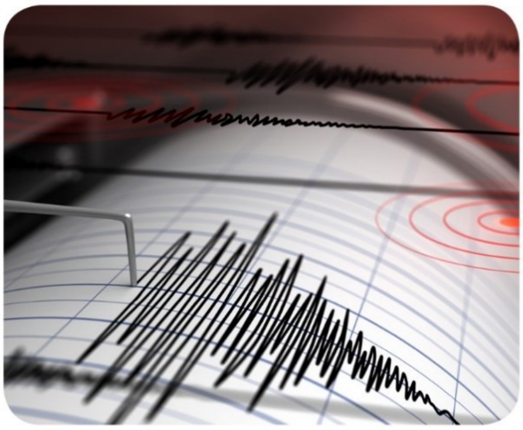
Air & Acoustic Consultants

Rosconn Strategic Land and Thomas Eric Baker and Sally Rose Hall, the Executors of Mr E C Baker and Mrs J Baker

Radwinter Road, Saffron Walden

Air Quality Modelling

August 2022



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1 Introduction

1.1.1 This report has been prepared on behalf of the Appellants, Rosconn Strategic Land and Thomas Eric Baker and Sally Rose Hall, the Executors of Mr E C Baker and Mrs J Baker, in light of the comments raised by the Rule 6 party's air quality consultant, Jessica Muirhead of AECOM (project ref: APP/C1570/W/22/3296426 – dated 2 August 2022) for planning application UTT/21/2509/OP - Land south of Radwinter Road (East of Griffin Place):

> *"Outline planning application for the erection of up to 233 residential dwellings including affordable housing, with public open space, landscaping, sustainable drainage system (SuDS) and associated works, with vehicular access point from Radwinter Road. All matters reserved except for means of access."*

1.1.2 A number of comments have been made regarding the integrity of the modelling carried out by Kairus Ltd for the planning application. The comments raised by AECOM, within the 'Review of Air Quality Assessment for Radwinter Road' document are summarised below:

- Potential underestimation of future baseline traffic volumes;
- Underestimation of background concentrations (baseline and future), resulting in underestimation of total concentrations, and affecting the verification factors;
- Lack of consideration for street canyons within Saffron Walden, potentially under–estimating pollutant concentrations;
- Lack of weight given to the whole Air Quality Management Area (AQMA); and
- Lack of consideration of health impacts of air quality and World Health Organisation (WHO) guidelines suggesting harm is caused at much lower concentrations than the current air quality objectives account for.

1.1.3 In light of these comments, a further modelling exercise has been carried out by Air & Acoustic Consultants Limited (AAC), which primarily considers the modelling points raised above.

2 Legislation and Policy Context

2.1 European Legislation

2.1.1 Air pollutants at high concentrations can give rise to adverse effects upon the health of both humans and ecosystems. The European Union (EU) legislation on air quality forms the basis for the national UK legislation and policy.

2.1.2 The EU Framework Directive 2008/50/EC came into force in May 2008 and sets out legally binding limits for concentrations of the major air pollutants that can impact on public health. This Directive came into force in England in June 2010[1]. Amendments to this Directive was made following amendments to the 2008/50/EC and 1004/107/EC on air quality made by Directive 2015/1480/EC. The updated Directive, The Air Quality Standards (Amendment) Regulations 2016, came into force on 31st December 2016[2].

2.1.1 Following the UK's departure from the EU and the Brexit transition period the previous EU Legislation has been retained in the United Kingdom. The following text is taken from the legislation.gov.uk[3] website, setting out details of the retention:

> *"The UK is no longer a member of the European Union. EU legislation as it applied to the UK on 31 December 2020 is now a part of UK domestic legislation, under the control of the UK's Parliaments and Assemblies, and is published on legislation.gov.uk.*
>
> *[…]*
>
> *EU legislation which applied directly or indirectly to the UK before 11.00 p.m. on 31 December 2020 has been retained in UK law as a form of domestic legislation known as 'retained EU legislation'. This is set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 (c. 16)."*

2.2 National Legislation, Policy and Strategy

2.2.1 Part IV of the Environment Act 1995[4] requires local authorities to review and assess the air quality within their boundaries. As a result, the Air Quality Strategy was adopted in 1997[5], with national health-based standards and objectives set out for the, then, eight key air pollutants including benzene, 1-3 butadiene, carbon monoxide, lead, nitrogen dioxide (NO_2), ozone, particulate matter and sulphur dioxide.

2.2.2 Part IV of the Environment Act 2021[6] amends both the Environment Act 1995 and the Clean Air Act 1993[7]. It builds on the foundations provided by Part IV of the Environment Act 1995 and strengthens the local air quality management framework. The act allows the Secretary of State to make provisions for, about or connect with the recall of relevant products that do not meet relevant environmental standards.

2.2.3 The government have resisted calls for the adoption of the recently updated World Health Organisation (WHO) air quality guidelines, specifically targeting particulate matter pollution. The act does introduce a duty on the government to bring forward at least two air quality targets by October 2022 for consultation

[1] Statutory Instrument, 2010. *The Air Quality Standards Regulations,' No. 1001. Queen's Printer of Acts of Parliament.*
[2] Statutory Instrument, 2016. *The Air Quality Standards Regulations,' No. 1184. Queen's Printer of Acts of Parliament.*
[3] EU legislation and UK law. Accessible at: *https://www.legislation.gov.uk/eu-legislation-and-uk-law*
[4] Parliament of the United Kingdom, 1990. *Environmental Protection Act*, Chapter 43. Queen's Printer of Acts of Parliament.
[5] Department for Environment Food and Rural Affairs, 1997. *The United Kingdom National Air Quality Strategy*, Cm 3587.
[6] UK Public General Acts, 2021. *Environmental Act 2021, Chapter 30. Queen's Printer of Acts of Parliament.*
[7] UK Public General Acts, 1993. Clean Air Act 1993, Chapter 11. Queen's Printer of Acts of Parliament.

that will be set in secondary legislation. The first will aim to reduce the annual average level of fine particulate matter ($PM_{2.5}$) in ambient air. The second will be a long-term target (set a minimum of 15 years in the future), which the government says, *"will encourage long-term investment and provide certainty for businesses and other stakeholders."*

2.2.4 The purpose of the Air Quality Strategy was to identify areas where air quality was unlikely to meet the objectives prescribed in the regulations. The strategy was reviewed in 2000 and the amended Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2000)[8] was published. This was followed by an Addendum in February 2003 and in July 2007, when an updated Air Quality Strategy was published[9].

2.2.5 The pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence regarding how each pollutant affects human health. Pollutant objectives are the future dates by which each standard is to be achieved, considering economic considerations, practical and technical feasibility.

UK Air Quality Objectives

2.2.6 The air quality objectives are managed through the Local Air Quality Management, (LAQM) regime, which is defined within the Air Quality (England) Regulations 2000, (SI 928) and the Air Quality (England) (Amendment) Regulations 2002, (SI 3043). Table 2.1 lists the current National Air Quality Objectives that are relevant to this AQA, as set out in the Air Quality Standards (Amendment) Regulations 2016.

Table 2.1: Air Quality Objectives (England)

Pollutant	Air Quality Objective	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3	1-hour mean not to be exceeded more than 18 times per year
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3*	24-hour mean not to be exceeded more than 35 times per year
	40 µg/m^3*	Annual mean
$PM_{2.5}$	20 µg/m^3*	Annual mean – Indicative Stage 2 limit value post 2020. 15% reduction in background to be achieved between 2010 & 2020 at Urban Background sites
Notes: *Except Scotland		

World Heath Organisation Guidelines

2.2.7 The WHO guidelines were updated in September 2021[10], and are a set of evidence-based recommendations of limit values for specific air pollutants developed to help countries achieve air quality

[8] Department of the Environment, Transport and the Regions, 2000. The Air Quality Strategy for England, Scotland, Wales, and Northern Ireland

[9] Department for Environment Food and Rural Affairs, 2007. *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*, Cm 7169, Department for Environment Food and Rural Affairs.

[10] World Health Organization, 2021. *WHO global air quality guidelines.*

that protects public health. They are significantly lower than the current levels legislated within the Air Quality Objectives (as set out in Table 2.1). The WHO guideline levels are set out in Table 2.2 below.

