ARDENT | CONSULTING ENGINEERS

EAST MALLING TRUST

PROPOSED RESIDENTIAL DEVELOPMENT: DITTON EDGE (SITE B)

AIR QUALITY ASSESSMENT

REPORT REF. 182600-13
PROJECT NO. 182600
DECEMBER 2018

PROPOSED RESIDENTIAL SCHEME:
DITTON EDGE (SITE B)

AIR QUALITY ASSESSMENT

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1.0 INTRODUCTION

Scope

1.1 Ardent Consulting Engineers (ACE) have been appointed on behalf of East Malling Trust (EMT) to produce an air quality assessment in relation to the proposed residential development located on land to the west of Kiln Barn Road (Site B) in Ditton, Kent (scheme referred to as 'Ditton Edge').

1.2 This air quality assessment considers the potential impacts of the proposed development on local air quality. The pollutants modelled as part of this assessment are nitrogen oxides (NOx) and particulate matter (PM_{10}).

1.3 The impacts of vehicle emissions have been assessed using the techniques detailed within Volume 11, Section 3 of the *Design Manual for Roads and Bridges* (*DMRB*)[1] and the *Local Air Quality Management Technical Guidance* (LAQM.TG16)[2]. The impact of road traffic emissions will be assessed using the ADMS-Roads air dispersion model. This model has been devised by Cambridge Environmental Research Consultants (CERC) and is described as a "*comprehensive tool for investigating air pollution problems due to small networks of roads*".

1.4 It should be noted that the short-term impacts of NO_2 and PM_{10} emissions have not been modelled as dispersion models are inevitably poor at predicting short-term peaks in pollutant concentrations, which are highly variable from year to year, and from site to site. Notwithstanding this, general assumptions have been made about short term concentrations based on the modelled annual mean concentrations.

1.5 In addition to this, the assessment has also assessed the potential impact on local air quality from demolition and construction activities at the site.

[1] Design Manual for Roads and Bridges, Vol 11, Section 3, Part 1 – HA207/07, Highways Agency, May 2007

[2] Part IV of the Environment Act 1995, Local Air Quality Management Technical Guidance (TG16), Defra, February 2018

2.0 POLLUTANTS AND LEGISLATION

Pollutant Overview

2.1 In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO_2), fine particulates (PM_{10}), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO_2). This air quality assessment focuses on NO_2 and PM_{10}, as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. **Table 2.1** provides an overview of NO_2 and PM_{10}.

Table 2.1 – Overview of NO_2 and PM_{10}

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particles (PM_{10})	Tiny particulates of solid or liquid nature suspended in the air	Road transport; Power generation plants; Production processes e.g. windblown dust	Soil erosion; Volcanoes; Forest fires; Sea salt crystals	Asthma; Lung cancer; Cardiovascular problems
Nitrogen Dioxide (NO_2)	Reddish-brown coloured gas with a distinct odour	Road transport; Power generation plants; Fossil fuels – extraction & distribution; Petroleum refining	No natural sources, although nitric oxide (NO) can form in soils	Pulmonary edema; Various environmental impacts e.g. acid rain

Air Quality Strategy

2.2 The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007[3]. The Strategy provides an over-arching strategic framework for air quality management in the UK.

2.3 With regards to this assessment, the Air Quality Strategy contains national air quality standards and objectives established by the Government to protect human health. The objectives for nitrogen dioxide and particulates (PM_{10} and $PM_{2.5}$) have been set, along with seven other pollutants (benzene, 1,3-butadiene, carbon monoxide, lead, PAHs, sulphur dioxide and ozone). Those which are limit values

[3] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs in partnership with the Scottish Executive, Welsh Assembly Government and Department of the Environment Northern Ireland, July 2007

required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2010 which came into force on 11th June 2010. **Table 2.2** provides the UK Air Quality Objectives for NO_2 and PM_{10}.

Table 2.2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as
Particles (PM_{10})	50μg/m^3 not to be exceeded more than 35 times a year	24 hour mean
	40μg/m^3	Annual mean
Particles ($PM_{2.5}$)	25μg/m^3 (except Scotland)	Annual Mean
Nitrogen Dioxide (NO_2)	200μg/m^3 not to be exceeded more than 18 times a year	1 hour mean
	40μg/m^3	Annual mean

2.4 Objectives for $PM_{2.5}$ were also introduced by the UK Government and the Devolved Administrations in 2010. However, these are not included in Regulations as the Air Quality Strategy has adopted an "exposure reduction" approach for $PM_{2.5}$ in order to seek a more efficient way of achieving further reductions in the health effects of air pollution by providing a driver to improve air quality everywhere in the UK rather than just in a small number of localised hotspot areas.

