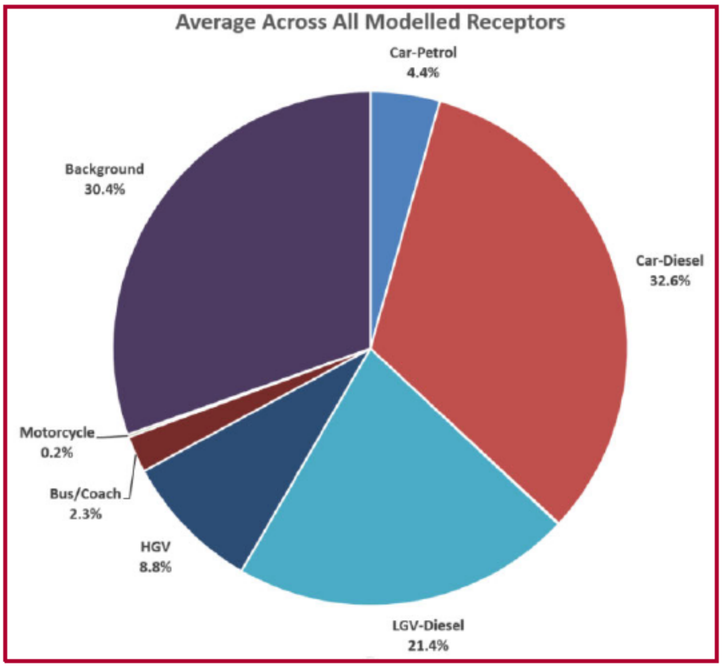
In terms of the average NO_x concentration at receptors with NO_2 concentration greater than 40µg/m^3, for the assessment of AQMA No.10 this removes 96 receptors from the analysis therefore the results are not affected significantly. Road traffic accounts for 76.2µg/m^3 (80.5%) of total NO_x concentration (94.6µg/m^3). Of the 76.2µg/m^3 total road NO_x the separate vehicle apportionment remain very similar, Diesel Cars (38.0%), Diesel LGVs (23.6%) and HGVs (10.7%) with the remaining vehicle source groups contributing less than 5.2% each.

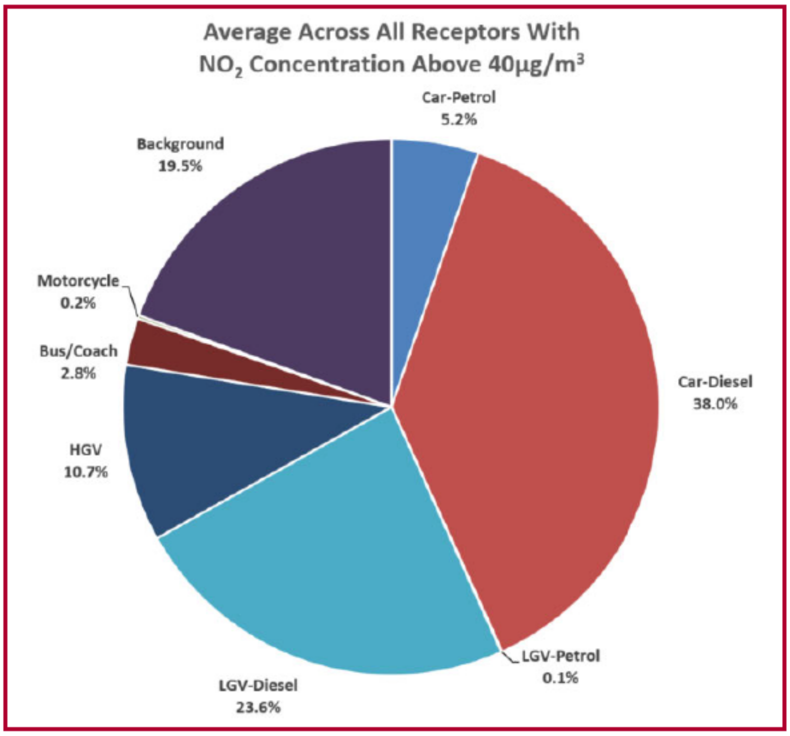
The receptor with the maximum road NO_x concentration is receptor ID 32, whereby the total road NO_x was predicted to be 127.6µg/m³. At receptor ID 268 road traffic accounts for 87.6% of total NO_x concentration (111.1µg/m³). Of the 111.1µg/m³ total road NO_x the separate vehicle apportionment remains similar to the previous assessments but with an increased apportionment to Diesel Cars; Diesel Cars (44.0%), Diesel LGVs (25.3%) and HGVs (10.4%). The apportionment to Petrol Cars also increased to 6.2%, with the remaining vehicle source groups contributing less than 5.0% each.

Table 3.21 – NO_x Source Apportionment Results: AQMA No.13

Results	All Vehicles	Car			LGV			HGV	Bus and Coach	Motorcycle	Background
		Petrol	Diesel	EV/LPG	Petrol	Diesel	EV/LPG				
Average across all modelled receptors											
NO_x Concentration (µg/m³)	42.3	2.7	19.8	0.0	0.0	13.0	0.0	5.3	1.4	0.1	18.5
Percentage of Total NO_x	69.6%	4.4%	32.6%	0.0%	0.0%	21.4%	0.0%	8.8%	2.3%	0.2%	30.4%
Percentage Contribution to Road NO_x	100.0%	6.3%	46.8%	0.0%	0.1%	30.7%	0.0%	12.6%	3.3%	0.2%	-
Average Across All Receptors With NO_2 Concentration exceeding the AQS Annual Mean Objective											
NO_x Concentration (µg/m³)	76.2	4.9	36.0	0.0	0.0	22.3	0.0	10.1	2.7	0.2	18.4
Percentage of Total NO_x	80.5%	5.2%	38.0%	0.0%	0.1%	23.6%	0.0%	10.7%	2.8%	0.2%	19.5%
Percentage Contribution to Road NO_x	100.0%	6.5%	47.2%	0.0%	0.1%	29.2%	0.0%	13.2%	3.5%	0.2%	-
At The Receptor With the Maximum Road NOx Concentration (ID 268)											
NO_x Concentration (µg/m³)	111.1	7.8	55.9	0.0	0.1	32.1	0.0	13.2	1.8	0.2	15.7
Percentage of Total NO_x	87.6%	6.2%	44.0%	0.0%	0.1%	25.3%	0.0%	10.4%	1.4%	0.2%	12.4%
Percentage Contribution to Road NO_x	100.0%	7.0%	50.3%	0.0%	0.1%	28.9%	0.0%	11.9%	1.6%	0.2%	-

Figure 3.21 – NO_x Source Apportionment Results: AQMA No.13




Average Across All Receptors With
NO2 Concentration Above 40µg/m3
Car-Petrol
5.2%
Car-Diesel
38.0%
LGV-Petrol
0.1%
LGV-Diesel
23.6%
HGV
10.7%
Bus/Coach
2.8%
Motorcycle
0.2%
Background
19.5%

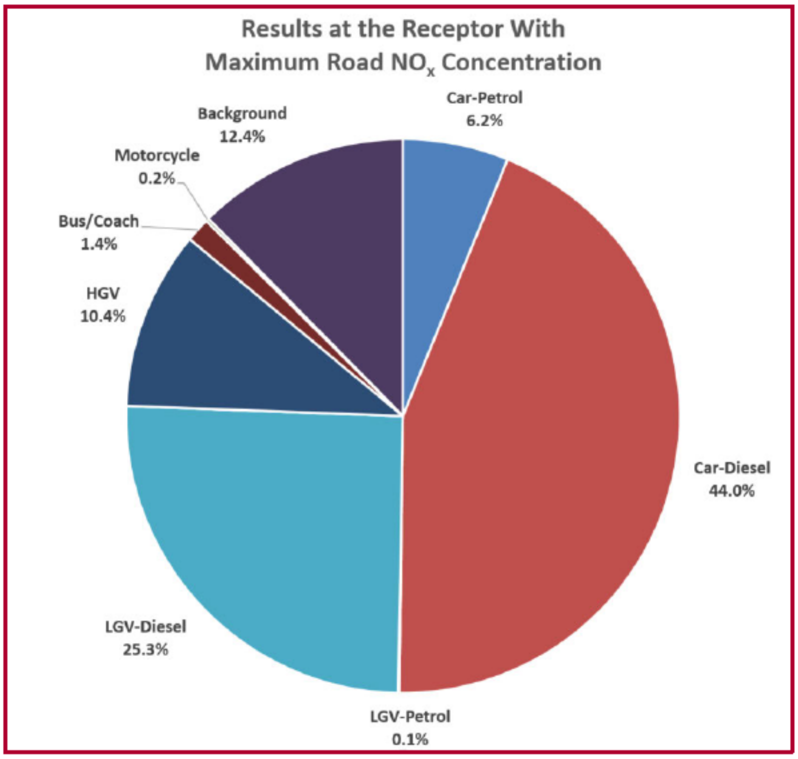

Results at the Receptor With
Maximum Road NOx Concentration
Car-Petrol
6.2%
Car-Diesel
44.0%
LGV-Petrol
0.1%
LGV-Diesel
25.3%
HGV
10.4%
Bus/Coach
1.4%
Motorcycle
0.2%
Background
12.4%

Figure 3.22 – Full Extent of AQMA No.13 with Relative Location of Other Images

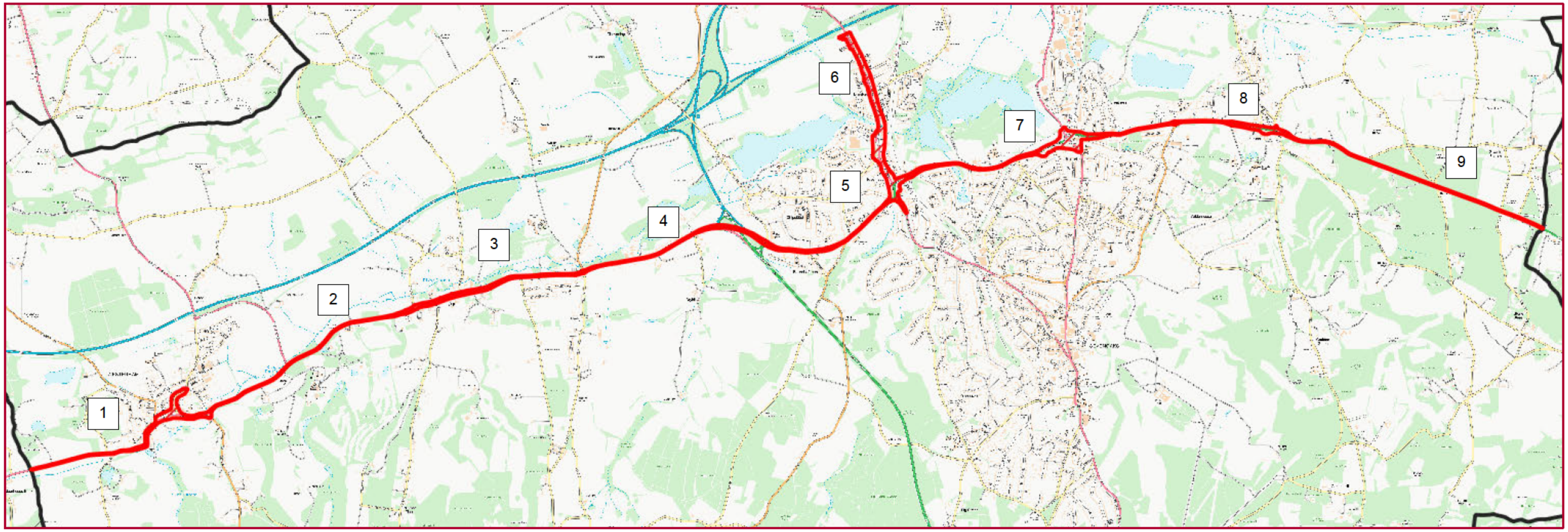
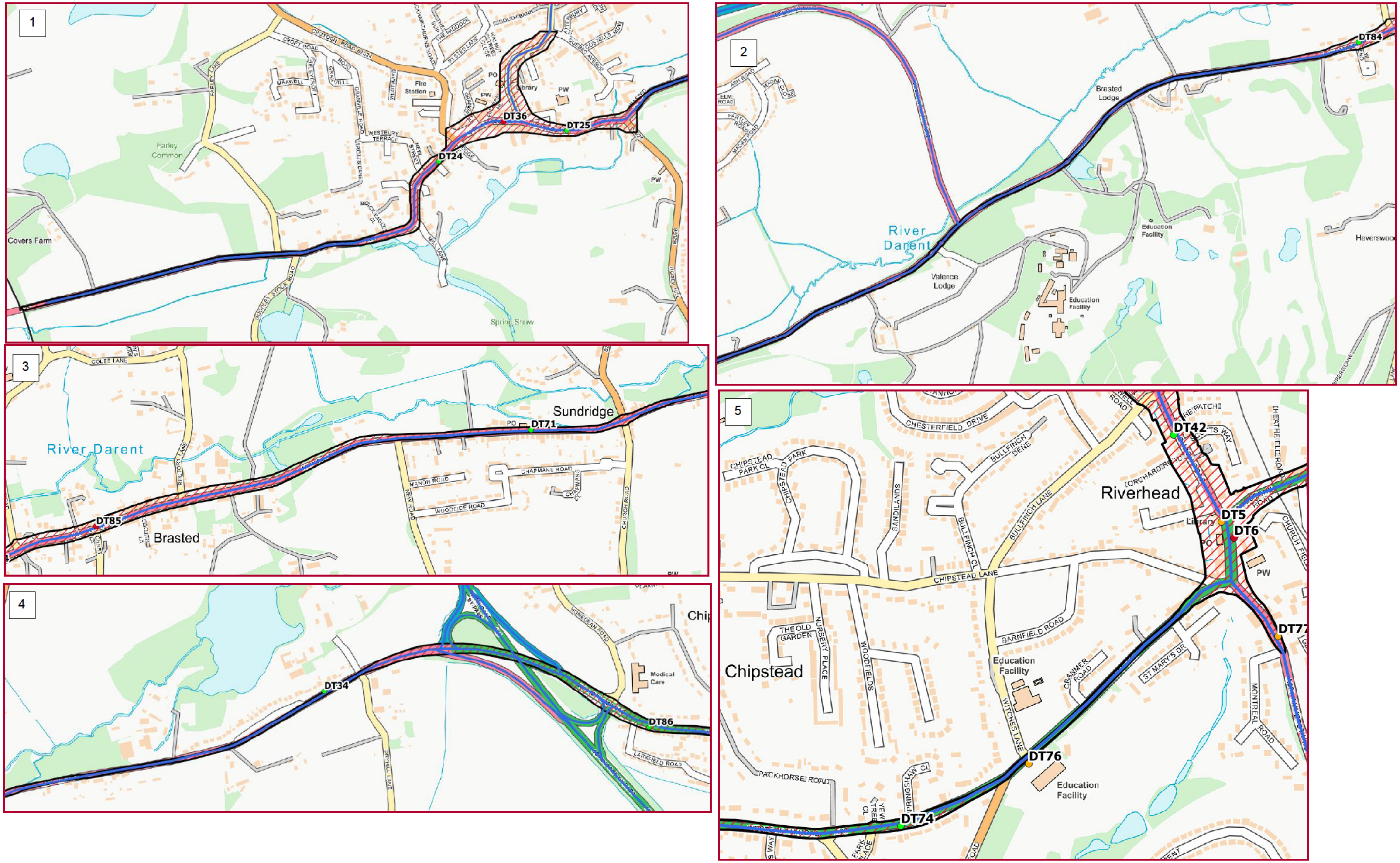