Table 2.2: WHO Air Quality Guidelines

Pollutant	Air Quality Guidelines	
	Concentration	Measured as
NO_2	25 µg/m^3	24-hour mean (99th percentile)
	10 µg/m^3	Annual mean
PM_{10}	45 µg/m^3	24-hour mean (99th percentile)
	15 µg/m^3	Annual mean
$PM_{2.5}$	15 µg/m^3	24-hour mean (99th percentile)
	5 µg/m^3	Annual mean

2.2.8 The Committee on the Medical Effects of Air Pollutants (COMEAP)[11] has concluded the following:

> *"The WHO's revised AQGs for pollutants in outdoor air are suitable as long-term targets to inform policy development. We stress that the AQG values should not be regarded as thresholds below which there are no impacts on health - the current evidence has not identified thresholds for effect at the population level, meaning that even low concentrations of pollutants are likely to be associated with adverse effects on health. Therefore continued reductions, even where concentrations are below the AQGs, are also likely to be beneficial to health."*

2.2.9 However, as these guidelines have not yet been adopted, this assessment has considered the current air quality objectives / limits, as set out in Table 2.1. These objectives / limits have been used to inform and assess the impact of the development against concentration at the modelled receptors chosen in this assessment. It is, however, noted that updated to the $PM_{2.5}$ objective will be brought forward in October 2022.

[11] Committee on the Medical Effects of Air Pollutants (COMEAP), 2022. *COMEAP statement: response to publication of the World Health Organization Air quality guidelines 2021*

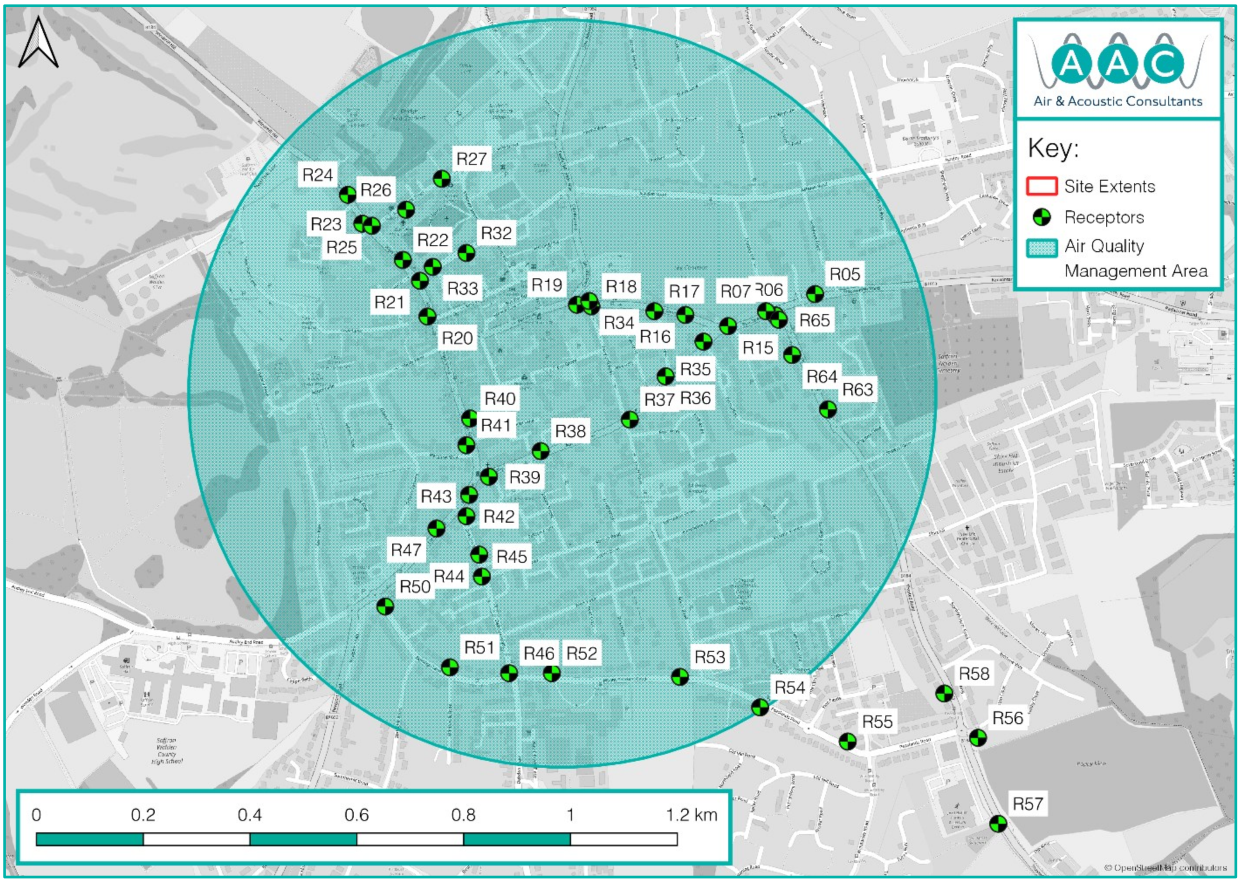
3 Modelling Approach

3.1 Modelling Parameters

Modelled Receptor Locations

3.1.1 The same modelled receptor locations have been utilised within this modelling exercise as were in the Air Quality Technical Note[12], produced by Kairus Ltd. These are outlined in Table A 1 and illustrated in Figure 3.1, based upon the same study area as the associated transport studies

Figure 3.1: Modelled Receptor Locations



Assessment Scenarios

3.1.2 The following scenarios have been considered for this modelling exercise:

- 2019 Verification;
- 2026 Baseline; and
- 2026 Baseline + Proposed Development

3.1.3 To note, the link road between Radwinter Road and Thaxted Road, being constructed under planning applications UTT/13/3467/OP and UTT17/2832/OP has not been considered within the modelling

[12] Kairus Ltd, 2021. *Land South of Radwinter Road (East of Griffin Place), Saffron Walden. Air Quality Technical Note – Version 1.*

assessment. The traffic flows are set out in Appendix A, which have been provided by Rappor, formerly Cotswold Transport Planning.

3.1.4 A number of committed developments have been considered for this development, with a number also not considered within the traffic data. These are:

- UTT/22/1939/DFO (UTT/17/3413/OP) – Traffic flows taken from 2013 application – difference between trip generation from different applications is negligible so the use of 2013 traffic data is robust. Furthermore, the traffic associated with 40 dwellings from this application were removed from the committed development trips, as the dwellings were occupied at the time of conducting the traffic surveys;
- S62A/22/0000002 – This application was submitted after UTT/21/2509/OP and is yet to be determined, so cannot be considered a committed development and was therefore not considered further;
- UTT/0400/09/OP – The residential element for this development was built out by the time traffic survey were conducted. The employment site for this development was applied under a separate reserved matters application, and the planning permission for this has now lapsed. Therefore, no further considerations were made for the employment element; and
- 20/2007/FUL – This development was undetermined at the time of the assessment works; however the Highway Authority requested that this be treated as a committed development. Therefore, this development was considered within the traffic flows.

Modelling Methodology

3.1.5 The modelling of the release of vehicular emissions, (dispersion), into the air has been carried out using the latest version of the air dispersion model: ADMS-Roads model (v5.0.1.3). The model calculates pollution concentrations and deposition over a specified area and / or at a specified location, based upon the following input information:

- Source parameters: e.g. highway width, average speed of vehicles, the number of vehicles per hour and the diurnal traffic profile;
- Meteorological parameters: e.g. wind speed, direction, precipitation, temperature and atmospheric stability; and
- Topographical factors: e.g. ground levels, gradients, buildings and surface roughness.

3.1.6 Junctions have been modelled in line with the LAQM Technical Guidance (TG(22))[13], which states:

"For junctions, common sense, driving experience and local knowledge are helpful to estimate speeds. For example, for a section of road leading up to traffic lights, the aim should be to estimate average speeds over a 50 m section of road:

- *Traffic pulling away from the lights, e.g. 40-50 kph;*
- *Traffic approaching the lights when green, e.g. 20-50 kph; and*

[13] Department for Environment, Food and Rural Affairs (2022). LAQM Technical Guidance LAQM.TG22, DEFRA, London.

- *Traffic on the carriageway approaching the lights when red, e.g. 5-20 kph, depending on the time of day and how congested the junction is.*

It is considered that the combined effect of these three conditions is likely in most instances to be a two-way average speed for all vehicles of 20 to 40 kph. Speeds in similar ranges would also apply at roundabouts, although on sections of large roundabouts, speeds may well average between 40-50 kph."