2.5 As defined in **Table 4.2**, background $PM_{2.5}$ concentrations are well below the limit value of 25.0 μg/m^3. As such, no further consideration has been given to $PM_{2.5}$ within this assessment.

Local Air Quality Management (LAQM)

2.6 At the core of LAQM delivery are three pollutant objectives; these are: nitrogen dioxide (NO_2), particulate matter (PM_{10}) and sulphur dioxide (SO_2). All current Air Quality Management Areas (AQMAs) across the UK are declared for one or more of these pollutants, with NO_2 accounting for the majority. It is a statutory requirement for local authorities to regularly review and assess air quality in their area and take action to improve air quality when objectives set out in regulation cannot be met.

Tonbridge and Malling Borough Council

2.7 The Council has declared a number Air Quality Management Areas (AQMAs). The "Ditton" and "Larkfield" AQMAs are located along the A20 London Road, meaning changes in vehicle flows along this link following completion of the proposed development could have a significant impact within the AQMA.

3.0 PLANNING POLICY AND GUIDANCE

National Planning Policy & Guidance

National Planning Policy Framework

3.1 On a national level, air quality can be a material consideration in planning decisions. The updated National Planning Policy Framework (NPPF) for England, released in July 2018, is considered a key part of the Governments reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

3.2 Paragraph 103 within the NPPF states that the "*The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making*".

3.3 It goes on to state in paragraph 170 that "*Planning policies and decisions should contribute to and enhance the natural and local environment by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans*".

3.4 And in paragraph 181 it states that "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions* *should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan*".

Land-Use Planning & Development Control

3.5 In January 2017, Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) produced guidance to ensure that air quality is adequately considered in the land-use planning and development control processes[4].

3.6 The guidance document is particularly applicable to assessing the effect of changes in exposure of members of the public resulting from residential and mixed-use developments, especially those within urban areas where air quality is poorer. It is also relevant to other forms of development where a proposal could affect local air quality and for which no other guidance exists.

Regional Planning Policy & Guidance

Kent and Medway Air Quality Partnership

3.7 The Air Quality Technical Guidance for the Kent and Medway Air Quality Partnership (September 2015) has been developed in response to the changes in national planning policy, through the National Planning Policy Framework (NPPF). The guidance will be regularly reviewed and updated in light of any specific future national and local policy changes, and feedback from users of the document.

3.8 Based on this guidance the proposed development is considered to be "major" as it exceeds 200 residential units and the air quality assessment has followed the appropriate methodology outlined within the guidance.

Local Planning Policy & Guidance

Tonbridge and Malling Borough Council

3.9 Policy SQ4 within the Councils "*Managing Development and the Environment DPD*" relates specifically to air quality and states the following:

[4] Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017

"*Development will only be permitted where all of the following criteria are met:*

(a) the proposed use does not result in a significant deterioration of the air quality of the area, either individually or cumulatively with other proposals or existing uses in the vicinity;

(b) proposals would not result in the circumstances that would lead to the creation of a new Air Quality Management Area;

(c) proximity to existing potentially air polluting uses will not have a harmful effect on the proposed use; and

(d) there is no impact on the air quality of internationally, nationally and locally designated sites of nature conservation interest or appropriate mitigation is proposed to alleviate any such impact".

4.0 ASSESSMENT METHODOLOGY

Construction Phase

4.1 The IAQM has published guidance on the assessment of dust from construction and demolition[5]. Based on this guidance, the main air quality impacts that may arise during construction activities are: -

- Dust deposition, resulting in the soiling of surfaces;
- Visible dust plumes, which are evidence of dust emissions;
- Elevated PM_{10} concentrations, as a result of dust generating activities on site; and
- An increase in concentrations or airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment on site.

4.2 In relation to the most likely impacts, the guidance states the following:

"*The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of particulate matter in all size fractions.*

Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed".