Figure 3.23 – AQMA No.13, Modelled Roads and Monitoring Locations (Continued Overleaf)



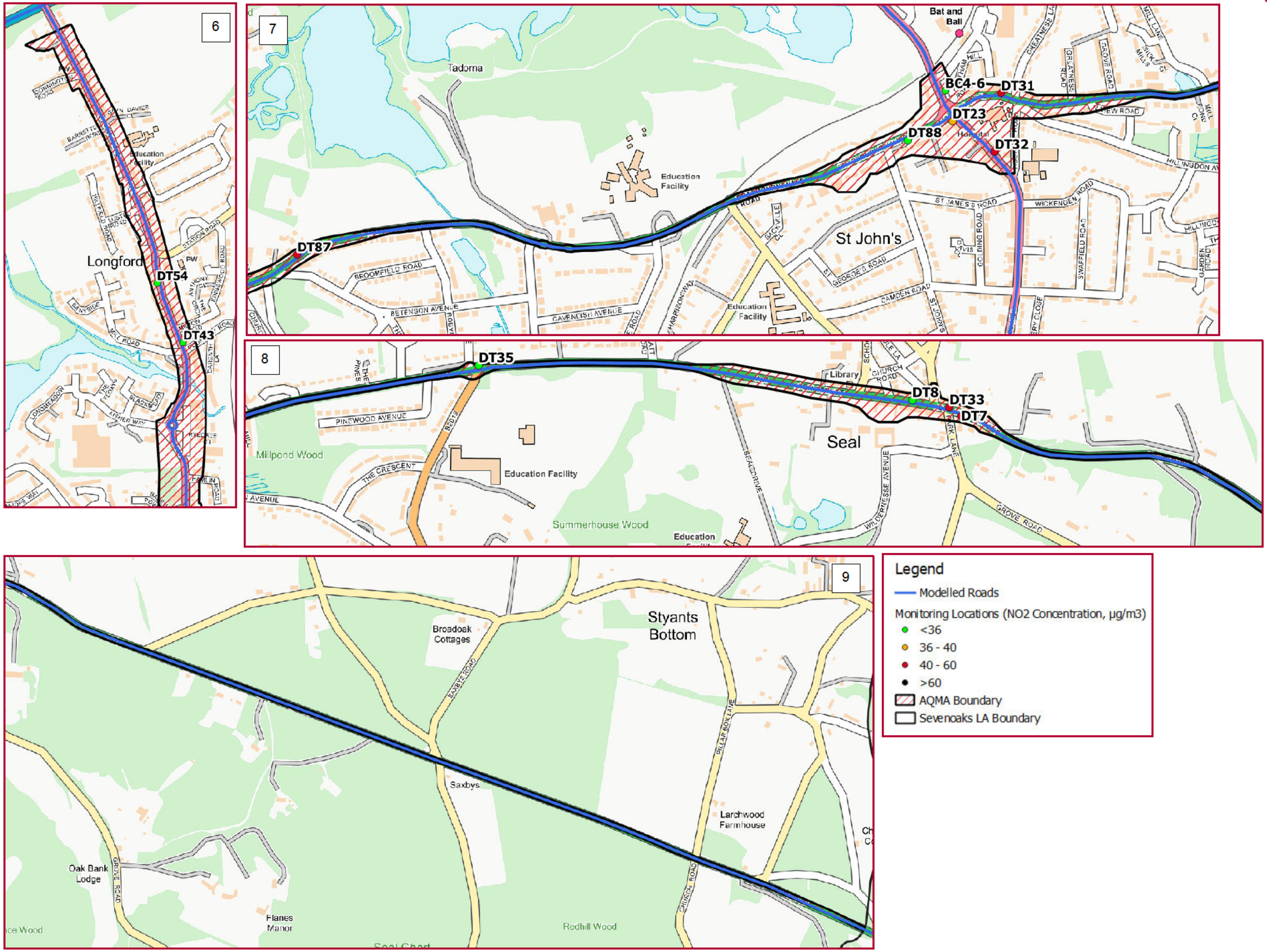
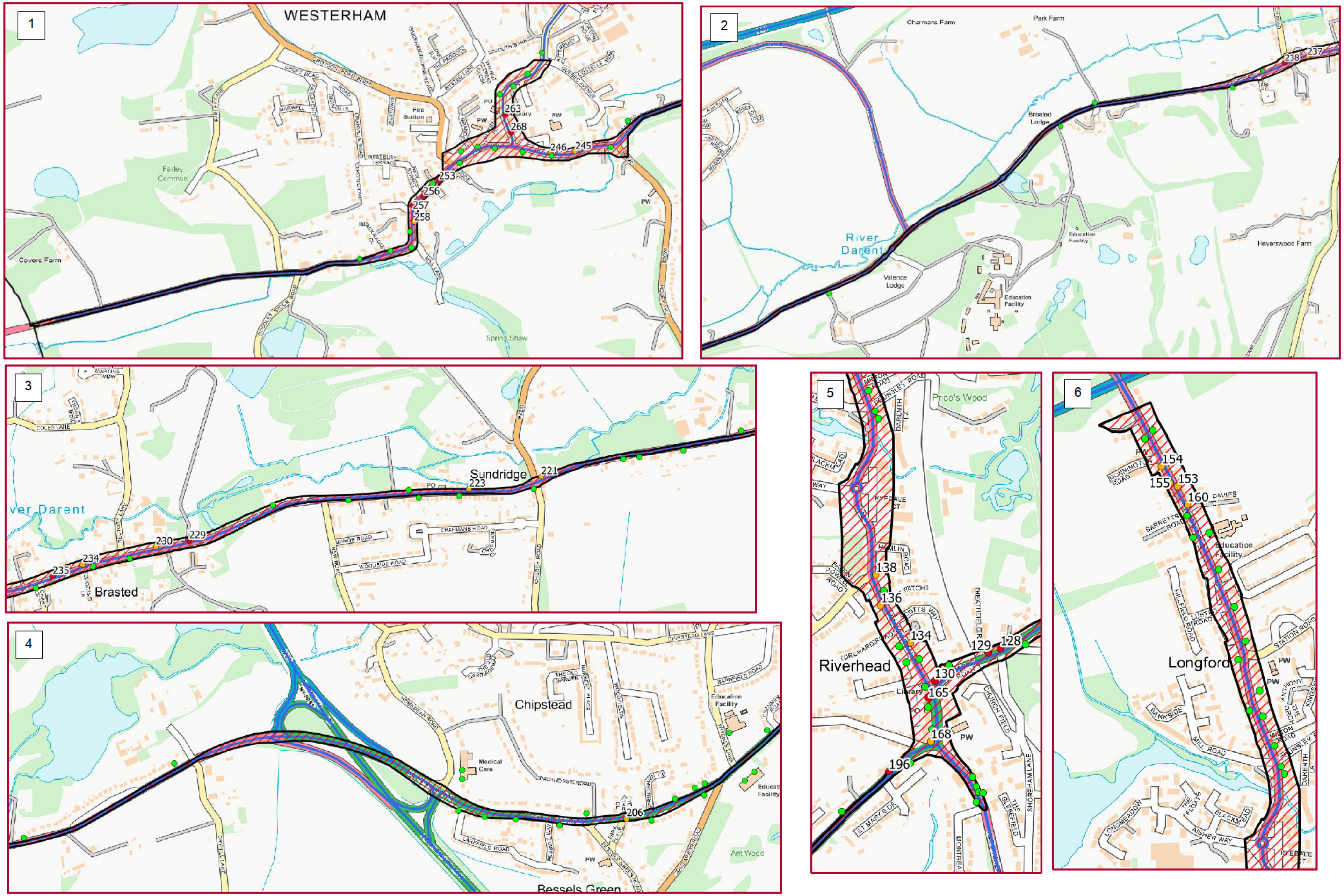

6
Longford
DT54
DT43
Education Facility
7
Tadorna
Bat and Ball
BC4-6
DT31
DT23
DT88
DT32
DT87
Education Facility
St John's
BROOMFIELD ROAD
CAVENDISH AVENUE
ST JAMES'S ROAD
ST GEORGE'S ROAD
CAMDEN ROAD
8
DT35
DT8
DT33
DT7
Library
Seal
PINEWOOD AVENUE
THE CRESCENT
Millpond Wood
Education Facility
Summerhouse Wood
GROVE ROAD
9
Styants Bottom
Broadoak Cottages
Saxbys
Larchwood Farmhouse
Oak Bank Lodge
Flanes Manor
Redhill Wood
Legend
Modelled Roads
Monitoring Locations (NO2 Concentration, µg/m3)
<36
36 - 40
40 - 60
>60
AQMA Boundary
Sevenoaks LA Boundary

Figure 3.24 – AQMA No.13, Modelled Receptor Locations (Continued Overleaf)