3.1.7 The road network modelled for the 2019 and 2026 assessment year scenarios, including the modelled speeds and the location of the AQMA, are illustrated below in Figure 3.2 and Figure 3.3. The figures illustrates that the majority of the AQMA has been modelled.

3.1.8 The proposed preliminary traffic signal design for the High Street and Church Street junction has been included within the 2026 Baseline + Proposed Development modelling scenario.

Figure 3.2: Modelled 2026 Baseline Road Network

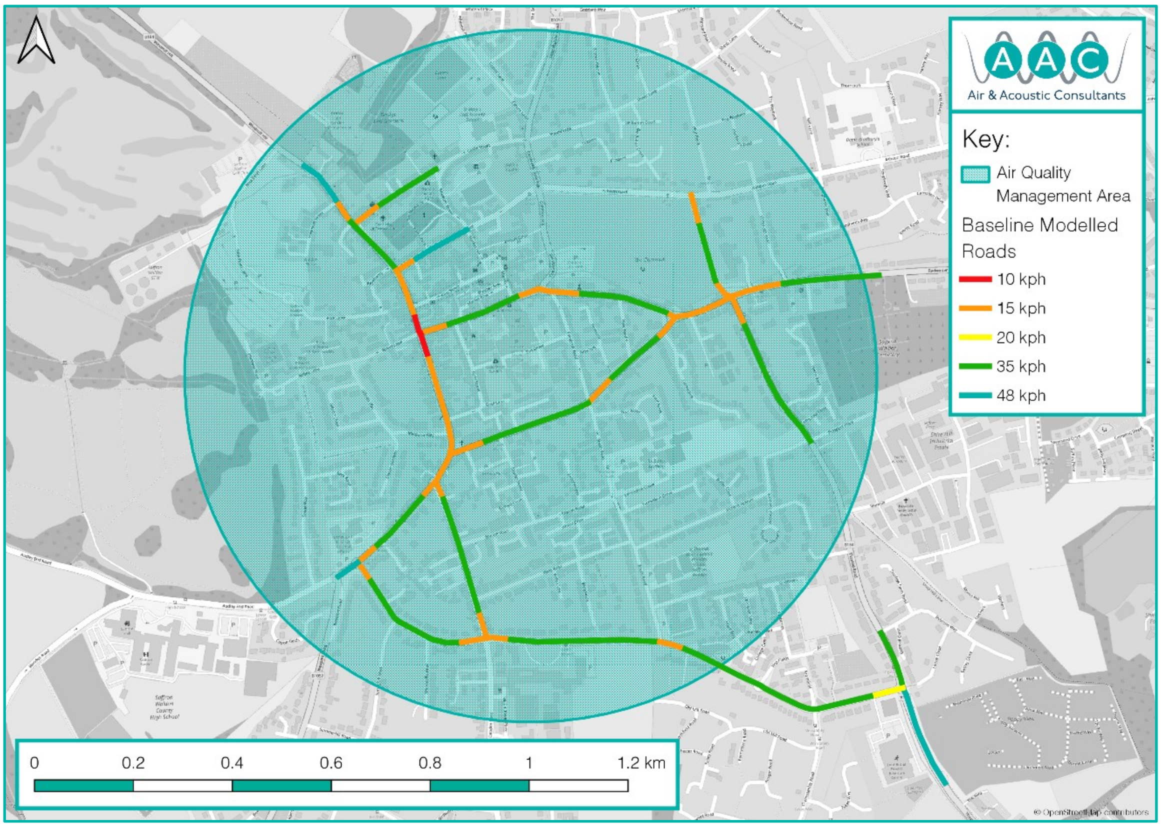
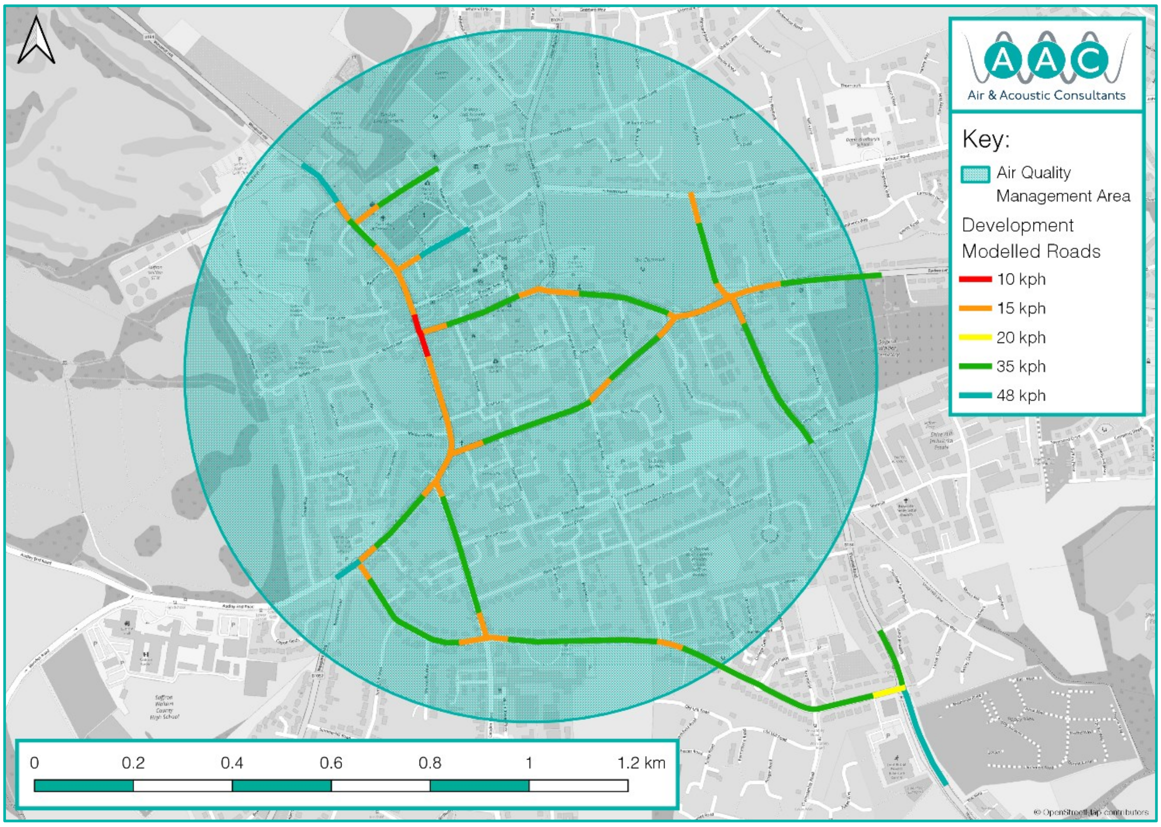


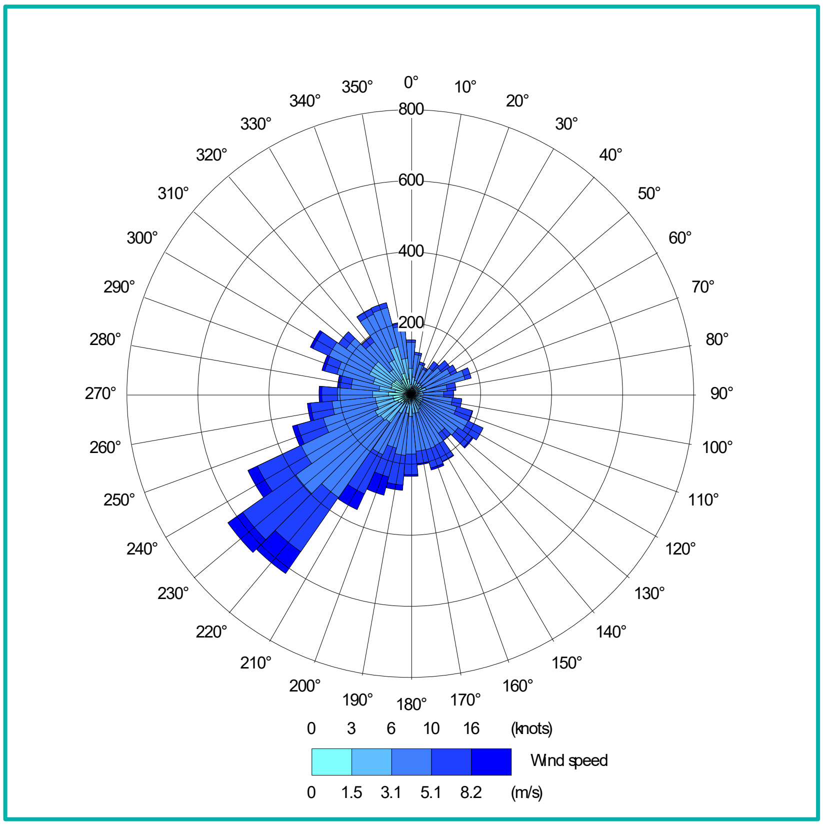
Figure 3.3: Modelled 2026 with Development Road Network



3.1.9 The meteorological data required for the ADMS-Roads model, must be sourced from a representative location to the study site and include a full year of sequential readings. A review of the nearest available meteorological stations indicates Stanstead Airport Meteorological Site is the most suitable site with the most complete/representative information. 2019 meteorological data has been utilised for this assessment in line with the verification year.