4.3 The guidance continues by providing an assessment procedure. This includes sub-dividing construction activities into four types to reflect their different potential impacts. These are as follows: -

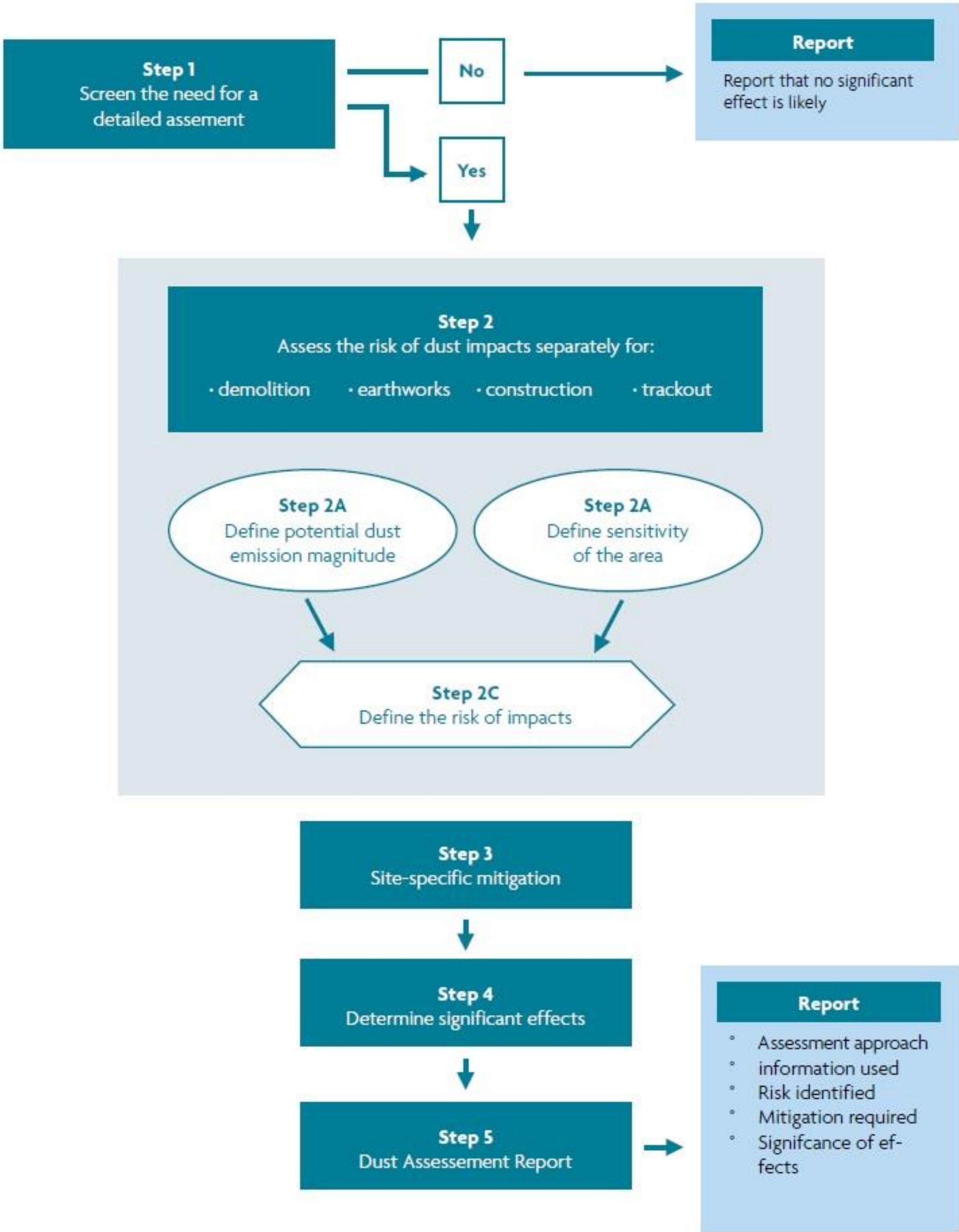
- Demolition;
- Earthworks;

5 Holman et al (2014). IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/construction-dust-2014.pdf

- Construction; and
- Track out.

4.4 With regards to the proposed development the potential for dust emissions is assessed for each activity that is likely to take place. The assessment procedure assumes no mitigation measures are applied. The conditions with no mitigation thus form the baseline or "do-nothing" situation for a construction site. The assessment procedure uses the steps provided in the guidance and summarised in **Figure 4.1**.

Figure 4.1 – Dust Assessment Procedure



Operational Phase (Traffic Emissions)

Modelled Scenarios

4.5 A modelled baseline year of 2017 has been used. A future year has also been chosen (2031) representing a future year with the proposed scheme in place and includes changes to traffic flows due to the scheme. Overall, four scenarios have been adopted as part of the assessment. These are as follows:

- **Scenario 1** – existing levels of air quality (2017);
- **Scenario 2** – future baseline (2031);
- **Scenario 3** – future baseline + proposed development (2031); and
- **Scenario 4** – future baseline + proposed & committed developments (2031).