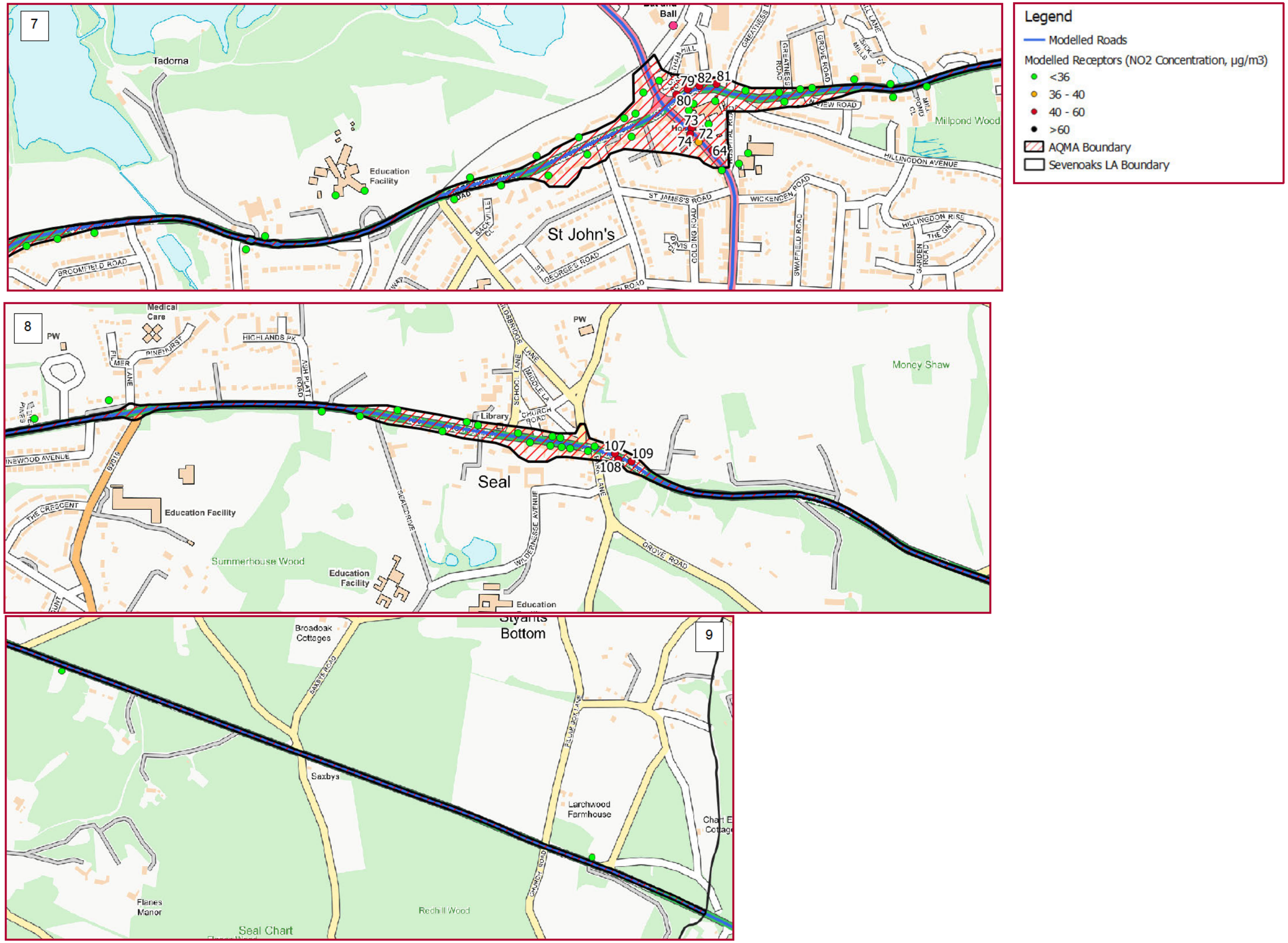
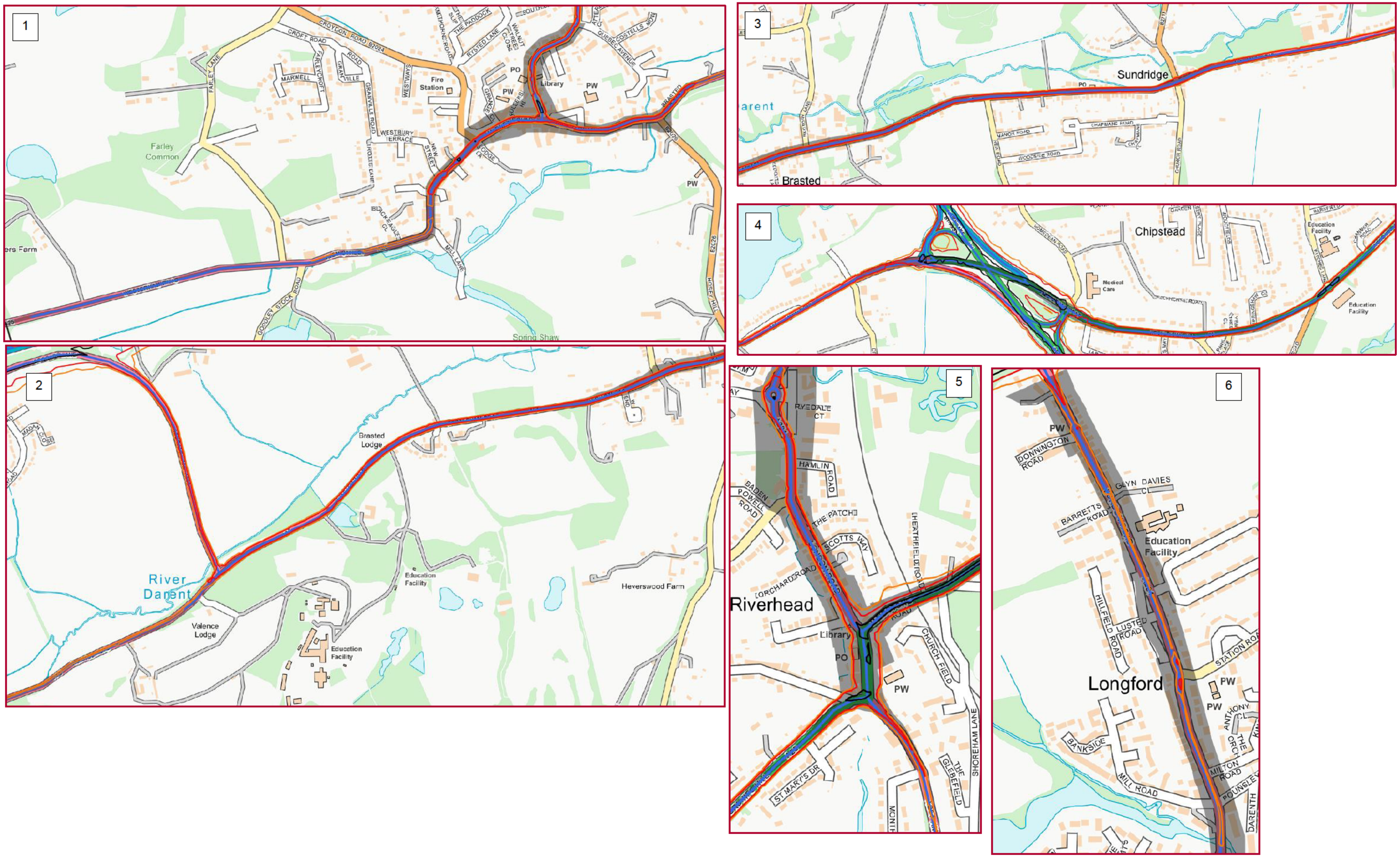
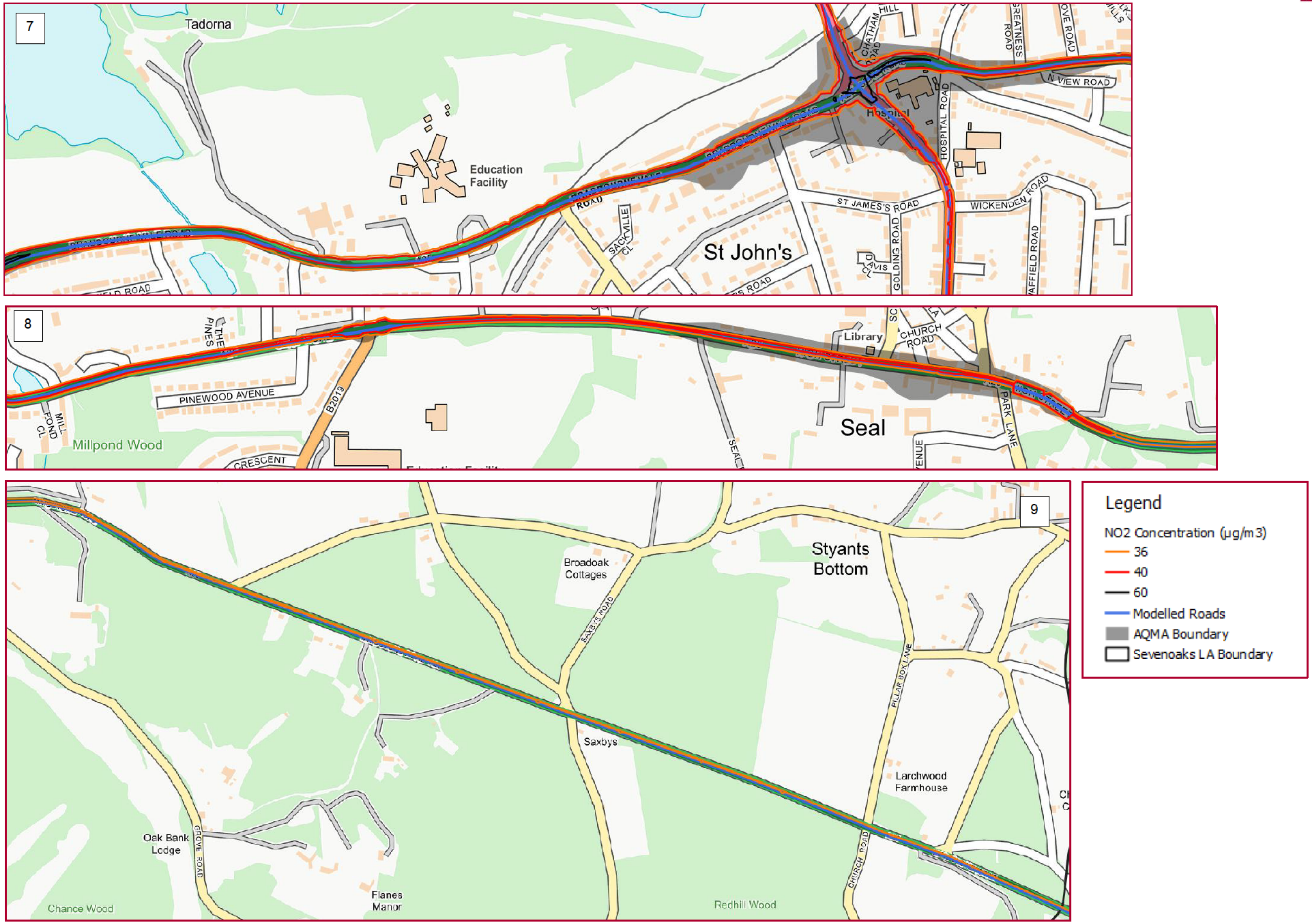

Legend
Modelled Roads
Modelled Receptors (NO2 Concentration, µg/m3)
<36
36 - 40
40 - 60
>60
AQMA Boundary
Sevenoaks LA Boundary
7
Tadorna
Education Facility
Millpond Wood
St John's
ST JAMES'S ROAD
WICKENDEN ROAD
HILLINGDON AVENUE
HILLINGDON RISE
BROOMFIELD ROAD
GOLDING ROAD
SWAFFIELD ROAD
GREATNESS ROAD
GROVE ROAD
79
82
81
80
73
72
74
64
8
Medical Care
PW
HIGHLANDS PK
PINEHURST
Library
CHURCH ROAD
SCHOOL LANE
Seal
Money Shaw
Education Facility
Summerhouse Wood
THE CRESCENT
GROVE ROAD
WILDERNESSE AVENUE
107
108
109
9
Broadoak Cottages
Styants Bottom
Saxbys
Larchwood Farmhouse
Fenes Manor
Redhill Wood
Seal Chart

Figure 3.25 – AQMA No.13 Modelled NO_2 Concentration Isopleths (Continued Overleaf)




7
Tadorna
Education Facility
Hospital
HOSPITAL ROAD
ST JAMES'S ROAD
WICKENDEN ROAD
GOLDING'S ROAD
St John's
8
PINEWOOD AVENUE
B2019
Millpond Wood
Library
CHURCH ROAD
Seal
PARK LANE
9
Broadoak Cottages
SAXBYS ROAD
Styants Bottom
PILLAR BOX LANE
Saxbys
Larchwood Farmhouse
CHURCH ROAD
Oak Bank Lodge
GROVE ROAD
Flanes Manor
Chance Wood
Redhill Wood
Legend
NO2 Concentration (µg/m3)
36
40
60
Modelled Roads
AQMA Boundary
Sevenoaks LA Boundary

3.8 Outside Existing AQMAs

3.8.1 Council Monitoring Data

There are 10 additional NO_2 monitoring sites that are located outside of the seven declared AQMAs assessed in this report. The locations of these monitoring sites are presented in Figure 3.26, and results for the previous five years are detailed in Table 3.22. The maximum concentration recorded in 2018 was 39.0µg/m^3 at the monitoring site of DT51, which has recorded the highest annual mean concentration for all monitoring located outside of the current AQMAs.

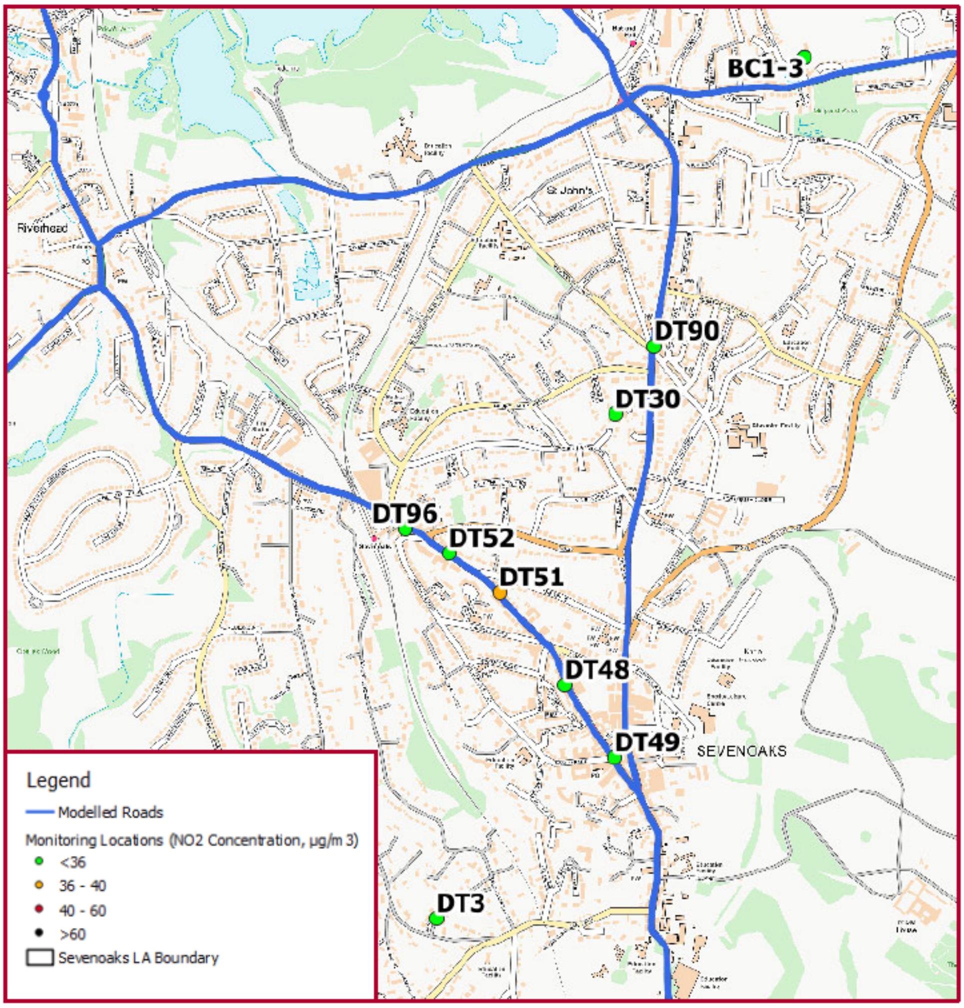
In 2018, no sites reported an annual mean NO_2 concentration in excess of the annual mean objective. Only two exceedances have been reported in the previous 5 years, which were at sites DT48 and DT51 in 2017 and 2016 respectively. Despite a concentration within 10% of the objective being recorded at DT51, this site is not located at a location of relevant exposure.

Table 3.22 – Current NO_2 Monitoring Within, or in Close Proximity to AQMA No.13

Site	Site Type	OS Grid Ref X	OS Grid Ref Y	Distance to Relevant Exposure (m)	Height (m)	Annual Mean NO_2 Concentration (µg/m^3)[1]				
						2014	2015	2016	2017	2018
DT3	UB	552467	154167	N/A	2	12.3	10.8	12.7	11.1	11.8
DT30	R	553019	155692	7	2.5	35.1	32.2	*36.1*	32.4	35.1
DT48	R	552863	154873	0.1	2	32.6	25.6	27.7	**40.7**	23.9
DT49	R	553018	154654	0.1	2	34.9	30.4	33.7	28.2	29.1
DT51	K	552662	155153	3	2.5	*39.2*	*36.1*	**40.4**	35.1	*39.0*
DT52	R	552506	155272	6	2.5	*39.6*	*37.9*	*38.3*	33.1	34.0
DT90	R	553140	155898	4	2.5	35.3	32.4	*36.9*	31.5	34.5
DT96	R	552371	155345	1.8	2.5	-	-	-	-	34.5
BC1-3	UB	553603	156774	N/A	2	*	*	*	15.7	13.9
CM1	UB	553603	156774	N/A	1.8	17	17	17	16	15

In **bold**, exceedance of the annual mean NO_2 AQS objective of 40µg/m^3.
When **underlined**, NO_2 annual mean exceeds 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective
R= Roadside
K= Kerbside
UB= Urban Background
*= Site not clearly listed in previous ASRs