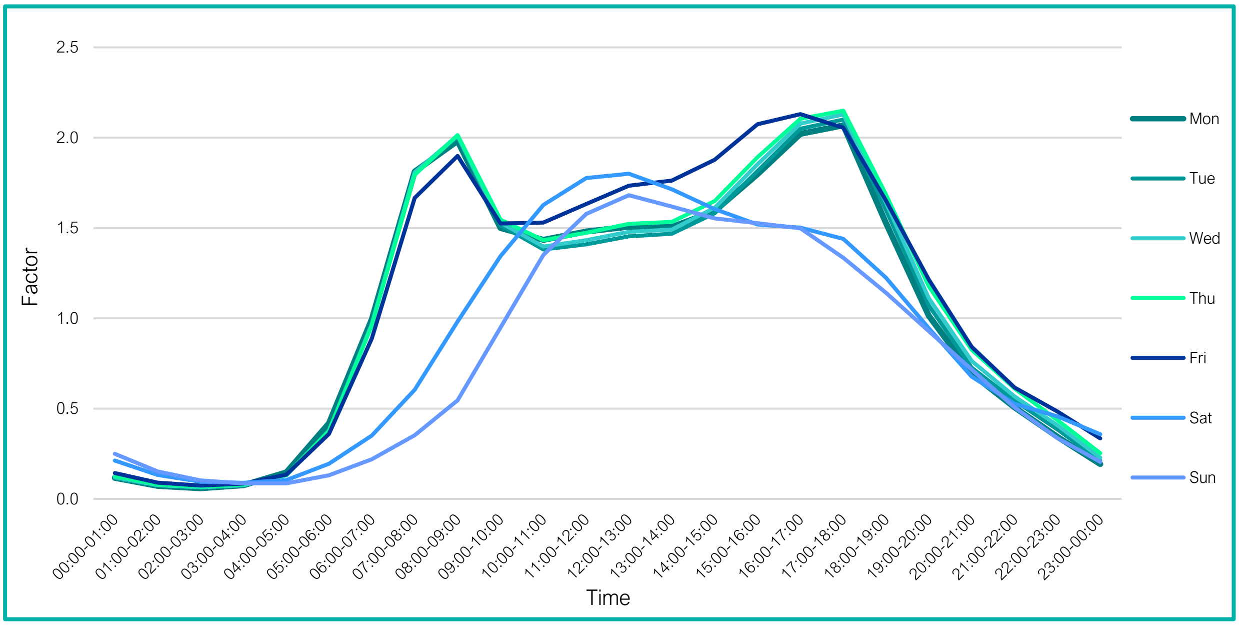
3.1.10 It is recognised that a minimum data capture of 90 % is recommended for representing hourly dispersion conditions within the dispersion model. Missing lines of meteorological data can be interpolated or filled by data for these specific hours from a neighbouring site. The data capture at Stanstead Airport Meteorological Site for 2019 was within an acceptable margin error, for all parameters. The wind rose is illustrated in Figure 3.4.

Figure 3.4: Stanstead Airport Meteorological Site (2019)



3.1.11 A standard diurnal profile from the Department of Transport website[14] has been utilised as part of the modelling process for an average 7-day week. The 2019 diurnal profile is illustrated in Figure 3.5.

Figure 3.5: 2019 Diurnal Profile



[14] Department for Transport. Road Traffic Statistics (TRA). Accessible at: https://www.gov.uk/government/statistical-data-sets/road-traffic-statistics-tra

Street Canyons

3.1.12 Due to the characteristics of streets within Saffron Walden, specifically within the town centre, street canyons were included within the model to account for poor dispersion. Due to this poor dispersion, concentrations at receptors can be higher than what would usually be experienced, due to the 'trapping' effect. LAQM TG(22) defines the following for street canyons:

> *"Although street canyons can generally be defined as narrow streets where the height of buildings on both sides of the road is greater than the road width, there are numerous example whereby broader streets may also be considered as street canyons where buildings result in reduced dispersion and elevated concentrations (which may be demonstrated by monitoring data). Therefore, canyon effects can occur both in small towns or large cities."*

3.1.13 Parameters that have been included within the model include:

- The street canyon width, which is not the road width, but the distance measured as façade to façade of buildings on either side of the street; and
- The average height of buildings on both sides of the road.

3.1.14 The advanced street canyons option was selected in the model, and street canyons were modelled along High Street, Bridge Street and Hill Street.

Emission Factors

3.1.15 There are numerous sources of NO_2, PM_{10} and $PM_{2.5}$ which include, for example, industry and domestic origins. However, the main source is usually road transport. For the purpose of this modelling exercise and due to the absence of other sources in the area, only road traffic emissions have been modelled.

3.1.16 The potential impacts have been modelled using the ADMS-Roads model atmospheric dispersion model, with Emission Factor Toolkit v11.0.

3.1.17 It has been widely known for some time that NO_x/NO_2 levels historically have not reduced as quickly as anticipated, and this was identified by DEFRA in 2011. This was recently reiterated in an IAQM Interim Position Statement (v1.1)[15] released in July 2018 recognising that emissions from diesel vehicles have not declined as expected by DEFRA. This document has since been formally withdrawn, stating:

> *"There is a growing body of evidence to suggest that the latest COPERT vehicle emission factors, which feed into the EFT (v9 and onwards), reflect the real-world NO_x emissions more accurately.*
>
> *It is judged that an exclusively vehicle emissions-based sensitivity test is no longer necessary.*
>
> *On this basis, the EFT may be used for future year modelling with greater confidence when considering the per vehicle emission, provided that the assessment is verified against measurements made in the year 2016 or later."*

3.1.18 Therefore, the EFT v11.0 within the ADMS model is acceptable for an assessment year of 2019 and 2026 and no sensitivity test has therefore been undertaken.

3.1.19 Vehicles emit NO_x with different proportions of NO_2. Following release into the atmosphere, chemical reactions take place between nitric oxide (NO), NO_2 and Ozone (O_3). In this AQA, the modelling of NO_x

[15] Institute of Air Quality Management, 2018. *Dealing with Uncertainty in Vehicle NO_x Emissions within Air Quality Assessments.*

emissions has taken place and the resulting NO_2 concentration has been calculated post modelling using the DEFRA NO_x to NO_2 Calculator (v8.1)[16].

Verification Process

3.1.20 Whilst the ADMS-Roads model is widely accepted for its use in assessments of this nature, it is still important that a model verification process is undertaken to confirm that the model's performance is within an acceptable margin of error. Therefore, a comparison of modelled results with monitored results has been undertaken in line with LAQM.TG(22).

3.1.21 The model was found to be under-predicting NO_2 compared to the monitored concentrations, which is not unusual. Therefore, an adjustment factor has been derived.

3.1.22 The model verification process is set out in Appendix C.

DEFRA Background Concentrations

3.1.23 The DEFRA website includes estimated background air pollution data for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for each 1km-by-1km OS grid square. Background pollutant concentrations are modelled from the base year of 2018 and based on ambient monitoring and meteorological data from 2018 and then projected for future years. Projected pollutant concentrations for 2019 and 2026, covering the closest OS grid square to the specified receptors, have been utilised within the modelling exercise.

3.1.24 To note, as per a recent statement from DEFRA, the DEFRA background concentrations do not consider short term variations as a result of the COVID-19 outbreak in the UK:

> *"Users of the updated LAQM tools should be aware that the projections in the 2018 reference year background maps and associated tools are based on assumptions which were current before the Covid-19 outbreak in the UK. In consequence these tools do not reflect short or longer term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns."*

3.1.25 Although the DEFRA background maps are based on ambient monitoring and meteorological data, they do contain some limitations, including assuming an average concentration over 1 km x 1 km square grid. Therefore, to improve the accuracy of the background mapping concentrations, a comparison of monitored data and mapped background concentrations (for the grid square where the monitoring site is located) has been conducted and used to calibrate the DEFRA background concentrations.