4.6 Scenarios 2, 3 and 4 will be used to determine the potential impact on existing receptors adjacent to the modelled road network as a result of the proposed and committed developments.

4.7 The committed development flows include a number of developments contained within the A20 Forecast Junction Assessment undertaken by Amey on behalf of Kent County Council in March 2018. The committed development flows also include the proposed residential development in Ditton (site C) to the east of New Road.

4.8 Predicted concentrations will be compared to the Air Quality Strategy objectives. Background pollutant concentrations and vehicle emission rates for all modelled years are based on the latest data issued by the Department for the Environment, Food and Rural Affairs (DEFRA). These background concentrations and emission factors are discussed further in the following sections.

ADMS-Roads

4.9 Modelling the impact of traffic emissions on the proposed development has been undertaken using the latest version of the ADMS-Roads model[6]. The approach adopted by ADMS-Roads is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure, and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters. The model uses advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions.

Emission Factors

4.10 DEFRA and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 8.0.1) which incorporates updated NOx emissions factors and vehicle fleet information[7]. These emission factors have been integrated into the latest ADMS-Roads modelling software. However, in order to undertake a worst-case assessment emission factors for 2017 have been used for all modelled years.

Traffic Data

4.11 Modelled traffic data is provided in **Table 4.1**. For the modelled speeds, the figures provided in **Table 4.1** have been used. However, where a link approaches a junction a speed of 20 kph has been modelled (or the speed provided in **Table 4.1**, whichever is lower) in order to represent queuing traffic at a junction.

4.12 There is a reduction in flows along the A20 London Road (west of New Road) when taking into account the committed development flows. This is due to the redistribution of vehicle flows on the local network.

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6 Model Version: 4.1.1.0. Interface Version 4.1.1 (18/01/2018)
7 https://laqm.defra.gov.uk/documents/EFT2017_v8.0.1.xlsb.zip

Table 4.1 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Modelled Roads, 2017 and 2031

Modelled Year / Scenario	Link	Baseline Flows			Baseline + Development Flows			Baseline + Development & Committed Flows		
		24-Hr AADT	**% HGV**	**Average Speed (kph)**	**24-Hr AADT**	**% HGV**	**Average Speed (kph)**	**24-Hr AADT**	**% HGV**	**Average Speed (kph)**
Modelled Baseline (2017)	Kiln Barn Road (south of site entrance)	1,294	11.0%	50						
	Kiln Barn Road (north of site entrance)	1,294	11.0%	50						
	Kiln Barn Road / New Road	1,294	11.0%	50						
	A20 London Road (west of New Road)	17,766	10.0%	70						
	A20 London Road (east of New Road)	13,432	10.0%	70						
Year of Completion (2031)	Kiln Barn Road (south of site entrance)	1,525	11.0%	50	1,769	9.7%	50	1,769	9.7%	50
	Kiln Barn Road (north of site entrance)	1,525	11.0%	50	2,950	6.6%	50	2,950	6.6%	50
	Kiln Barn Road / New Road	1,525	11.0%	50	2,950	6.6%	50	2,950	6.6%	50
	A20 London Road (west of New Road)	18,907	10.0%	70	19,585	9.7%	70	17,676	9.7%	70
	A20 London Road (east of New Road)	14,919	10.0%	70	15,390	9.8%	70	17,564	9.8%	70

Street Canyons

4.13 A street canyon may be defined as a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. Street canyons may result in elevated pollutant concentrations from road traffic emissions due to a reduced likelihood of the pollutants becoming dispersed in the atmosphere. Street canyons have not been modelled as part of this assessment.

Background Concentrations

4.14 Background NOx, NO_2 and PM_{10} concentrations have been obtained from Defra[8]. These 1 km x 1 km grid resolution maps are derived from a base year of 2015 (for NOx, NO_2, PM_{10} and $PM_{2.5}$ only), which are then projected to future years (2017). Background concentrations of NOx, NO_2, PM_{10} and $PM_{2.5}$ derived from DEFRA are provided in **Table 4.2**.

Table 4.2 – Background NOx, NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Pollutant	X	Y	2017
NO_2	571500	158500	18.2
NOx			25.6
PM_{10}			17.9
$PM_{2.5}$			12.1

4.15 In order to undertake a worst-case assessment, 2017 background concentrations have been assumed for all modelled scenarios.