Figure 3.26 –Modelled Roads and Monitoring Locations Outside Existing AQMAs



3.8.2 Modelled Receptors, Annual Mean NO_2

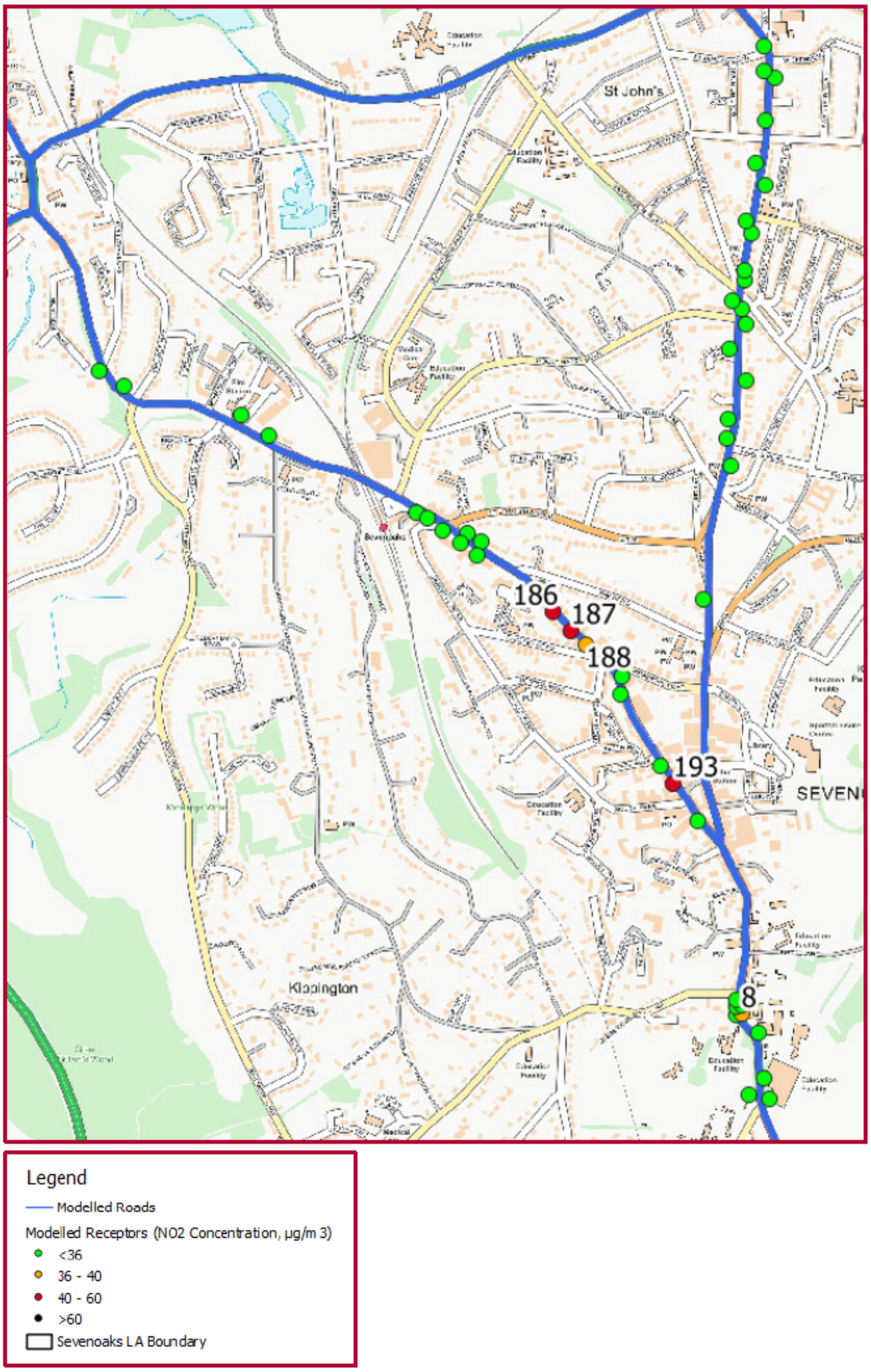
Table 3.23 shows the modelled annual mean NO_2 concentrations predicted at existing residential receptor locations outside of the existing AQMAs which are predicted to be exceeding, or near to exceeding, for 2018. The full summary of receptor locations outside all AQMAs is presented in Table D.2 Of the 62 modelled receptor locations, exceedances of the annual mean NO_2 objective have been predicted at three of the modelled receptor locations, with an additional two modelled receptor locations having a predicted concentration within 10% of the AQS objective.

Figure 3.27 presents the modelled receptor locations in reference to their predicted annual mean NO_2 concentrations. From this it can be seen that the three predicted exceedances are located along the A224 London Road/Tubs Hill in Sevenoaks. Receptor ID 193 is located above a commercial unit, with a modelled height of 4m, and it is unclear whether this location is used for residential purposes, therefore may not be at relevant exposure. Additionally, receptor IDs 186 and 187 are located along an area which is relatively narrow with buildings on either side. In this area, there is an additional receptor (ID 188) which has predicted a concentration within 10% of the AQS objective. This receptor was modelled at 4m height as it would be above the commercial units; however it is unclear if these spaces are used for residential purposes. Receptor ID 8 also has a predicted concentration within 10% of the AQS objective, and is located just outside of AQMA No.10 in a similar street canyon setting.

Table 3.23 – Outside AQMAs, Summary of Exceeding and Near Exceeding Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
8	553139	154142	1.5	40	*37.1*	*92.7*
186	552683	155113	1.5	40	**41.3**	**103.2**
187	552727	155067	1.5	40	**41.1**	**102.8**
188	552764	155033	4	40	*38.7*	*96.8*
193	552974	154698	4	40	**42.6**	**106.5**

Figure 3.27 –Modelled Receptor Locations Outside Existing AQMAs



4 Conclusions and Recommendations

Following the completion of the analysis of both monitoring data and modelled concentrations across the assessed areas, including the seven designated AQMAs where traffic data is available, a number of recommendations have been made in terms of the current designations of the AQMAs within Sevenoaks.

4.1 AQMA No.1 M20

AQMA No.1 is currently designated for exceedances of the annual mean NO_2, with two monitoring locations located within and nearby to the AQMA using NO_2 diffusion tubes. There has continued to be exceedances of the NO_2 annual mean objective at DT26, however this site is located close to the A20, an additional road source. When distance corrected to the nearest relevant exposure as per LAQM.TG(16), this site has a predicted concentration well below the AQS objective. Discrete receptor locations have predicted concentrations below the AQS objective at relevant receptor locations within and in close proximity to the AQMA. Due to the low number of monitoring locations, it is recommended that monitoring is undertaken further eastwards at points of relevant exposure to understand the influence in other areas. If no exceedances are monitored at these locations then the AQMA could be considered for revocation.

The M20 is a Highways England controlled road and therefore the measures to be developed would have to be a collaboration between the Council and Highways England. From the source apportionment completed, road traffic sources account for less than 50% of the NO_x and NO_2 concentrations, however Diesel Cars and Diesel LGVs have a significant contribution to the concentrations.

4.2 AQMA No.2 M25

AQMA No.2 is currently designated for exceedances of the annual mean NO_2 and monitoring is completed within, and close to the AQMA using NO_2 diffusion tubes. DT12, located in the southern section near Westerham, has reported exceedances for 4 years, with the concentration in 2018 being within 10% of the annual mean NO_2 exceedance value. Once distance corrected to a point of relevant exposure however, this site has been well below 40µg/m^3. All other monitoring locations within or in close proximity to the AQMA have continually reported concentrations below 40µg/m^3 for the past 5 years. The modelling results show that at relevant points of exposure, most sites have a predicted concentration well below the AQS objective, however one receptor (ID 301) predicts a concentration in exceedance of this.

It is recommended that additional monitoring is carried out near the roundabout of London Road in Westerham, close to the residential properties where receptor ID 301 is located in order to verify whether there are exceedances here. Additionally, further monitoring should be carried out through the section of the M25 between junction 5 and 6, near to any residential properties, such as along the A224 and B2211, due to a lack of monitoring in these areas. If these sites show no exceedances, the AQMA could be considered for revocation, or at least reduced in size to focus on the exceedance area.

The M25 is a Highways England controlled road and therefore the measures to be developed would have to be a collaboration between the Council and Highways England. From the source apportionment completed, Diesel Cars, Diesel LGVs and HGVs have a significant contribution to the NO_x and NO_2 concentrations.

4.3 AQMA No.3 M26

AQMA No.3 is currently designated for exceedances of the annual mean NO_2, however no monitoring is completed within or close to the AQMA. The modelling results predict that there are no concentrations greater than 40µg/m^3, however one location (receptor ID 161) reports a concentration within 10% of the AQS objective. This receptor is located at a residential property, on the northern side of the A224 London Road flyover.

It is recommended that monitoring is carried out close to relevant exposure near the A224 London Road flyover to determine the annual concentrations in these areas as the model has predicted a concentration to be within 10% of the annual mean NO_2 objective. If there are no exceedances monitored then the AQMA could be considered for revocation.

The M26 is a Highways England controlled road and therefore the measures to be developed would have to be a collaboration between the Council and Highways England. From the source apportionment completed, Diesel Cars, Diesel LGVs and HGVs have a significant contribution to the NO_x and NO_2 concentrations.

4.4 AQMA No.4 A20(T)

AQMA No.4 is currently designated for exceedances of the annual mean NO_2, however no monitoring is completed within or close to the AQMA. The modelling results predict that there are no concentrations greater than 40µg/m^3, nor any within 10% of the AQS objective.

It is recommended that monitoring is carried out close to relevant exposure along this stretch, primarily near to residential properties close to the A20 on Phillip Avenue/Ladds Way/Cyclamen Road, as the 36µg/m^3 contour comes into contact with these properties. If no exceedances are reported, revoking the AQMA could be considered.

The A20 is a Highways England controlled road and therefore the measures to be developed would have to be a collaboration between the Council and Highways England. From the source apportionment completed, Diesel Cars, Diesel LGVs have a significant contribution to the NO_x and NO_2 concentrations.

4.5 AQMA No.6 M25 (PM_{10})

AQMA No.6 is currently designated for exceedances of the 24-hour mean PM_{10}, however no monitoring is completed within or close to the AQMA. From estimations through calculations of the annual PM_{10} concentrations, it is estimated that there will be 4 daily concentrations greater than 50µg/m^3. The modelling results therefore predict that there are no receptors which are likely to be exposed to concentrations greater than 50µg/m^3 any more than 35 times in a year. As a result of this, the AQMA could potentially be revoked.

The M25 is a Highways England controlled road and therefore the measures to be developed would have to be a collaboration between the Council and Highways England.

4.6 AQMA No.10 Sevenoaks High Street

AQMA No.10 is currently designated for exceedances of the annual mean NO_2 concentration, with four monitoring locations located within the AQMA using NO_2 diffusion tubes. There has continued to be exceedances of the NO_2 annual mean objective at DT2 over the past 5 years, DT28 has shown exceedances for 3 years with the past 2 years being within 10% of the AQS objective, and DT27 has also continued to remain within 10% of the AQS objective. Once distance corrected, DT2 continues to report concentrations greater than 40µg/m^3. The model has also predicted an area of concentration greater than 60µg/m^3 along the narrow section of the High Street near Bank Street.

It is recommended that the AQMA remains in place, with additional monitoring being carried out in the narrow section of the High Street where receptor ID 32 is located in order to verify whether there are annual mean NO_2 concentrations greater than 60µg/m^3, as this would indicate exceedances of the hourly NO_2 objective. If this is the case, then the AQMA should be amended to include the hourly NO_2 objective. Furthermore, the model has shown exceeding concentrations to be located along the A224 at receptor ID 193, from where the High Street splits off to just past the junction to Lime Tree Walk. Although monitoring at DT49 shows no exceedances, it could be considered that AQMA No.10 is extended along here, especially if residential properties are located above the commercial units as receptor ID 193 has a predicted exceedance at a first floor level.

From the source apportionment completed, road traffic sources account for over 75% of the NO_x and NO_2 concentrations, with Diesel Cars having the most significant contribution to the concentrations, followed by diesel LGVs. It is therefore recommended that any measures to improve air quality in this area largely focuses on reducing the emissions from diesel cars.

4.7 AQMA No.13 A25

AQMA No.13 is currently designated for exceedances of the annual mean NO_2 concentration, with 8 monitoring locations with a reporting an exceedance in 2018, 7 of which have reported exceedances for the past 5 years.

Once distance corrected, 3 sites, DT31, DT32 and DT85, continue to report concentrations in excess of 40µg/m^3 at the nearest relevant receptor.

Both the 40µg/m^3 and 36µg/m^3 contours don't extend as far west along the A25 High Street from Westerham as the current boundary, nor do the 40µg/m^3 contour extend east along the A25 from Seal. Therefore, the AQMA could be reduced in these areas, and additional monitoring can be used to support this.

On the other hand, one receptor outside the AQMA boundary (receptor ID 196) was predicted to be exceeding. This is located just west along the A25 from the Riverhead junction. Therefore, it may be worthwhile considering extending the AQMA slightly west along the northern side of the A25 from the Riverhead junction. In some areas, such as the stretch of the A25 between Westerham and Brasted, Sundridge and the junction to the A21, and between the junction to the A21 and Riverhead, the exceedance contours extend beyond the AQMA, however neither the receptors or monitoring data here predict exceedances.

The model has predicted areas of concentrations greater than 60µg/m^3, located along part of London Road coming from the junction to the A25 Market Square in Westerham, along the junction to the A21, near to the junction to Witches Lane, as well as along areas of the Riverhead junction and the Bat & Ball Junction. Many of these contours lie within the middle of the road, or in areas where there is no relevant exposure. Monitoring is already carried out at the Bat & Ball junction, and near to the junction to Witches Lane, however none is carried out along London Road from the A25 Market Square in Westerham, or near to the southern roundabout in Riverhead. It is therefore advisable that monitoring is carried out here to verify whether there are annual mean concentrations in excess of 60µg/m^3. Annual mean NO_2 concentrations greater than 60µg/m^3 indicate that there are exceedances of the hourly NO_2 objective. If monitoring identifies annual concentrations greater than 60µg/m^3 here, the AQMA should be updated to include this objective, or an additional smaller AQMA should be declared in the area.

From the source apportionment completed, road traffic sources account for over 50% of the NO_x and NO_2 concentrations, and at the maximum and at exceeding receptors, this is over 75%. Diesel cars and diesel LGVs have the most significant contributions, however HGVs also have a important contribution. It is therefore recommended that any measures to improve air quality within this AQMA are largely focused on reducing emissions from diesel cars, diesel LGVs, and HGVs. Additionally, most of the areas of exceedances are at junctions, therefore measures should also focus on reducing congestion and improving traffic flow in these areas.

4.8 Outside of Existing AQMAs

In addition to the assessment of NO_2 within the existing AQMAs, monitored and modelled concentrations of annual mean NO_2 have been assessed outside of the AQMAs. Currently there are no monitoring locations recording an annual mean NO_2 concentrations in exceedance of the annual mean objective at a location of relevant exposure. There were three modelled receptor locations that were predicted to exceed the annual mean objective, and an additional two receptors were predicted to be within 10% of the objective.