3.1.26 The background NO_2, concentrations have been calibrated against data measured in 2019 at two urban background diffusion tube monitoring locations operated by Uttlesford District Council (UDC). Background monitoring for PM_{10} and $PM_{2.5}$ was not carried out by UDC, therefore, in the absence of any available local monitoring data, the NO_2 calibration factor has been used to adjust the DEFRA PM_{10} and $PM_{2.5}$ background concentrations.

3.1.27 Measured annual mean NO_2 concentrations at the monitoring locations have been compared against the annual mean concentration predicted by DEFRA's background maps to find a calibration factor for NO_2. The calibration factor has then been applied to the DEFRA background concentration for NO_2, PM_{10}

[16] Department for Environment, Food & Rural Affairs. NO_x to NO_2 Calculator. Accessible at: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

and $PM_{2.5}$. The background calibration factors for NO_2 are set out in Table 3.1. The estimated calibrated annual mean background concentrations are then set out in Table 3.2.

Table 3.1: NO_2 Background Calibration Factors

NO_2	Monitoring Sites	
	UT003	UT012
Measured Concentration (µg/m³)	11.1	15.5
Mapped Concentration (µg/m³)	9.9	9.9
Calibration Factor	1.1	1.6
Average Calibration Factor	1.3	

Table 3.2: Estimated Annual Mean Background Pollutant Concentrations (µg/m³)

Pollutant	2026
NO_2	10.0 – 12.1
PM_{10}	18.5 – 19.2
$PM_{2.5}$	11.5 – 11.8
Notes: Data presented are derived from the ordinance survey grid references set out in Table A 1.	

Modelling Uncertainty

3.1.28 There are many uncertainties when considering both measured and predicted pollution concentrations. The model is dependent upon the traffic data provided for the project, and should this be subject to change, so may the resulting pollution concentrations.

3.1.29 The background air quality concentrations have been taken from the DEFRA background mapping. The DEFRA website[17] includes estimated background air pollution data for NO_x, NO_2, PM_{10} and $PM_{2.5}$ for each 1km by 1km OS grid square. Background pollutant concentrations are modelled from the base year of 2018 and based on ambient monitoring and meteorological data from 2018. The 2018 mapping includes projections for future years, up to currently 2030. Furthermore, the concentrations are modelled at a standard 'living height,' which has been averaged across the grid square.

3.1.30 Due to the ongoing uncertainty regarding 2020 air quality monitoring data as a result of the COVID-19 global pandemic, and to ensure a conservative assessment of future exposure and impacts is made, the verification process has used 2019 monitoring data. This is supported by DEFRA and Greater London Authority (GLA), which published the LAQM Covid-19: Supplementary Guidance[18], which states:

> *"An option would be to exclude the use of 2020 as a verification year, certainly until such time as it becomes clearer what the longer-term impacts of COVID-19 are / have been. The use of 2019 as a verification year would be recommended under such a direction, as the most recent year available without the effects of the pandemic. However, there are uncertainties as to whether changes to trends in both road traffic emissions and background concentrations have*

[17] Department for Environmental Food and Rural Affairs. Accessible at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
[18] Department for Environment, Food & Rural Affairs, 2021. LAQM Covid-19: Supplementary Guidance.

taken place and whether any changes would be likely to lead to longer-term shifts. This in turn could also lead to challenges and cost implications on LAQM projects (e.g. detailed modelling assessments, AQAPs) whose outcomes would be based on this more conservative approach in contravention, it could be argued, of real-world observations."

3.1.31 The emissions factors within the latest DEFRA Emission Factor Toolkit (EFT) are based on assumptions which were current before the occurrence of the Covid-19 pandemic. As such, this data will not reflect any changes that have occurred or may occur in the future as a result of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns, travel restrictions etc.).

3.2 Significance Impact Criteria

Operational Impacts

3.2.1 Currently there is no formal guidance on the absolute magnitude and significance criteria for the assessment of air quality impacts. However, the Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) (2017) guidance recommendations for describing the impact at individual receptor locations as set out in Table 3.3, which has been utilised to determine the degree of change of the air quality concentrations.

Table 3.3: Operational Degree of Change Descriptors

Long Term Average Concentration at Receptor in Assessment Year	% Change in concentration relative to Air Quality Action Level (AQAL)				
	<0.5	1	2 – 5	6 – 10	>10
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

Notes:

- Values are rounded to the nearest whole number.
- When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
- AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL).'

3.2.2 The EPUK & IAQM (2017) advice provides guidance on the severity of an impact as a descriptor. However, although the impacts might be considered 'Slight,' 'Moderate' or 'Substantial' at one or more receptor location, the overall effects of a proposed development may not always be judged as being significant.

3.2.3 The guidance believes that the assessment of significance should be based on professional judgement, with the overall air quality impact of the scheme / proposed development described as either significant or not significant. In drawing this conclusion, the following factors should be taken into account:

- Receptor sensitivity;

- The existing and future air quality in the absence of the scheme / proposed development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

3.2.4 The judgement of the significance should be made by a competent professional who is suitably qualified.

4 Operational Impacts

4.1 Traffic Emissions

2026 Impact Assessment Scenario

4.1.1 The '2026 Future Baseline' NO_2, PM_{10} and $PM_{2.5}$ concentrations at the previously specified human receptor locations, as set out in Table A 1 and illustrated in Figure 3.1, have been compared to the '2026 Future Baseline + proposed development' concentrations and the results are set out in Table B 1, Table B 2 and Table B 3. The tables also set out the degree of change of the air quality concentrations, considered against the annual mean air quality standards set out in Table 2.1, at each receptor location in line with the assessment matrix set out in Table 3.3.

NO_2

4.1.2 The modelled NO_2 concentrations in Table B 1 show that NO_2 concentrations at all specified residential receptor locations are below the annual mean objective (40 µg/m^3). The highest concentration, 28.9 µg/m^3, is predicted to be at R23.

4.1.3 Using the matrix in Table 3.3, it can be seen that the impacts associated with the proposed development are anticipated to be **negligible (adverse)** at all modelled receptors other than at R22, which is predicted to experience a **moderate (adverse)** impact.

4.1.4 Based on the annual average mean concentration at all receptors being below 60 µg/m^3, it is unlikely that any modelled receptor identified would experience an exceedance of the 1-hour mean objective, in line with paragraph 7.97 of LAQM.TG(22).

PM_{10}

4.1.5 The modelled PM_{10} concentrations in Table B 2 do not predict any exceedances of the annual mean objective (40 µg/m^3) at any of the specified receptor locations. Using the matrix in Table 3.3, it can be seen that the impacts are anticipated to be **negligible (adverse)**.

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

4.1.6 For PM_{10}, the following equation can be used to derive the number of days that the 24-hour mean objective (50 µg/m^3) is likely to be exceeded.

4.1.7 There are limitations to this calculation, and this is set out in LAQM.TG(22), which states:

> *"The relationship does have limitations in so far that it should not be applied when the annual mean PM_{10} concentration is lower than 14.8 µg/m^3".*

4.1.8 On the basis that all receptors are above 14.8 µg/m^3, the formula above can be used to inform the number of 24-hour mean objective exceedances.

4.1.9 The highest annual mean PM_{10} concentration is 23.5 µg/m^3, predicted at R23 in 2026. Based on the formula above, this predicts 9.2 exceedance days, which is below the 35-days annual limit. Therefore, according to the formula, none of the receptors would be exposed to any material impact from the short-term concentrations of PM_{10}.

$PM_{2.5}$

4.1.10 The modelled $PM_{2.5}$ concentrations in Table B 3 do not predict any exceedances of the Stage 2 Post 2020 annual mean objective (20 µg/m^3) at any of the specified receptor locations. The highest concentration, 14.4 µg/m^3, is predicted to be at R23.

4.1.11 Using the matrix in Table 3.3, it can be seen that the impacts are anticipated to be **negligible (adverse)**.

Significance of Impacts

4.1.12 The impacts on the receptors associated with the proposed development are anticipated to be **negligible (adverse)** for NO_2, PM_{10} and $PM_{2.5}$ concentrations, with one receptor, R23, predicted to experience a **moderate (adverse)** impact for NO_2.