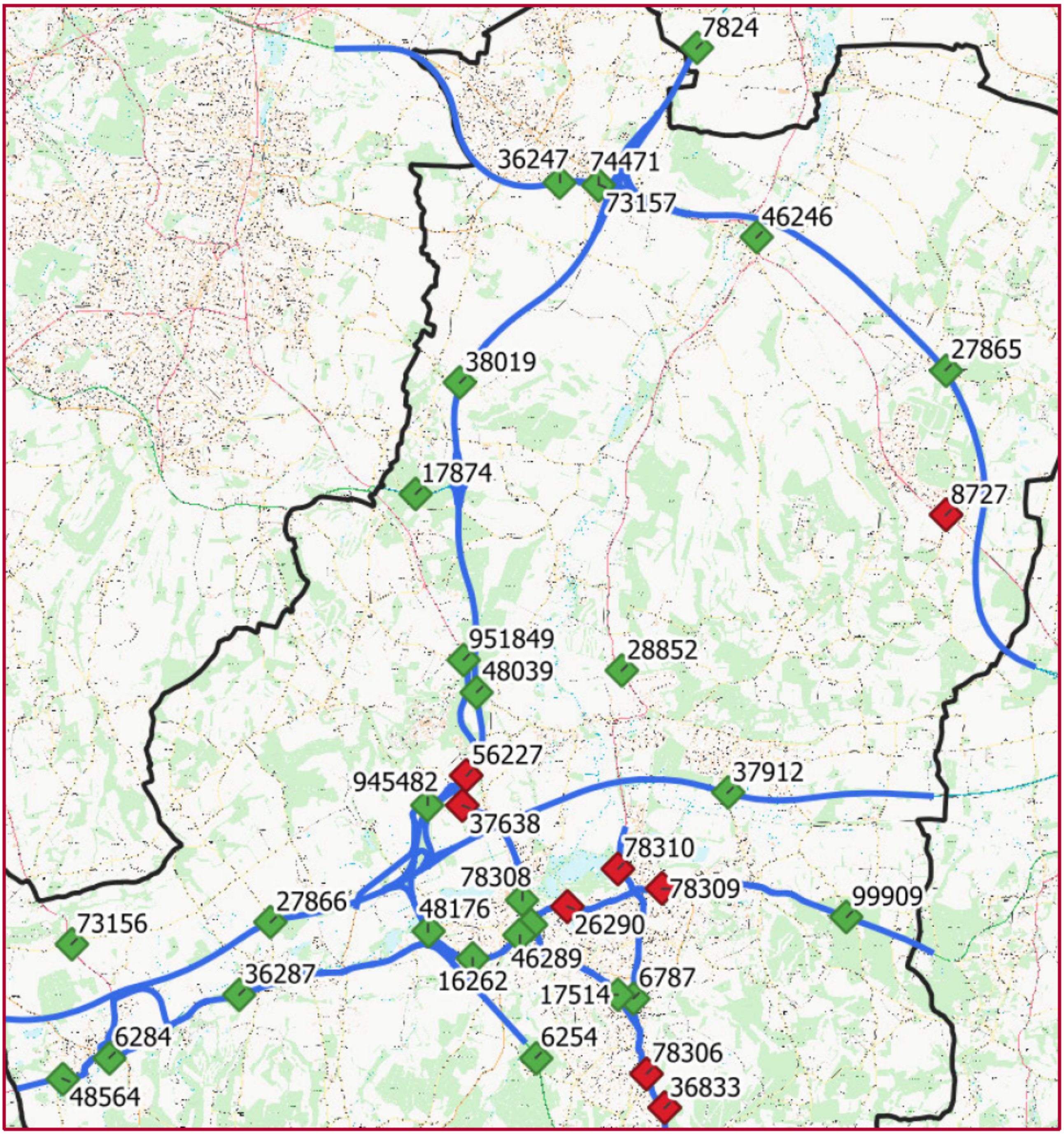
Based upon the review of the current monitoring network outside of existing AQMAs, and the modelling completed it is recommended that monitoring location DT51 is moved further south along the road, between receptor ID 186 and 187 to ascertain the NO_2 concentration within this area along the A224. DT51 is currently located further north along this stretch and has reported concentrations within 10% of the AQS annual mean NO_2 objective, however due to recent developments the area may become more congested towards the junction. If an exceedance is detected, AQMA 10 could be extended to cover this area.

The exceedance predicted at receptor ID 193 has been discussed above in section 4.6, and there are no other receptors located outside an existing AQMA that have predicted exceedances in areas which have been modelled.

Appendices

Appendix A – Traffic Data

Figure A.1 – DfT Count Point Locations



Legend

DfT Traffic Count Locations

- Estimates or manual counts within 3 years
- Estimates or manual counts over 3 years
- Modelled Roads
- Sevenoaks LA Boundary

Table A.1 – DfT Traffic Data

Source ID	Description	2018 Traffic Flow (AADT)	% Car	% LGV	% HGV	% Bus/ Coach	% Motorcycle
6787	Estimated using previous year's AADF on this link	14528	88.4	9.2	1.0	0.8	0.6
99909	Estimated using previous year's AADF on this link	15057	82.2	12.8	3.4	0.4	1.2
78309*	Estimated using previous year's AADF on this link	12849	78.6	15.8	4.1	0.5	1.0
26290*	Estimated using previous year's AADF on this link	16258	80.3	14.7	4.2	0.3	0.5
74797	Manual count	21291	84.5	12.1	2.4	0.6	0.5
46289	Estimated using previous year's AADF on this link	18513	81.9	14.0	3.2	0.4	0.6
16262	Manual count	17752	81.3	14.7	3.3	0.4	0.4
36287	Estimated using previous year's AADF on this link	15554	77.5	17.8	3.1	0.4	1.2
6284	Manual count	10706	80.3	14.3	3.1	0.9	1.4
48564	Estimated using previous year's AADF on this link	10107	83.3	13.1	2.7	0.2	0.7
78308	Estimated using previous year's AADF on this link	18689	87.6	9.7	1.4	0.8	0.6
37912	Automatic counter	48494	65.3	19.5	14.2	0.6	0.4
27866	Estimated using previous year's AADF on this link	129011	70.1	18.3	10.9	0.2	0.4
48039	Automatic counter	107739	71.5	18.9	9.0	0.2	0.4
38019	Automatic counter	118889	71.5	19.2	8.6	0.2	0.5
73157	Estimated from nearby links	43511	75.3	18.9	4.1	0.3	1.4
74471	Estimated using previous year's AADF on this link	28472	75.3	18.9	4.1	0.3	1.4
27865	Manual count	57855	68.4	17.7	12.7	0.3	0.9
36247	Automatic counter	54390	75.3	18.9	4.1	0.3	1.4
945482	Manual count	5220	84.9	12.6	1.3	0.0	1.1
56227*	Estimated using previous year's AADF on this link	12839	82.2	14.8	1.9	0.2	1.0
48176	Manual count	55018	74.6	18.8	5.9	0.2	0.5
78310*	Estimated using previous year's AADF on this link	15213	83.3	13.1	2.7	0.4	0.5
6254	Manual count	49823	77.8	16.6	4.7	0.3	0.6
37638*	Estimated using previous year's AADF on this link	8816	80.9	14.3	3.5	0.5	0.8
17874	Manual count	36805	76.2	18.3	4.7	0.2	0.5

Source ID	Description	2018 Traffic Flow (AADT)	% Car	% LGV	% HGV	% Bus/ Coach	% Motorcycle
7824	Estimated using previous year's AADF on this link	115104	69.8	16.9	12.4	0.3	0.6
46246	Estimated using previous year's AADF on this link	22321	80.5	15.4	1.9	0.3	1.9
73156	Estimated using previous year's AADF on this link	10027	80.6	16.6	1.7	0.4	0.7
78306*	Estimated using previous year's AADF on this link	12468	85.9	11.3	1.6	0.7	0.5
36833*	Estimated using previous year's AADF on this link	11713	84.9	12.4	1.6	0.5	0.6
17514	Estimated using previous year's AADF on this link	12058	90.0	7.7	0.9	0.7	0.7
951849	Manual count	1247	82.2	13.4	2.3	0.9	1.1
8727*	Estimated using previous year's AADF on this link	8871	69.5	23.7	4.4	0.6	1.8
28852	Estimated using previous year's AADF on this link	6970	84.5	13.5	0.9	0.2	0.8

Notes:
* = Estimates based on manual counts conducted more than 3 years ago

Appendix B – Verification

Table B.1 – Details of All Passive NO2 Monitoring Locations within Sevenoaks District Council

Site ID	X Coordinate	Y Coordinate	Site Type	Height (m)
DT2	553156	154409	Roadside	2
DT27	553139	154259	Roadside	2.5
DT28	553045	154889	Kerbside	2.5
DT48	552867	154858	Roadside	2
DT49	553018	154654	Roadside	2
DT51	552662	155153	Kerbside	2.5
DT52	552506	155272	Roadside	2.5
DT77	551529	155967	Roadside	2.5
DT87	551640	156335	Roadside	2.5
DT88	552963	156583	Roadside	2.5
DT90	553140	155898	Roadside	2.5
DT23	553050	156625	Roadside	2.5
DT30	553019	156692	Roadside	2.5
DT31	553165	156686	Roadside	2.5
DT32	553146	156563	Roadside	2.5
DT5	551414	156194	Kerbside	2.5
DT6	551442	156158	Roadside	2.5
DT42	551315	156380	Roadside	2.5
DT76	551020	155711	Roadside	2.5
DT7	555096	156692	Roadside	2.5
DT8	554992	156727	Roadside	2.5
DT33	555068	156711	Roadside	2
DT34	549427	155691	Roadside	2.5
DT35	554092	156797	Roadside	2.5
DT43	551279	156864	Roadside	2.5
DT54	551225	156974	Roadside	2.5
DT74	550768	155583	Roadside	2.5
DT86	550318	155593	Roadside	2
DT71	548238	155355	Roadside	2.5
DT12	546816	155851	Roadside	2
DT84	546801	155000	Roadside	2.5
DT85	547095	155099	Roadside	2.5
DT24	544416	153916	Roadside	2.5
DT25	544770	154000	Roadside	2.5
DT36	544602	154024	kerbside	2.5
DT13	552504	167700	Roadside	2.5
DT14	553108	167869	Roadside	2.5
DT81	553416	167615	Urban	2.5
DT26	554219	167254	Roadside	2
DT96	552371	155345	Roadside	2.5

Table B.2 – Initial Model Wide Verification

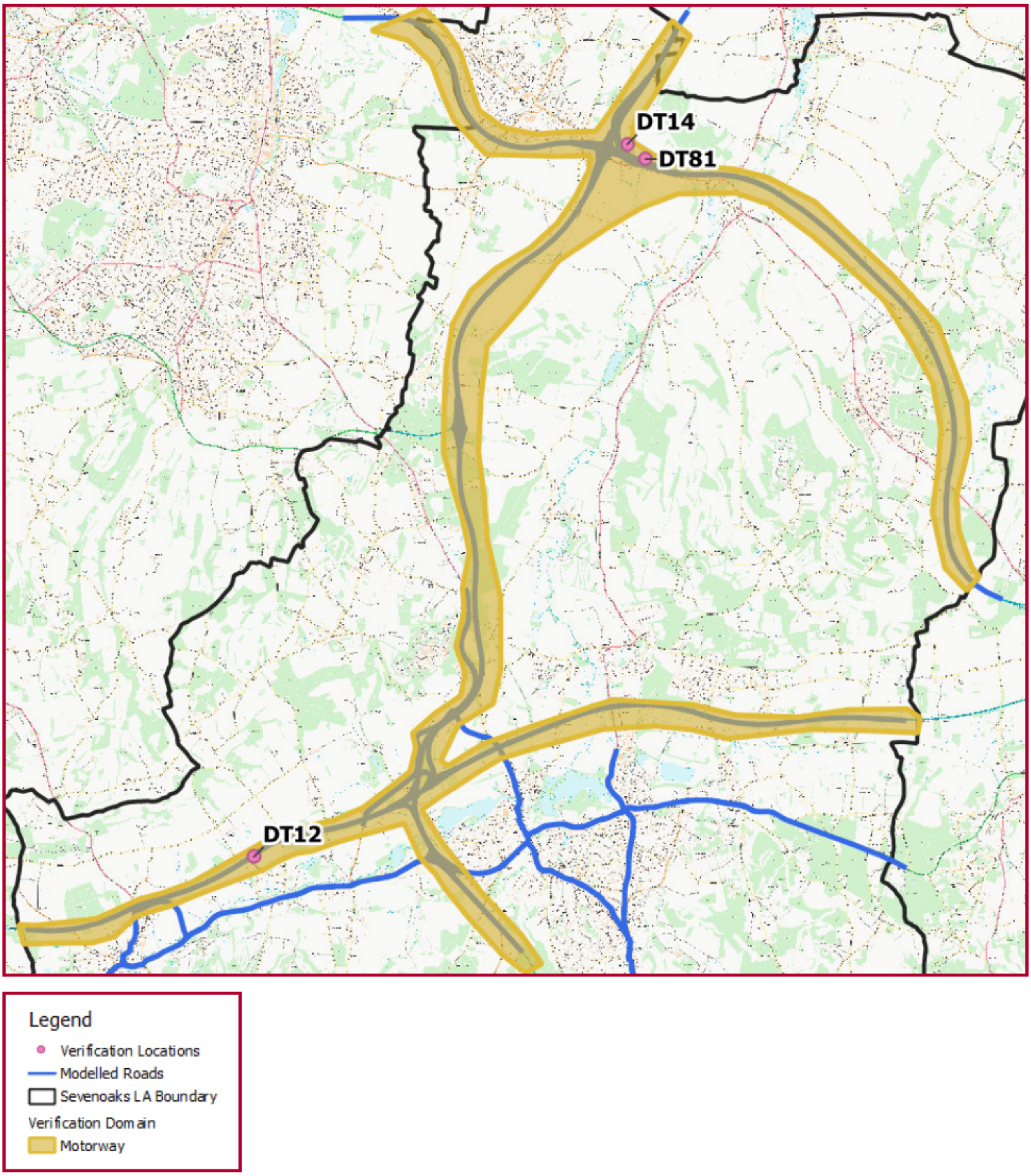
Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x ($\mu g/m^3$)	Adjusted modelled total NO_x (including background NO_x) ($\mu g/m^3$)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) ($\mu g/m^3$)	Monitored total NO_2 ($\mu g/m^3$)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT2	3.13	2.610	70.22	86.91	44.54	49.89	-10.72
DT27	3.67		37.96	54.66	30.93	37.70	-17.96
DT28	2.78		48.11	64.81	35.42	36.80	-3.75
DT48	3.56		16.82	33.51	20.89	23.90	-12.61
DT49	2.72		32.64	49.33	28.49	29.12	-2.16