4.1.13 Paragraph 7.6 of the EPUK & IAQM (2017) states:

> *"Often, it is possible to be very clear when an impact is sufficiently slight that it has no effect on receptors and can therefore be described unequivocally as 'not significant.' In the opposite case, when an impact is clearly substantial, it will be obvious that there is potential for a significant effect. The problem lies in the intermediate region where there is likely to be uncertainty on the transition from insignificant to significant. In those circumstances where a single development can be judged in isolation, it is likely that a 'moderate' or 'substantial' impact will give rise to a significant effect and a 'negligible' or 'slight' impact will not have a significant effect, but such judgements are always more likely to be valid at the two extremes of impact severity."*

4.1.14 Paragraph 7.8 of this guidance goes on to state:

> *"The population exposure in many assessments will be evaluated by describing the impacts at individual receptors. Often, these will be chosen to represent groups of residential properties, for example, and the assessor will need to consider the approximate number of people exposed to impacts in the various different categories of severity, in order to reach a conclusion on the significance of effect. An individual property exposed to a moderately adverse impact might not be considered a significant effect, but many hundreds of properties exposed to a slight adverse impact could be. Such judgements will need to be made taking into account multiple factors and this guidance avoids the use of prescriptive approaches."*

4.1.15 It is noted that the likely cause of the moderate (adverse) impact at this receptor is due to a number of factors, including:

- Street Canyon Effect; and
- Reduced speed when considering the new proposed traffic signal junction along High Street/Church Street.

4.1.16 The reduced vehicular speeds within the modelling exercise are causing a greater impact than what would normally be anticipated to occur under free-flowing conditions, as illustrated by the large increase in concentrations from the 2026 Baseline to the 2026 Baseline + proposed development scenarios.

4.1.17 As highlighted above, only one receptor location out of the forty-four modelled is predicted to have a moderate (adverse) impact as a result of the proposed development, therefore it is only representative of one receptor location, and not receptors modelled as a whole. Furthermore, this receptor is predicted to comply with the annual mean objectives for NO_2, PM_{10} and $PM_{2.5}$, as set out in Table 2.1. Based on this, and in accordance with the IAQM (2017) guidance and professional judgement, the overall impact of the proposals is considered as '**not significant**.'

5 Summary and Conclusions

5.1.1 As set out in paragraph 1.1.2 AECOM raised a number of comments within document. *'Review of Air Quality Assessment for Radwinter Road'* document, dated 02nd August 2022, which, for completeness, have been replicated below:

- Potential underestimation of future baseline traffic volumes;
- Underestimation of background concentrations (baseline and future), resulting in underestimation of total concentrations, and affecting the verification factors;
- Lack of consideration for street canyons within Saffron Walden, potentially under estimating pollutant concentrations;
- Lack of weight given to the whole Air Quality Management Area (AQMA); and
- Lack of consideration of health impacts of air quality and World Health Organisation (WHO) guidelines suggesting harm is caused at much lower concentrations than the current air quality objectives account for.

5.1.2 As set out in Section 3, a number of committed developments have been considered within the traffic data provided by Rappor. The further developments set out in AECOMs report have been considered, and it has concluded that these either have been included within the traffic flows, or have not been considered any further.

5.1.3 A further modelling exercise has been undertaken, which considered both the underestimates of background air quality concentrations and street canyons. The highest overall modelled concentrations are predicted at Receptor R23, with NO_2, PM_{10} and $PM_{2.5}$ concentration 28%, 41% and 28% below their respective current annual mean objectives / limits, as set out in Table 2.1. The conclusion of this modelling exercise was that the impacts of the proposed development would be 'not significant,' which is consistent with the previous air quality assessments.

5.1.4 As illustrated in Figure 3.2 and Figure 3.3 the primary roads within the AQMA has been modelled, which was in line with the revised Transport studies, which did not consider the link road.

5.1.5 The WHO guidelines have not been adopted by the government. Furthermore, although the $PM_{2.5}$ targets that will be brought forward by October 2022, as set out in the Environment Act 2021, have been out for consultation, they are yet to be adopted. Therefore, the assessment has been carried out using the current national objectives / limits, as set out in Table 2.1. As set out in paragraph 5.1.3 the further modelling has not demonstrated any exceedances of the NO_2, PM_{10} and $PM_{2.5}$ objectives / limits.

5.1.6 It can, therefore, be concluded that impacts associated with the proposed development are 'not significant' and the proposed development is not in breach of all relevant national and local air quality policy.

APPENDICES

APPENDIX A – RECEPTORS

Table A 1: Modelled Receptor Locations

ID	Description	Coordinates (m)		
		X	Y	Z
Existing Receptors				
R05	Residential	554426	238485	1.5
R06	Residential	554352	238445	1.5
R07	Residential	554334	238453	1.5
R15	Residential	554263	238425	1.5
R16	Residential	554183	238446	1.5
R17	Residential	554125	238453	1.5
R18	Residential	554007	238462	1.5
R19	Residential	553980	238465	1.5
R20	Residential	553700	238443	1.5
R21	Residential	553686	238510	1.5
R22	Residential	553654	238549	1.5
R23	Residential	553578	238617	1.5
R24	Residential	553551	238671	1.5
R25	Residential	553596	238613	1.5
R26	Residential	553660	238643	1.5
R27	Residential	553727	238701	1.5
R32	Residential	553773	238562	1.5
R33	Residential	553710	238536	1.5
R34	Residential	554003	238472	1.5
R35	Residential	554217	238396	1.5
R36	Residential	554146	238331	1.5
R37	Residential	554079	238250	1.5
R38	Residential	553912	238191	1.5
R39	Residential	553815	238143	1.5
R40	Residential	553780	238252	1.5
R41	Residential	553773	238202	1.5
R42	Residential	553778	238109	1.5
R43	Residential	553773	238069	1.5
R44	Residential	553797	237997	1.5
R45	Residential	553802	237956	1.5
R46	Residential	553853	237775	1.5
R47	Residential	553717	238046	1.5
R50	Residential	553621	237900	1.5

R51	Residential	553742	237786	1.5
R52	Residential	553933	237775	1.5
R53	Residential	554173	237768	1.5
R54	Residential	554323	237711	1.5
R55	Residential	554487	237647	1.5
R56	Residential	554731	237654	1.5
R57	Residential	554769	237493	1.5
R58	Residential	554668	237737	1.5
R63	Residential	554450	238269	1.5
R64	Residential	554383	238371	1.5
R65	Residential	554358	238437	1.5

Appendix B – Operational Impacts

Table B 1: Predicted NO_2 Impacts at Specified Receptors

Calculated NO_2 Annual Mean (µg/m³)					
Receptor	Annual Mean Objective	2026 Baseline	2026 Baseline + Proposed Development	% Change of Objective	Degree of Change
R05	40	18.6	18.9	1%	Negligible
R06	40	16.9	17.1	0%	Negligible
R07	40	17.4	17.7	1%	Negligible
R15	40	19.3	19.7	1%	Negligible
R16	40	17.7	17.9	1%	Negligible
R17	40	15.0	15.1	0%	Negligible
R18	40	15.5	15.6	0%	Negligible
R19	40	13.0	13.1	0%	Negligible
R20	40	19.9	20.1	0%	Negligible
R21	40	22.2	22.5	1%	Negligible
R22	40	20.7	24.9	>10%	Moderate
R23	40	28.4	28.9	1%	Negligible
R24	40	22.3	22.7	1%	Negligible
R25	40	13.7	13.8	0%	Negligible
R26	40	12.0	12.1	0%	Negligible
R27	40	12.1	12.2	0%	Negligible
R32	40	12.3	12.5	0%	Negligible
R33	40	12.6	12.8	0%	Negligible
R34	40	20.1	20.5	1%	Negligible
R35	40	14.9	15.0	0%	Negligible
R36	40	14.5	14.6	0%	Negligible
R37	40	16.5	16.6	0%	Negligible
R38	40	13.7	13.8	0%	Negligible
R39	40	15.5	15.6	0%	Negligible
R40	40	16.2	16.3	0%	Negligible
R41	40	13.3	13.4	0%	Negligible
R42	40	21.2	21.4	1%	Negligible
R43	40	15.9	16.0	0%	Negligible
R44	40	14.5	14.5	0%	Negligible
R45	40	12.4	12.4	0%	Negligible
R46	40	13.5	13.5	0%	Negligible
R47	40	13.7	13.8	0%	Negligible
R50	40	15.9	16.0	0%	Negligible
R51	40	11.9	11.9	0%	Negligible
R52	40	12.5	12.5	0%	Negligible
R53	40	13.0	13.0	0%	Negligible
R54	40	12.2	12.2	0%	Negligible

R55	40	12.7	12.7	0%	Negligible
R56	40	12.0	12.0	0%	Negligible
R57	40	11.4	11.4	0%	Negligible
R58	40	11.7	11.7	0%	Negligible
R63	40	16.6	16.7	0%	Negligible
R64	40	13.9	13.9	0%	Negligible
R65	40	16.0	16.1	0%	Negligible

Note: **Bold** indicates exceedance of the NO_2 annual mean objective.