DT51	3.08		45.98	64.34	35.48	39.02	-9.07
DT52	4.68		23.76	42.12	25.33	34.02	-25.55
DT77	4.54		30.64	49.10	28.67	38.71	-25.93
DT90	3.40		33.77	51.92	29.91	34.48	-13.25
DT32	3.12		71.56	90.99	46.62	51.91	-10.20
DT96	5.91		19.29	37.64	23.15	34.48	-32.86
DT87	3.66		51.09	70.96	38.58	46.96	-17.84
DT88	3.11		28.28	47.18	27.82	30.32	-8.25
DT23	3.66		37.89	57.33	32.55	39.16	-16.88
DT30	3.65		31.25	50.69	29.52	35.13	-15.96
DT31	4.31		50.48	69.91	38.04	51.11	-25.57
DT5	3.05		45.13	65.00	36.02	39.29	-8.33
DT6	2.89		52.81	72.68	39.30	41.67	-5.69
DT42	3.34		32.51	52.38	30.38	34.50	-11.95
DT76	3.44		38.95	57.41	32.47	37.86	-14.24
DT7	2.28		72.45	88.24	44.92	41.29	8.78
DT8	2.86		29.38	46.09	27.00	28.33	-4.71
DT33	4.66		34.37	50.16	28.75	40.50	-29.02
DT34	2.06		35.20	51.72	29.61	26.12	13.36
DT35	3.54		32.52	49.23	28.47	33.72	-15.57
DT43	3.27		22.62	42.49	25.73	28.46	-9.59
DT54	5.32		18.51	38.37	23.73	32.74	-27.51
DT74	4.07		31.43	48.30	28.08	35.94	-21.87
DT86	3.59		33.57	50.44	29.07	34.71	-16.26
DT71	2.60		38.79	55.51	31.37	31.30	0.22
DT12	1.00		150.01	167.35	72.93	39.83	83.09
DT84	2.52		42.05	59.38	33.20	32.54	2.03
DT85	4.11		41.73	60.10	33.69	43.75	-22.99
DT24	3.21		40.86	56.56	31.66	35.81	-11.58
DT25	1.97		31.18	50.88	29.65	26.07	13.72
DT36	4.67		30.74	50.43	29.45	40.13	-26.61
DT13	2.34		40.69	61.70	34.70	32.85	5.62
DT14	1.75		33.92	56.82	32.80	27.62	18.75
DT81	1.66		39.08	61.98	35.11	28.62	22.69
DT26	7.84		19.52	41.07	25.24	42.66	-40.83

Motorway Verification

The motorway verification factor includes diffusion tubes DT12, DT13, DT14, DT81, and DT26, as these were all located in close proximity to a motorway, and likely to be more representative of the pollutant emissions here as opposed to the other roadside locations. These are presented, alongside the verification domain, in Figure B.1. The results of this initial motorway verification is presented in Table B.3, and it can be seen that DT26 is significantly under predicting. This was due to this diffusion tube being located on a main road which has not been modelled, and was therefore removed from verification. This was also the case with DT13, which was also removed from further verification.

Figure B.1 – Motorway Verification Domain and Diffusion Tubes used for Verification



The results of the final motorway verification factor are presented in Table B.4 and Figure B.2. Although DT81 and DT14 are still under predicting, they are within the ±25% acceptance level. Alongside this, the RMSE for this verification is 3.6µg/m^3, and the R^2 value is 1, indicating that this finalised motorway verification is performing accurately. It is important to note that the R^2 value is influenced by the number of data points used to produce a line, and in this case, there are only 3. The verification factor used for any receptors located near to a motorway within the boundary of Sevenoaks District Council is 1.075.

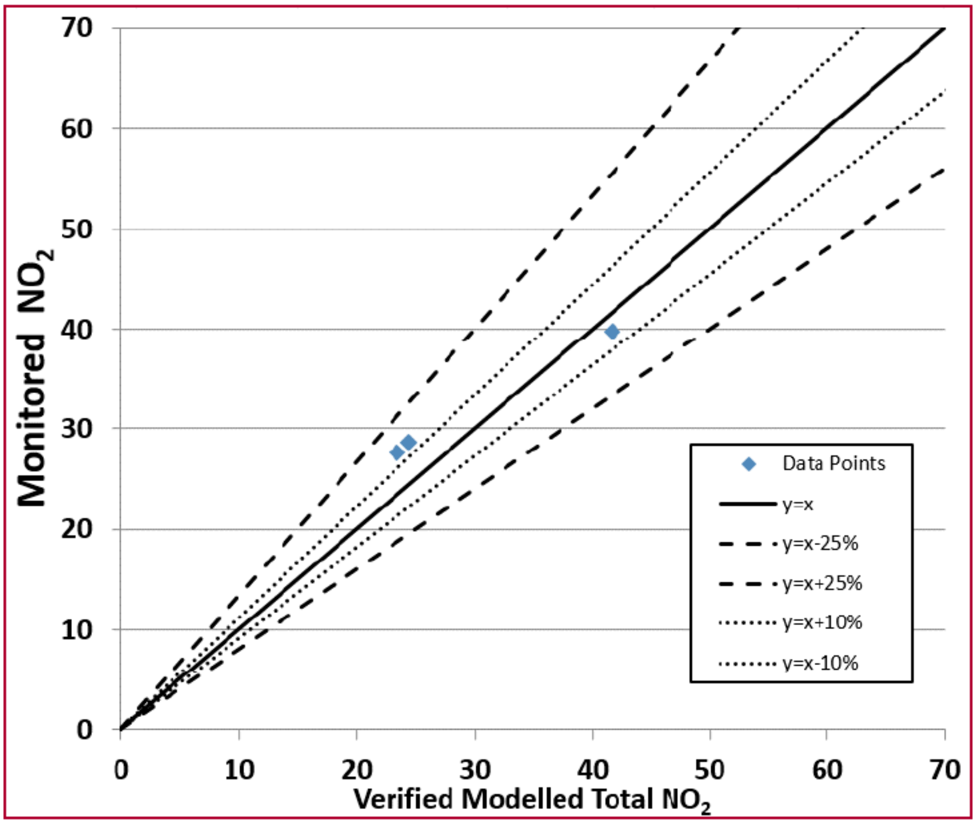
Table B.3 – Initial Motorway Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT81	1.66	1.247	18.67	41.57	25.64	28.62	-10.40
DT14	1.75		16.21	39.10	24.43	27.62	-11.55
DT12	1.00		71.68	89.01	45.53	39.83	14.30
DT13	2.34		19.44	40.46	24.85	32.85	-24.36
DT26	7.84		9.33	30.88	20.16	42.66	-52.74

Table B.4 – Final Motorway Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT81	1.66	1.075	16.10	39.00	24.38	28.62	-14.80
DT14	1.75		13.97	36.87	23.33	27.62	-15.53
DT12	1.00		61.80	79.13	41.59	39.83	4.41

Figure B.2 – Final Motorway Adjusted Verification Monitored NO_2 Concentrations vs. Verified Modelled NO_2



Model Wide (Excluding Motorway and Westerham) Area Verification

Following the removal of the diffusion tubes located near the motorway, verification was carried out with the remaining 35 sites. The results of this are presented in Table B.5, and for the majority of sites the model is now performing better than it was previously. Despite this, three sites, DT7, DT34 and DT25 were over predicting NO_2 concentrations by more than 25%, and one site, DT96, was under predicting by more than 25%. DT33 and DT85 were under predicting due to located near un-modelled roads. There was however no clear reason why the model was over or under predicting at the other locations, and the model was unable to be adjusted further. Sites DT25 and DT36 (which was also under predicting, but by less than 25%) are located within Westerham, whilst the other monitoring sites are located outside of Westerham. It was therefore decided that a separate verification for the Westerham Area would be required.

Table B.5 – Model Wide Verification (Excluding Motorway)

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT2	3.13	3.258	87.66	104.36	51.21	49.89	2.65
DT27	3.67		47.39	64.09	35.11	37.70	-6.87
DT28	2.78		60.06	76.76	40.46	36.80	9.95
DT48	3.56		21.00	37.69	22.96	23.90	-3.95
DT49	2.72		40.75	57.44	32.18	29.12	10.51
DT51	3.08		57.40	75.76	40.32	39.02	3.34
DT52	4.68		29.67	48.02	28.13	34.02	-17.32
DT77	4.54		38.25	56.71	32.15	38.71	-16.94
DT90	3.40		42.16	60.31	33.69	34.48	-2.29
DT32	3.12		89.33	108.76	53.34	51.91	2.75
DT87	3.66		63.79	83.66	43.81	46.96	-6.71
DT88	3.11		35.31	54.20	31.07	30.32	2.47
DT23	3.66		47.31	66.74	36.69	39.16	-6.31
DT30	3.65		39.02	58.45	33.05	35.13	-5.91
DT31	4.31		63.02	82.46	43.23	51.11	-15.41
DT5	3.05		56.34	76.21	40.78	39.29	3.78
DT6	2.89		65.93	85.80	44.67	41.67	7.19
DT42	3.34		40.58	60.45	34.03	34.50	-1.37
DT76	3.44		48.63	67.09	36.71	37.86	-3.04
DT7	2.28		90.45	106.24	51.76	41.29	25.35
DT8	2.86		36.67	53.38	30.37	28.33	7.19
DT34	2.06		43.95	60.46	33.54	26.12	28.41
DT35	3.54		40.60	57.31	32.15	33.72	-4.66
DT43	3.27		28.24	48.10	28.40	28.46	-0.20
DT54	5.32		23.10	42.97	25.96	32.74	-20.70
DT74	4.07		39.23	56.10	31.65	35.94	-11.94
DT86	3.59		41.91	58.78	32.85	34.71	-5.37
DT71	2.60		48.42	65.15	35.62	31.30	13.80
DT84	2.52		52.49	69.82	37.72	32.54	15.92
DT85	4.11		52.10	70.47	38.18	43.75	-12.72
DT24	3.21		51.01	66.71	36.10	35.81	0.82

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT36	4.67		38.37	58.07	32.93	40.13	-17.93
DT25	1.97		38.93	58.62	33.17	26.07	27.22
DT33	4.66		42.91	58.70	32.62	40.50	-19.46
DT96	5.91		24.08	42.43	25.48	34.48	-26.10

The Model Wide (ex. Motorway and Westerham) verification was carried out using the remaining 32 monitoring sites throughout the Sevenoaks District. These can be seen, alongside the verification domain, in Figure B.4. The results of the verification are presented in Table B.6 and Figure B.4. For the majority of sites, the modelled NO_2 concentration is well within ±25% of the monitored NO_2 concentration, with the exception of DT7, DT34, and DT96. This may be a result of inaccuracies in the traffic data, or unknown/unmodelled influences. Despite this, all sites where exceedances have been monitored, have also been modelled as an exceedance, with the exception of DT85 and DT33. As discussed in the Westerham area verification, these two sites are located on directly opposite junctions, where a joining road has not been modelled.

The verification factor for the Model Wide area (ex. Motorway and Westerham) is 3.258, with an RMSE of 4.6µg/m³ and a R^2 value of 0.638. This verification factor shall be used for all remaining modelled receptors.

Figure B.3 – Model Wide (Excluding Motorway and Westerham) Verification Domain and Diffusion Tubes used for Verification

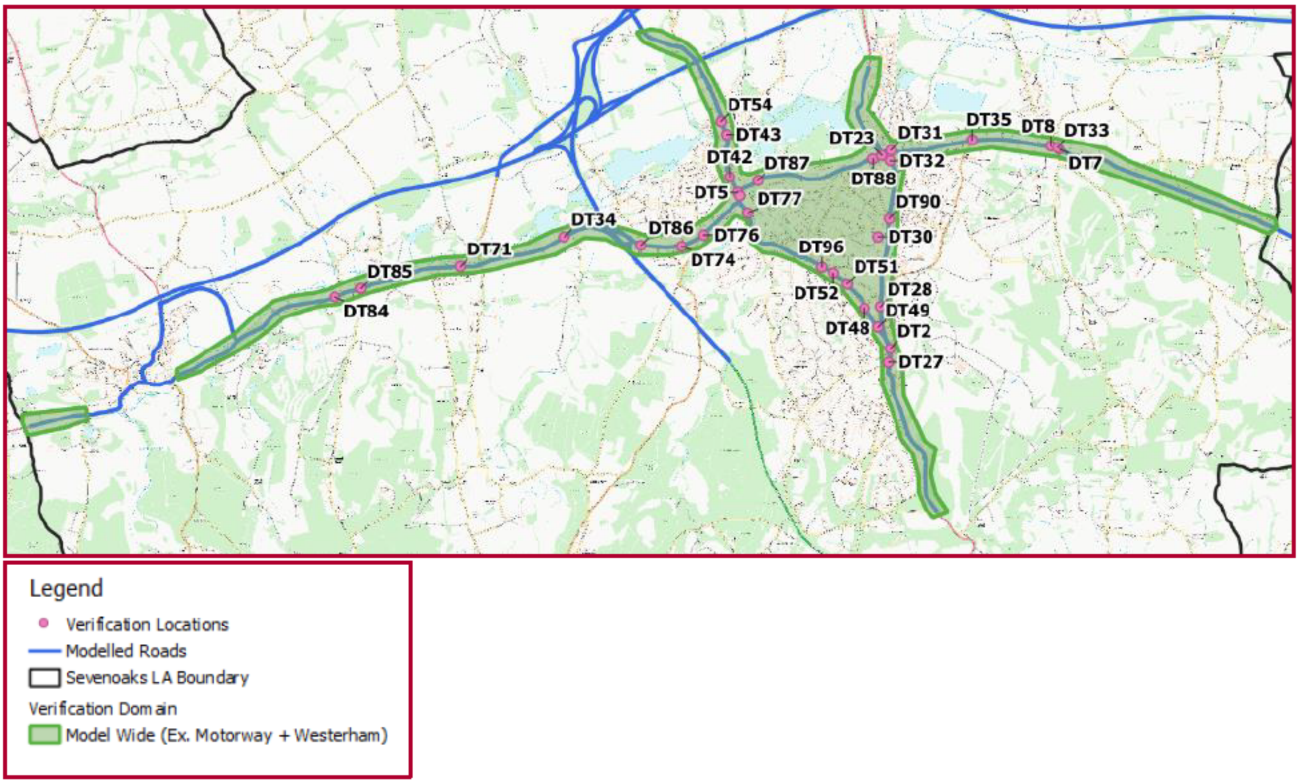
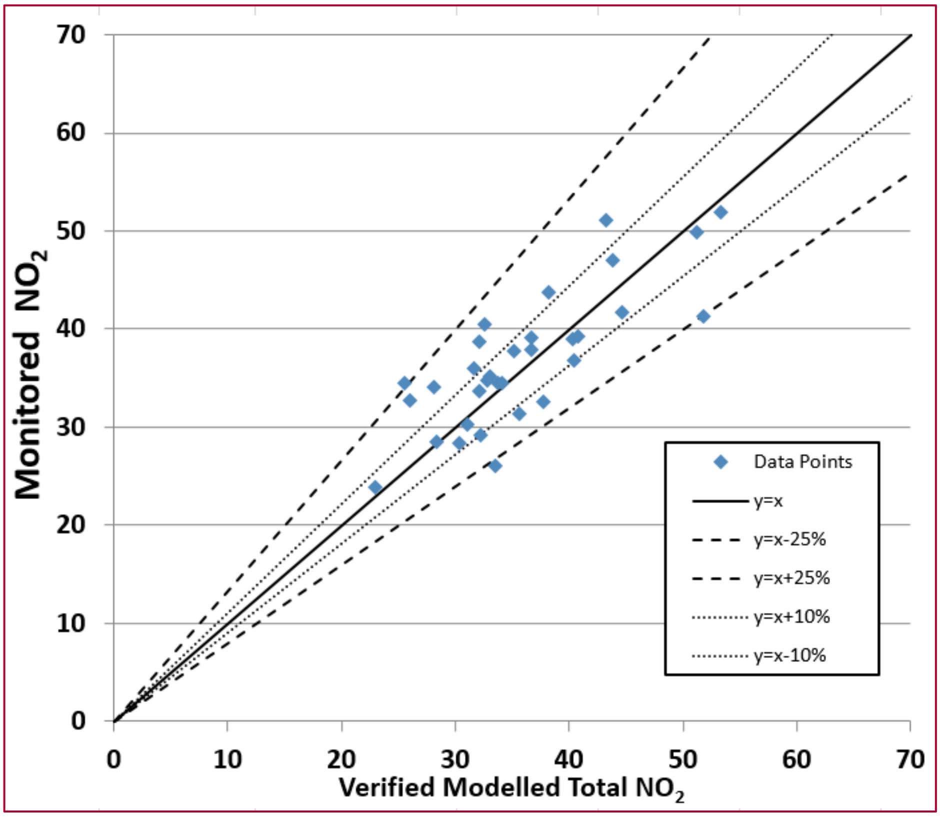


Table B.6 – Final Model Wide (Ex. Motorway and Westerham) Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT2	3.13	3.258	87.65	104.35	51.21	49.89	2.65
DT27	3.67		47.39	64.08	35.11	37.70	-6.87
DT28	2.78		60.06	76.75	40.45	36.80	9.92
DT48	3.56		20.99	37.69	22.96	23.90	-3.95
DT49	2.72		40.74	57.44	32.18	29.12	10.51
DT51	3.08		57.40	75.75	40.32	39.02	3.34
DT52	4.68		29.66	48.02	28.13	34.02	-17.32
DT77	4.54		38.24	56.70	32.15	38.71	-16.94
DT90	3.40		42.15	60.31	33.69	34.48	-2.29
DT32	3.12		89.32	108.76	53.34	51.91	2.75
DT87	3.66		63.78	83.65	43.81	46.96	-6.71
DT88	3.11		35.30	54.20	31.07	30.32	2.47
DT23	3.66		47.30	66.73	36.68	39.16	-6.33
DT30	3.65		39.01	58.45	33.05	35.13	-5.91
DT31	4.31		63.02	82.45	43.23	51.11	-15.41
DT5	3.05		56.34	76.21	40.77	39.29	3.75
DT6	2.89		65.93	85.79	44.67	41.67	7.19
DT42	3.34		40.58	60.45	34.03	34.50	-1.37
DT76	3.44		48.62	67.08	36.71	37.86	-3.04
DT7	2.28		90.44	106.23	51.75	41.29	25.32
DT8	2.86		36.67	53.38	30.37	28.33	7.19
DT34	2.06		43.95	60.46	33.54	26.12	28.41
DT35	3.54		40.60	57.31	32.14	33.72	-4.69
DT43	3.27		28.23	48.10	28.40	28.46	-0.20
DT54	5.32		23.10	42.97	25.96	32.74	-20.70
DT74	4.07		39.23	56.10	31.65	35.94	-11.94
DT86	3.59		41.91	58.78	32.85	34.71	-5.37
DT71	2.60		48.42	65.14	35.62	31.30	13.80
DT84	2.52		52.49	69.82	37.72	32.54	15.92
DT85	4.11		52.09	70.46	38.17	43.75	-12.75
DT33	4.66		42.90	58.69	32.61	40.50	-19.49
DT96	5.91		24.07	42.43	25.48	34.48	-26.10

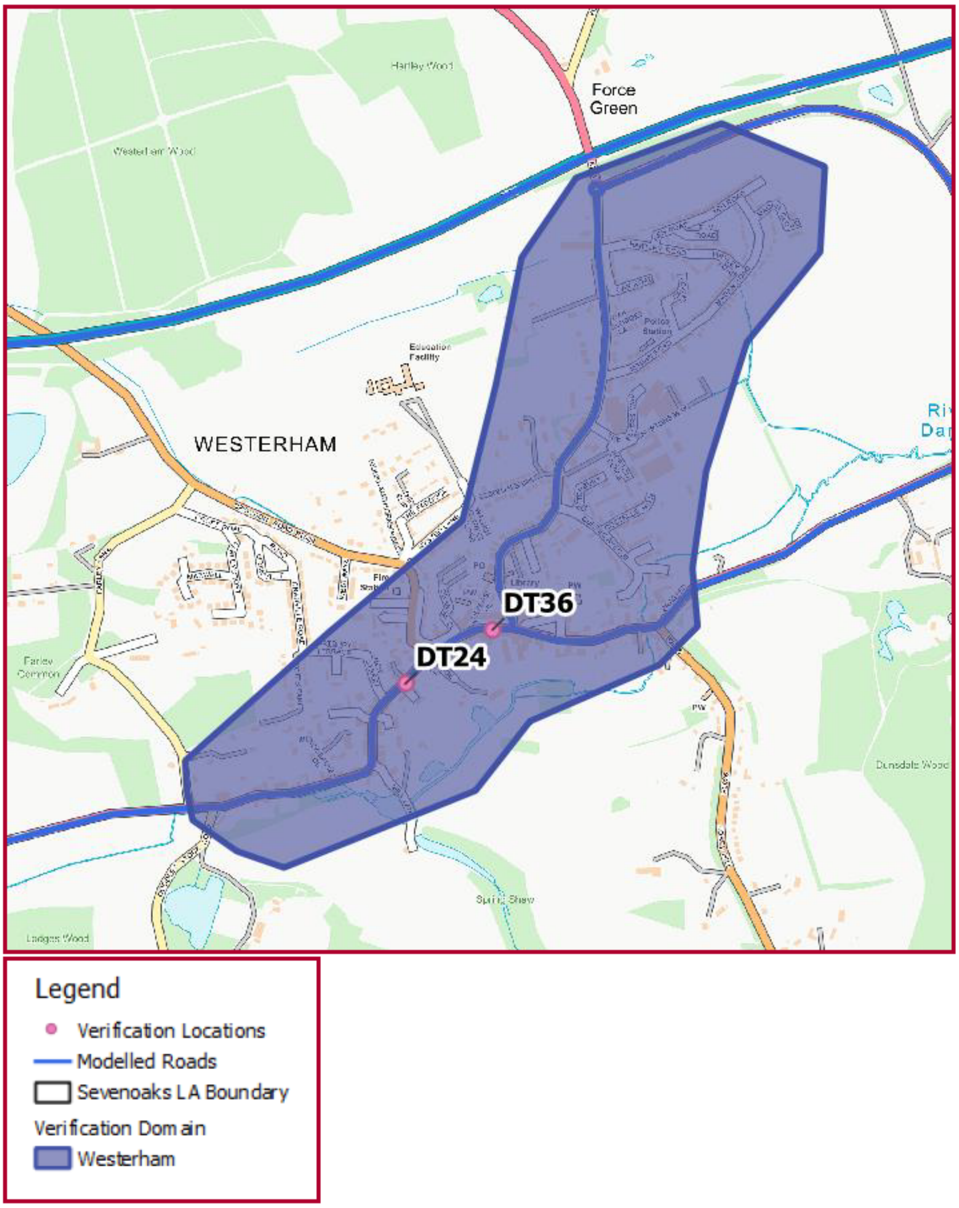
Figure B.4 – Final Model Wide (Ex. Motorway and Westerham) Adjusted Verification Monitored NO_2 Concentrations vs. Verified Modelled NO_2



Westerham Verification

Using the monitoring sites located within Westerham, DT36, DT24 and DT25, an initial verification was carried out. The verification domain and monitoring site locations can be seen in Figure B.5. The results of this is shown in Table B.7, and DT25 was significantly over predicting whilst DT36 continued to under predict. Upon further investigation, DT25 was found to be obscured by vegetation, which could impede the air flow around the tube. This would likely explain why the model is over predicting the concentration compared to the monitored concentration, and DT25 was therefore removed from the verification.

Figure B.5 – Westerham Verification Domain and Diffusion Tubes used for Verification



The final verification for the Westerham area is presented in Table B.8 and Figure B.6. Although DT36 is still under predicting, no further adjustments could be carried out to the model in this area. The under prediction is likely a result of a nearby bus stop and parking, neither of which could be modelled. This verification has an RMSE of 4.1µg/m^3, and an R^2 value of 1. The verification factor is 3.742, and shall be used for all receptors located in Westerham, south of the M25, east of Farley Lane, and west of the first bend in Brasted Road leaving Westerham (grid coordinates 545009, 154111).

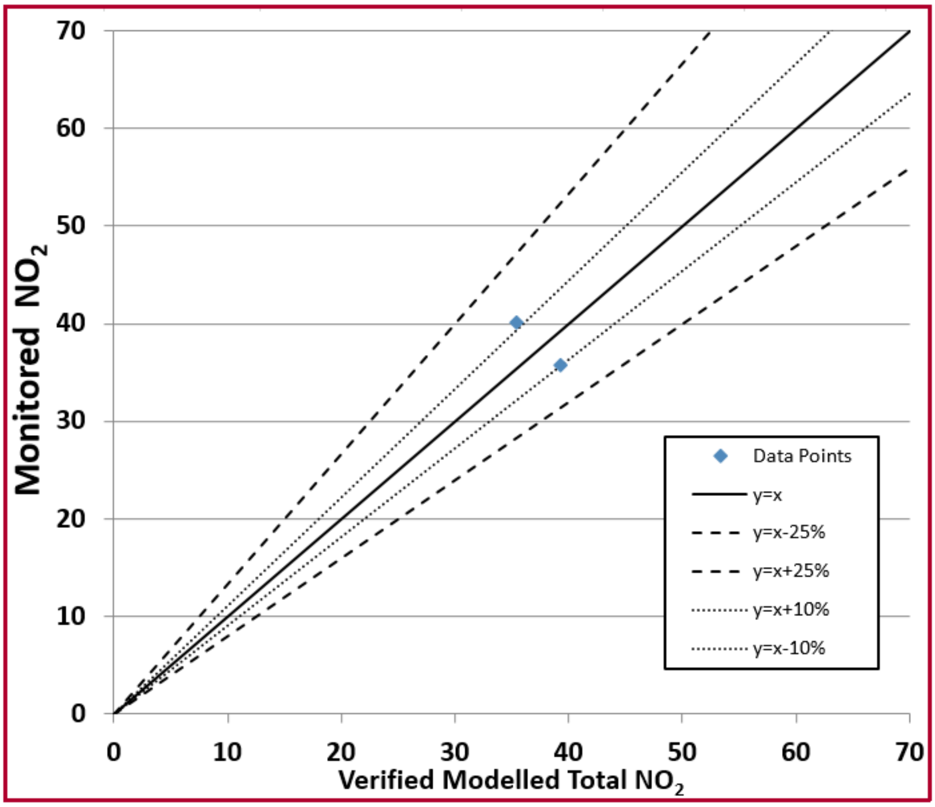
Table B.7 – Initial Westerham Area Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m^3)	Adjusted modelled total NO_x (including background NO_x) (µg/m^3)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m^3)	Monitored total NO_2 (µg/m^3)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT36	4.67	3.263	38.43	58.12	32.95	40.13	-17.89
DT24	3.21		51.08	66.78	36.13	35.81	0.90
DT25	1.97		38.98	58.68	33.20	26.07	27.33

Table B.8 – Final Westerham Area Verification

Site ID	Ratio of monitored road contribution NO_x / modelled road contribution NO_x	Adjustment factor for modelled road contribution NO_x	Adjusted modelled road contribution NO_x (µg/m³)	Adjusted modelled total NO_x (including background NO_x) (µg/m³)	Modelled total NO_2 (based upon empirical NO_x / NO_2 relationship) (µg/m³)	Monitored total NO_2 (µg/m³)	% Difference (adjusted modelled NO_2 vs. monitored NO_2)
DT36	4.67	3.742	44.07	63.77	35.45	40.13	-11.65
DT24	3.21		58.59	74.28	39.29	35.81	9.72

Figure B.6 – Final Westerham Area Adjusted Verification Monitored NO_2 Concentrations vs. Verified Modelled NO_2



Appendix C – Background Concentrations

Table C.1 – Background Concentrations in Sevenoaks

Grid Square (X, Y)	NO_2	NO_x	PM_{10}
557500, 155500	10.5	14.3	14
545500, 154500	13.3	18.3	16
550500, 154500	11.5	15.7	15.5
553500, 158500	15	21	16.4
550500, 159500	17.5	24.9	17.3
550500, 160500	17	24.1	16.8
550500, 161500	16.7	23.7	16.7
551500, 167500	16.6	23.6	16.8
553500, 169500	21.9	32.6	17.8
557500, 165500	16.6	23.5	16.7
558500, 163500	15.4	21.7	16.3
558500, 162500	15.5	21.8	16.4
Background locations have been taken from the Defra Background Mapping resource for Sevenoaks District Council.			