Table B 2: Predicted PM_{10} Impacts at Specified Receptors

Calculated PM_{10} Annual Mean (μg/m³)					
Receptor	Annual Mean Objective	2026 Baseline	2026 Baseline + Proposed Development	% Change of Objective	Degree of Change
R05	40	20.0	20.1	0%	Negligible
R06	40	19.7	19.7	0%	Negligible
R07	40	19.8	19.9	0%	Negligible
R15	40	20.4	20.5	0%	Negligible
R16	40	20.4	20.5	0%	Negligible
R17	40	19.4	19.5	0%	Negligible
R18	40	19.3	19.4	0%	Negligible
R19	40	19.2	19.3	0%	Negligible
R20	40	20.8	20.9	0%	Negligible
R21	40	21.4	21.5	0%	Negligible
R22	40	22.1	22.3	1%	Negligible
R23	40	23.4	23.5	0%	Negligible
R24	40	23.2	23.3	0%	Negligible
R25	40	19.6	19.6	0%	Negligible
R26	40	19.1	19.1	0%	Negligible
R27	40	19.1	19.1	0%	Negligible
R32	40	19.2	19.3	0%	Negligible
R33	40	19.2	19.2	0%	Negligible
R34	40	20.6	20.7	0%	Negligible
R35	40	19.2	19.3	0%	Negligible
R36	40	19.2	19.3	0%	Negligible
R37	40	19.7	19.7	0%	Negligible
R38	40	19.6	19.6	0%	Negligible
R39	40	19.8	19.8	0%	Negligible
R40	40	19.9	19.9	0%	Negligible
R41	40	19.3	19.3	0%	Negligible
R42	40	21.2	21.2	0%	Negligible
R43	40	20.0	20.0	0%	Negligible
R44	40	20.2	20.2	0%	Negligible

R45	40	19.5	19.5	0%	Negligible
R46	40	19.7	19.7	0%	Negligible
R47	40	19.6	19.6	0%	Negligible
R50	40	20.4	20.4	0%	Negligible
R51	40	19.4	19.4	0%	Negligible
R52	40	19.5	19.5	0%	Negligible
R53	40	20.2	20.2	0%	Negligible
R54	40	19.9	19.9	0%	Negligible
R55	40	20.1	20.1	0%	Negligible
R56	40	19.9	19.9	0%	Negligible
R57	40	19.7	19.7	0%	Negligible
R58	40	19.7	19.7	0%	Negligible
R63	40	20.0	20.0	0%	Negligible
R64	40	19.0	19.0	0%	Negligible
R65	40	19.4	19.5	0%	Negligible

Note: **Bold** indicates exceedance of the PM_{10} annual mean objective.

Table B 3: Predicted $PM_{2.5}$ Impacts at Specified Receptors

Calculated $PM_{2.5}$ Annual Mean ($\mu g/m^3$)					
Receptor	Annual Mean Objective	2026 Baseline	2026 Baseline + Proposed Development	% Change of Objective	Degree of Change
R05	20	12.7	12.7	0%	Negligible
R06	20	12.5	12.5	0%	Negligible
R07	20	12.6	12.6	0%	Negligible
R15	20	12.9	12.9	0%	Negligible
R16	20	12.9	12.9	0%	Negligible
R17	20	12.3	12.4	0%	Negligible
R18	20	12.3	12.3	0%	Negligible
R19	20	11.9	11.9	0%	Negligible
R20	20	12.8	12.9	0%	Negligible
R21	20	13.2	13.2	0%	Negligible
R22	20	13.5	13.6	1%	Negligible
R23	20	14.3	14.4	0%	Negligible
R24	20	14.1	14.2	0%	Negligible
R25	20	12.1	12.1	0%	Negligible
R26	20	11.8	11.8	0%	Negligible
R27	20	11.9	11.9	0%	Negligible
R32	20	11.9	11.9	0%	Negligible
R33	20	11.9	11.9	0%	Negligible
R34	20	13.0	13.1	0%	Negligible
R35	20	12.3	12.3	0%	Negligible
R36	20	12.2	12.3	0%	Negligible

R37	20	12.5	12.5	0%	Negligible
R38	20	12.1	12.1	0%	Negligible
R39	20	12.2	12.3	0%	Negligible
R40	20	12.3	12.3	0%	Negligible
R41	20	11.9	11.9	0%	Negligible
R42	20	13.0	13.0	0%	Negligible
R43	20	12.3	12.3	0%	Negligible
R44	20	12.4	12.4	0%	Negligible
R45	20	12.0	12.0	0%	Negligible
R46	20	12.1	12.1	0%	Negligible
R47	20	12.1	12.1	0%	Negligible
R50	20	12.5	12.5	0%	Negligible
R51	20	11.9	11.9	0%	Negligible
R52	20	12.0	12.0	0%	Negligible
R53	20	12.4	12.4	0%	Negligible
R54	20	12.2	12.2	0%	Negligible
R55	20	12.3	12.3	0%	Negligible
R56	20	12.2	12.2	0%	Negligible
R57	20	12.1	12.1	0%	Negligible
R58	20	12.1	12.1	0%	Negligible
R63	20	12.6	12.7	0%	Negligible
R64	20	12.1	12.1	0%	Negligible
R65	20	12.4	12.4	0%	Negligible

Note: **Bold** indicates exceedance of the $PM_{2.5}$ annual mean objective.

Appendix C – Verification

Model verification studies are undertaken in order to check the performance of dispersion models and, where modelled concentrations are significantly different to monitored concentrations, a factor can be established by which the modelled results can be adjusted in order to improve their reliability. The model verification process is detailed in LAQM.TG(22).

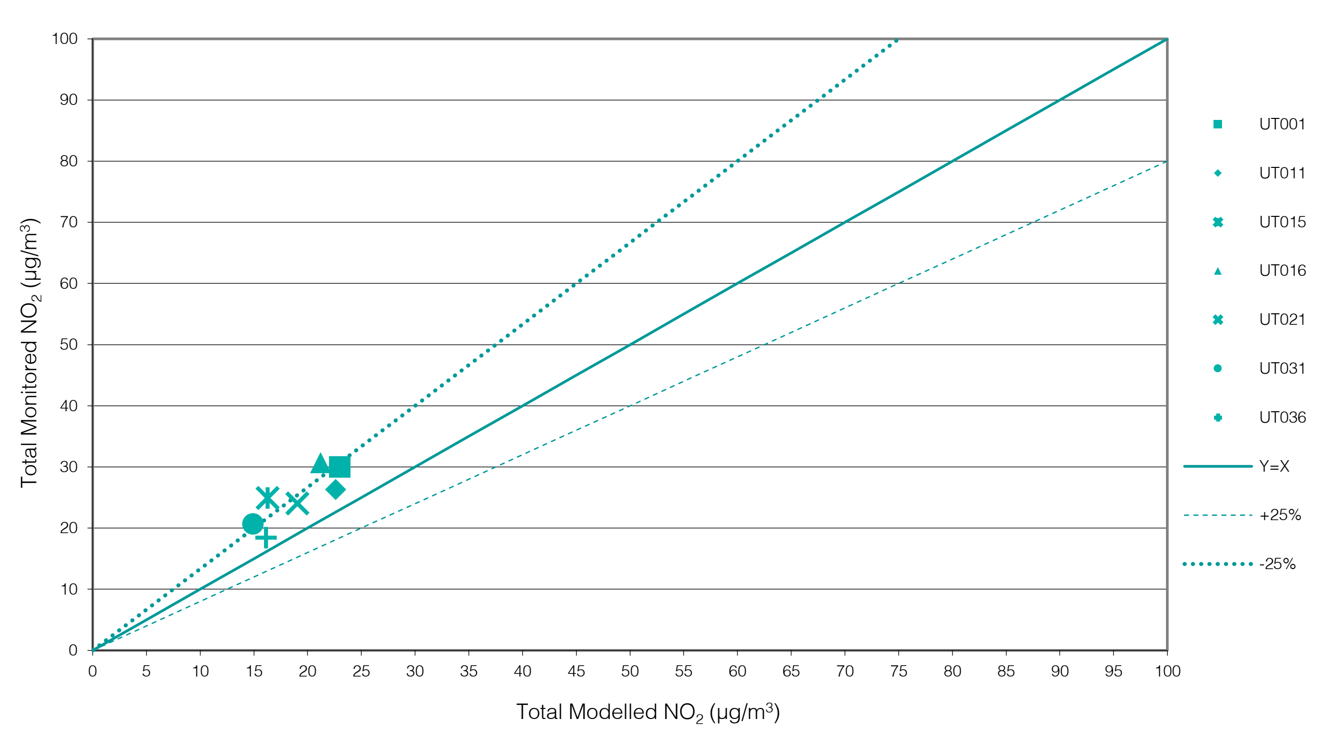
According to TG(22), no adjustment factor is necessary where the results of the model all lie within 25% of the monitored concentrations, but ideally within 10%.

Model verification can only be undertaken where there is sufficient roadside monitoring data in the vicinity of the subject scheme being assessed. TG(22) recommends that a combination of automatic and diffusion tube monitoring data is used; although this may be limited by data availability. For this assessment, seven NO_2 diffusion tube sites were used to verify against. These diffusion tubes were located within Saffron Walden. compares the monitored and modelled NO_2 concentrations at the monitoring locations.

Table C 1: Comparison of Monitored and Modelled NO_2 Concentrations

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
UT001	Diffusion Tube	30.0	23.0	-23.5
UT011	Diffusion Tube	26.3	22.6	-14.1
UT015	Diffusion Tube	24.9	16.3	-34.7
UT016	Diffusion Tube	30.7	21.2	-30.9
UT021	Diffusion Tube	24.0	19.1	-20.6
UT031	Diffusion Tube	20.7	14.9	-28.1
UT036	Diffusion Tube	18.4	16.1	-12.4

Figure C 1: Comparison of Monitored and Modelled NO_2 Concentrations Before Adjustment



The data in Table C 1 shows that the model is under-predicting NO_2 concentrations. This is not unusual and is likely to be the result of local dispersion conditions.

As the difference for all of the sites is greater than +/- 10%, an adjustment factor has been derived to ensure a conservative assessment is undertaken.

As it is primary NO_x rather than secondary NO_2 emissions that are modelled, an adjustment factor must be derived for the road contribution of NO_x. A ratio of the modelled versus monitored NO_x concentrations using the least squares statistical method has been undertaken to derive an adjustment factor, as set out in Table C.2.

Table C 2: Deriving the Adjustment Factor

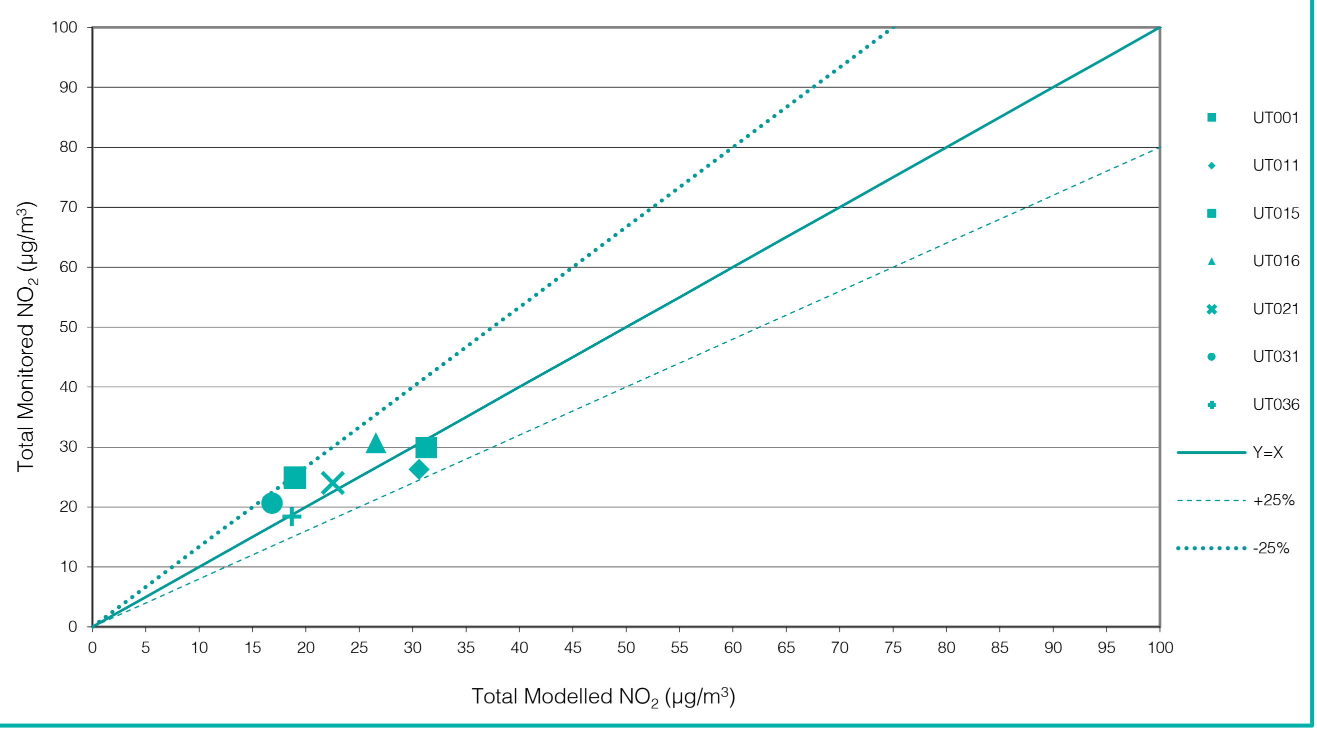
Site	Monitored Road NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio
UT001	32.6	18.3	1.929
UT011	24.9	17.6	
UT015	22.1	5.5	
UT016	30.3	11.3	
UT021	16.7	7.2	
UT031	14.9	3.9	
UT036	9.5	5.2	

Table C 3 compares monitored and modelled NO_2 concentrations at the monitoring location after the adjustment factor has been applied.

Table C 3: Comparison of Monitored and Adjusted Modelled NO_2 Concentrations

Site ID	Type	Concentrations (µg/m^3)		
		Monitored	Modelled	% Difference
UT001	Diffusion Tube	30.0	31.3	4.2
UT011	Diffusion Tube	26.3	30.6	16.4
UT015	Diffusion Tube	24.9	19.0	-23.8
UT016	Diffusion Tube	30.7	26.6	-13.5
UT021	Diffusion Tube	24.0	22.5	-6.1
UT031	Diffusion Tube	20.7	16.8	-18.7
UT036	Diffusion Tube	18.4	18.7	1.6

Figure C 2: Comparison of Monitored and Modelled NO_2 Concentrations After Adjustment



As the adjusted difference for the site is now less than +/- 25%, and at least three of the sites within the ideal +/- 10%, TG(22) considers the verification suitable.

A Root Mean Square Error (RMSE) has been calculated in Table C 4 to determine the error within the calculations after Road-NO_x adjustment, based upon the following calculation:

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(obs_i - Pred_i)^2}$$

Table C 4: Root Mean Squared Error

Site	Predictions	Observations	Difference
UT001	31.3	30.0	1.3
UT011	30.6	26.3	4.3
UT015	19.0	24.9	-5.9
UT016	26.6	30.7	-4.2
UT021	22.5	24.0	-1.5
UT031	16.8	20.7	-3.9
UT036	18.7	18.4	0.3
		RMSE:	3.6

The calculated RMSE is 3.6 µg/m³, which correlates to an 9.0% error ratio. The RMSE means that modelled results could be under or over predicting pollution concentrations between +/- 3.6 µg/m³. The RMSE means that modelled results are acceptable, as they are within a 10% margin of error (as advised in TG(22)), and therefore no adjustment factor is required.

As there are no appropriate PM_{10} or $PM_{2.5}$ monitoring locations within the study area, the predicted road-PM_{10} and road-$PM_{2.5}$ components have been adjusted using the road EFT NO_x factor before adding the appropriate background concentration.

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