Appendix D – Additional Information

Table D.1 – AQMA No.13, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
63	553178	156506	1.5	N	40	30.1	75.2
64	553159	156547	1.5	Y	40	**41.6**	**104.0**
65	553235	156542	1.5	N	40	20.9	52.4
66	553150	156604	1.5	Y	40	25.4	63.5
67	553165	156653	1.5	Y	40	27.2	68.1
68	553109	156633	1.5	Y	40	30.3	75.7
69	553118	156648	1.5	Y	40	30.0	75.0
70	553215	156520	1.5	N	40	23.4	58.4
72	553130	156567	1.5	Y	40	*36.1*	*90.2*
73	553113	156595	1.5	Y	40	**43.5**	**108.8**
74	553111	156583	4	Y	40	**48.4**	**121.0**
75	553045	156697	1.5	Y	40	35.7	89.2
76	553012	156672	1.5	Y	40	29.5	73.8
77	552995	156627	1.5	Y	40	31.8	79.5
79	553105	156679	1.5	Y	40	**49.2**	**123.0**
80	553082	156667	1.5	Y	40	**50.8**	**127.0**
81	553168	156689	1.5	Y	40	**40.6**	**101.6**
82	553131	156686	1.5	Y	40	**49.8**	**124.5**
83	553229	156676	1.5	Y	40	32.1	80.3
84	553300	156671	1.5	Y	40	33.6	84.1
85	553312	156652	1.5	Y	40	26.3	65.7
86	553345	156678	1.5	Y	40	32.9	82.2
87	553371	156682	1.5	Y	40	33.6	83.9
88	553461	156699	1.5	N	40	27.1	67.8
89	553543	156662	1.5	N	40	22.8	56.9
90	553538	156689	1.5	N	40	31.7	79.2
91	553615	156684	1.5	N	40	25.2	63.1
92	554738	156746	1.5	Y	40	22.9	57.3
93	554481	156788	1.5	N	40	22.7	56.8
94	554562	156778	1.5	N	40	23.2	57.9
95	554642	156791	1.5	Y	40	25.8	64.5
96	554790	156766	1.5	Y	40	25.2	63.1
97	554814	156759	1.5	Y	40	26.8	67.1
98	554900	156742	1.5	Y	40	31.5	78.8
99	554924	156722	1.5	Y	40	25.9	64.7
100	554968	156715	1.5	Y	40	25.5	63.7
101	554972	156735	4	Y	40	22.4	56.1
102	554989	156732	1.5	Y	40	29.7	74.2
103	554992	156712	1.5	Y	40	25.1	62.8
104	555010	156709	1.5	Y	40	24.6	61.5
105	555047	156703	1.5	Y	40	25.8	64.4
106	555062	156713	1.5	Y	40	34.3	85.7
107	555105	156698	1.5	Y	40	**57.8**	**144.6**
108	555113	156686	1.5	Y	40	**53.5**	**133.7**
109	555141	156682	1.5	Y	40	**49.3**	**123.1**
110	557280	155925	1.5	N	40	22.0	55.0
111	555978	156382	1.5	N	40	19.3	48.2
112	554028	156812	1.5	N	40	20.7	51.8
113	553869	156772	1.5	N	40	25.4	63.4
114	552986	156577	1.5	Y	40	25.5	63.8

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
115	552971	156616	1.5	Y	40	30.0	75.1
116	552874	156576	1.5	Y	40	27.4	68.5
117	552893	156539	1.5	Y	40	24.5	61.3
118	552810	156494	1.5	Y	40	22.5	56.1
119	552784	156537	1.5	N	40	26.1	65.3
120	552709	156473	1.5	N	40	26.0	65.1
121	552609	156444	1.5	N	40	24.9	62.2
122	552206	156366	1.5	N	40	30.4	76.1
123	552166	156337	1.5	N	40	23.2	58.0
124	551842	156373	1.5	N	40	26.7	66.7
125	551764	156360	1.5	N	40	27.7	69.2
126	551698	156344	1.5	Y	40	31.0	77.4
127	551629	156306	1.5	Y	40	32.7	81.9
128	551573	156296	1.5	Y	40	**44.9**	**112.2**
129	551547	156286	1.5	Y	40	**43.9**	**109.7**
130	551427	156222	3	Y	40	**42.3**	**105.8**
131	551459	156257	5	Y	40	30.7	76.6
132	551406	156210	4	Y	40	32.2	80.5
133	551364	156265	1.5	Y	40	29.3	73.1
134	551374	156308	1.5	Y	40	*36.9*	*92.3*
135	551349	156301	1.5	Y	40	30.4	76.1
136	551309	156392	1.5	Y	40	*37.4*	*93.6*
137	551315	156426	1.5	Y	40	35.2	87.9
138	551297	156461	1.5	Y	40	*37.9*	*94.7*
139	551393	156272	4	Y	40	30.8	77.1
140	551295	156828	4	Y	40	24.2	60.4
141	551302	156811	1.5	Y	40	26.4	66.1
142	551280	156875	1.5	Y	40	28.0	69.9
143	551255	156941	1.5	Y	40	27.3	68.3
144	551225	156954	1.5	Y	40	24.4	61.0
145	551247	156999	1.5	Y	40	24.0	60.1
146	551200	157069	1.5	Y	40	25.3	63.3
147	551215	157109	1.5	Y	40	29.5	73.9
148	551191	157187	1.5	Y	40	26.0	65.0
149	551157	157271	4	Y	40	23.5	58.7
150	551136	157354	1.5	Y	40	23.7	59.2
151	551100	157343	1.5	Y	40	24.8	62.0
152	551086	157391	1.5	Y	40	27.9	69.8
153	551066	157458	1.5	Y	40	*37.0*	*92.5*
154	551030	157502	1.5	Y	40	*36.5*	*91.3*
155	551049	157465	1.5	Y	40	*38.0*	*95.1*
156	550993	157564	1.5	Y	40	29.4	73.5
157	551011	157584	1.5	Y	40	30.4	75.9
160	551088	157416	1.5	Y	40	*37.8*	*94.5*
165	551413	156184	1.5	Y	40	**42.9**	**107.2**
166	551413	156164	6	Y	40	27.1	67.9
167	551421	156115	4	Y	40	34.1	85.3
168	551419	156086	4	Y	40	*37.2*	*93.0*
169	551512	156006	1.5	Y	40	30.3	75.8
170	551519	155985	1.5	Y	40	33.0	82.5
171	551525	155973	1.5	Y	40	33.5	83.8

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
172	551520	155950	1.5	N	40	26.4	66.1
173	551536	155971	1.5	N	40	27.0	67.5
195	551374	156039	1.5	Y	40	32.2	80.5
196	551326	156019	1.5	N	40	**41.9**	**104.9**
197	551222	155930	1.5	N	40	32.5	81.4
198	551074	155708	1.5	N	40	21.3	53.3
199	551047	155683	1.5	N	40	21.2	52.9
200	551003	155817	1.5	N	40	21.0	52.4
201	550936	155675	1.5	N	40	32.6	81.5
202	550908	155664	1.5	N	40	30.1	75.3
203	550934	155643	1.5	N	40	26.3	65.8
204	550854	155633	1.5	N	40	34.5	86.1
205	550788	155573	1.5	N	40	23.4	58.4
206	550720	155578	1.5	Y	40	*36.1*	*90.2*
207	550609	155592	1.5	N	40	28.1	70.3
208	550535	155559	1.5	N	40	27.8	69.5
209	550414	155576	1.5	N	40	32.6	81.5
210	550328	155582	1.5	Y	40	30.1	75.3
211	550255	155599	1.5	N	40	30.0	74.9
212	550266	155688	1.5	N	40	26.0	64.9
213	550265	155713	1.5	N	40	24.7	61.8
214	549470	155731	1.5	N	40	27.0	67.4
216	549054	155524	1.5	N	40	31.8	79.5
217	548893	155468	1.5	N	40	25.8	64.4
218	548770	155449	1.5	N	40	27.1	67.8
219	548724	155444	1.5	N	40	31.2	78.0
220	548530	155409	1.5	N	40	35.4	88.5
221	548496	155394	1.5	Y	40	*38.4*	*95.9*
222	548475	155360	5	N	40	21.4	53.6
223	548294	155359	1.5	Y	40	*36.7*	*91.7*
224	548267	155340	1.5	N	40	26.7	66.9
225	548126	155357	1.5	N	40	31.4	78.4
226	547746	155313	1.5	Y	40	33.0	82.5
227	547957	155328	1.5	N	40	31.7	79.3
229	547513	155213	1.5	Y	40	**41.5**	**103.8**
230	547420	155196	1.5	Y	40	*36.9*	*92.4*
231	546278	154908	1.5	N	40	31.4	78.5
232	547346	155163	1.5	Y	40	29.2	72.9
233	547244	155140	1.5	Y	40	30.9	77.2
234	547215	155147	1.5	Y	40	*36.9*	*92.2*
235	547131	155113	1.5	Y	40	**41.6**	**104.0**
236	547084	155080	1.5	Y	40	27.9	69.8
237	546953	155055	1.5	Y	40	*36.4*	*90.9*
238	546881	155035	1.5	Y	40	**45.2**	**113.0**
239	546810	155010	1.5	Y	40	34.5	86.3
240	546715	154955	1.5	N	40	25.5	63.7
241	546169	154830	1.5	N	40	24.8	62.0
242	545436	154293	1.5	N	40	21.6	53.9
243	544965	154099	1.5	N	40	24.9	62.4
244	544917	154024	1.5	Y	40	30.0	75.1
245	544814	154010	1.5	Y	40	*38.3*	*95.7*

Receptor ID	OS Grid X	OS Grid Y	Height (m)	In AQMA?	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
246	544743	154006	1.5	Y	40	*39.7*	*99.2*
247	544664	154008	5	Y	40	22.1	55.3
248	544534	154024	5	Y	40	25.5	63.8
249	544487	154010	6	Y	40	23.0	57.5
250	544484	153978	5	Y	40	21.3	53.2
251	544747	153998	1.5	Y	40	33.7	84.4
252	544584	154019	5	Y	40	23.6	59.0
253	544424	153924	1.5	Y	40	**58.3**	**145.7**
255	544405	153917	1.5	Y	40	32.6	81.5
256	544379	153879	1.5	Y	40	**47.5**	**118.7**
257	544349	153855	1.5	Y	40	**48.8**	**122.0**
258	544353	153808	1.5	Y	40	*38.1*	*95.3*
259	544340	153778	1.5	Y	40	34.2	85.5
260	544345	153731	1.5	Y	40	22.5	56.3
261	544285	153722	1.5	Y	40	30.5	76.2
262	544197	153699	1.5	N	40	30.5	76.3
263	544612	154118	1.5	Y	40	**40.7**	**101.8**
264	544597	154177	1.5	Y	40	27.4	68.4
265	544636	154199	1.5	Y	40	30.7	76.9
266	544678	154235	1.5	Y	40	33.6	84.0
267	544720	154298	1.5	N	40	35.3	88.3
268	544629	154066	1.5	Y	40	**59.4**	**148.5**
271	552418	156463	1.5	N	40	20.0	49.9
272	552356	156452	1.5	N	40	19.7	49.3
121a	552643	156490	1.5	N	40	29.7	74.3
198a	551109	155824	1.5	N	40	30.5	76.4
224a	548153	155334	1.5	N	40	25.4	63.5

Table D.2 – Outside AQMAs, Summary of Modelled Receptor Results (NO_2)

Receptor ID	OS Grid X	OS Grid Y	Height (m)	AQS objective (µg/m³)	2018 Annual Mean NO_2 (µg/m³)	% of AQS objective
1	553545	152728	1.5	40	15.7	39.3
2	553521	152909	1.5	40	14.8	37.0
3	553156	153948	1.5	40	15.9	39.7
4	553205	153936	1.5	40	18.8	47.1
5	553193	153988	1.5	40	22.6	56.4
6	553178	154097	1.5	40	24.4	61.0
7	553126	154138	1.5	40	34.3	85.8
8	553139	154142	1.5	40	*37.1*	*92.7*
9	553125	154160	1.5	40	35.6	89.0
10	553139	154163	1.5	40	30.1	75.2
11	553126	154176	1.5	40	33.5	83.7
45	553047	155144	1.5	40	23.9	59.8
46	553114	155464	1.5	40	24.8	61.9
47	553102	155532	1.5	40	24.4	60.9
48	553107	155579	1.5	40	22.6	56.4
49	553150	155670	1.5	40	22.1	55.3
50	553111	155746	1.5	40	21.8	54.4
51	553148	155806	1.5	40	24.0	60.0

Receptor ID	OS Grid X	OS Grid Y	Height (m)	AQS objective (µg/m^3)	2018 Annual Mean NO_2 (µg/m^3)	% of AQS objective
52	553141	155843	4	40	22.8	57.1
53	553117	155863	1.5	40	23.6	59.0
54	553146	155913	1.5	40	32.0	80.0
55	553147	155936	1.5	40	35.2	88.0
56	553196	156142	1.5	40	25.0	62.5
57	553165	156026	1.5	40	35.0	87.5
58	553149	156055	1.5	40	24.3	60.8
59	553173	156195	1.5	40	24.5	61.3
60	553195	156300	1.5	40	30.8	76.9
61	553219	156401	1.5	40	26.5	66.2
62	553192	156478	4	40	23.4	58.6
71	553194	156417	1.5	40	26.6	66.6
78	552837	157395	1.5	40	28.2	70.5
162	550659	157892	1.5	40	30.7	76.9
163	550557	157927	1.5	40	30.5	76.3
164	550388	157994	1.5	40	32.8	82.1
174	551590	155693	1.5	40	21.9	54.7
175	551651	155657	4	40	21.3	53.4
176	551934	155588	1.5	40	20.8	51.9
177	552001	155537	1.5	40	23.2	57.9
178	552356	155353	5	40	19.2	48.0
179	552384	155340	4	40	20.3	50.8
180	552418	155311	6	40	17.7	44.4
181	552479	155301	1.5	40	25.8	64.5
182	552460	155280	4	40	19.2	48.1
183	552511	155281	1.5	40	25.1	62.8
184	552501	155248	1.5	40	20.7	51.7
185	552656	155168	1.5	40	27.3	68.3
186	552683	155113	1.5	40	**41.3**	**103.2**
187	552727	155067	1.5	40	**41.1**	**102.8**
188	552764	155033	4	40	*38.7*	*96.8*
189	552821	155005	1.5	40	25.5	63.7
190	552849	154957	1.5	40	28.0	69.9
191	552849	154913	1.5	40	24.8	62.1
192	552944	154741	8	40	15.6	39.1
193	552974	154698	4	40	**42.6**	**106.5**
194	553033	154608	4	40	19.8	49.5
269	544796	154496	1.5	40	28.7	71.7
273	550239	155519	1.5	40	19.0	47.6
274	550821	154855	1.5	40	21.7	54.2
339	553062	167386	1.5	40	20.3	50.8
340	553037	167315	1.5	40	20.0	49.9
341	553295	167426	1.5	40	20.6	51.6
78a	552855	157312	1.5	40	25.7	64.3