Surface Roughness

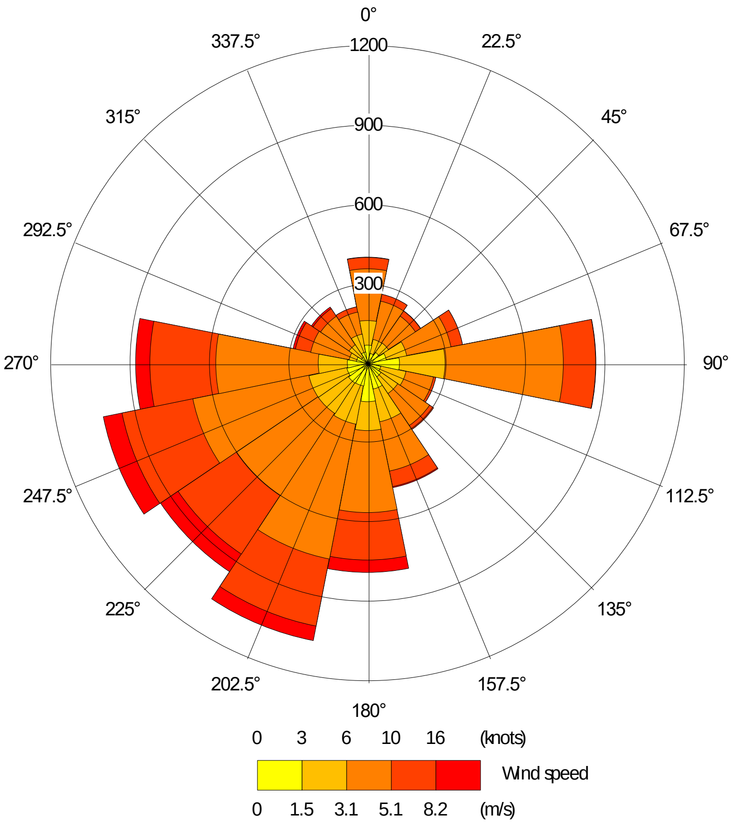
4.16 A surface roughness of 0.5 metres has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for open suburbia. This value has been used across the modelled domain.

8 http//uk-air.defra.gov.uk/data/laqm-background-maps?year=2015

Meteorological Data

4.17 Hourly sequential meteorological data from the Gravesend meteorological station has been used. Wind speed and direction data from the Gravesend meteorological station has been plotted as a wind rose in **Figure 4.2**.

Figure 4.2 – Wind Speed and Direction Data, Gravesend



Model Output

NOx/NO_2 Relationship

4.18 Following recent evidence that shows the proportion of primary NO_2 in vehicle exhaust has increased[9]. As such, a new NOx to NO_2 calculator has been devised[10]. This new calculator has been used to determine NO_2 concentrations for this assessment, based on predicted NOx concentrations using ADMS-Roads. Converted NO_2 concentrations are initially compared to local monitoring data in order to verify the model output. If the model performance is considered unacceptable then the NOx concentrations are adjusted before conversion to NO_2.

Predicted Short Term Concentrations

4.19 As discussed in the introduction, it has not been possible to model the short-term impacts of NO_2 and PM_{10}. Research undertaken in 2003[11] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 $\mu g/m^3$.

4.20 For PM_{10}, a relationship between the annual mean and the number of 24-hour mean exceedances has been devised and is as follows: -

- No. 24-hour mean exceedances = -18.5 + 0.00145 x annual mean^3 + (206/annual mean)

4.21 This relationship has been applied to the modelled annual mean concentrations in order to estimate the number of 24-hourly exceedances.

[9] Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007
[10] https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v6.1.xls
[11] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

Model Verification

4.22 Monitored concentrations from a number of roadside monitoring sites have been used for the purposes of model verification during the baseline year (2017). Sites have been selected based on their proximity to the proposed development and the modelled network, and the availability of traffic data. The location of these verification sites is provided in **Table 4.3**.

Table 4.3 – Modelled Verification Locations

Monitoring ID	Location	X	Y	Height (m)
TN47	London Road, Ditton (nos 516)	571399	158375	1.84
TN64	London Road, Larkfield (no 606)	570948	158482	2.9
TN89	7 Station Road, Ditton	571305	158412	2.16
TN92	794 London Rd, Larkfield	570189	158326	2.15
TN49,53,54	London Road	571237	158377	2.48
TN57,58,59	London Road, Larkfield (no 743)	570467	158328	1.74
DF4,5,6	London Road (no559), Ditton Bus stop (W-bound)	571139	158427	2.28
DF7,8,9	London Road (by Wealden Hall), Larkfield Bus Stop (W bound)	570386	158311	2.21

Receptor Locations

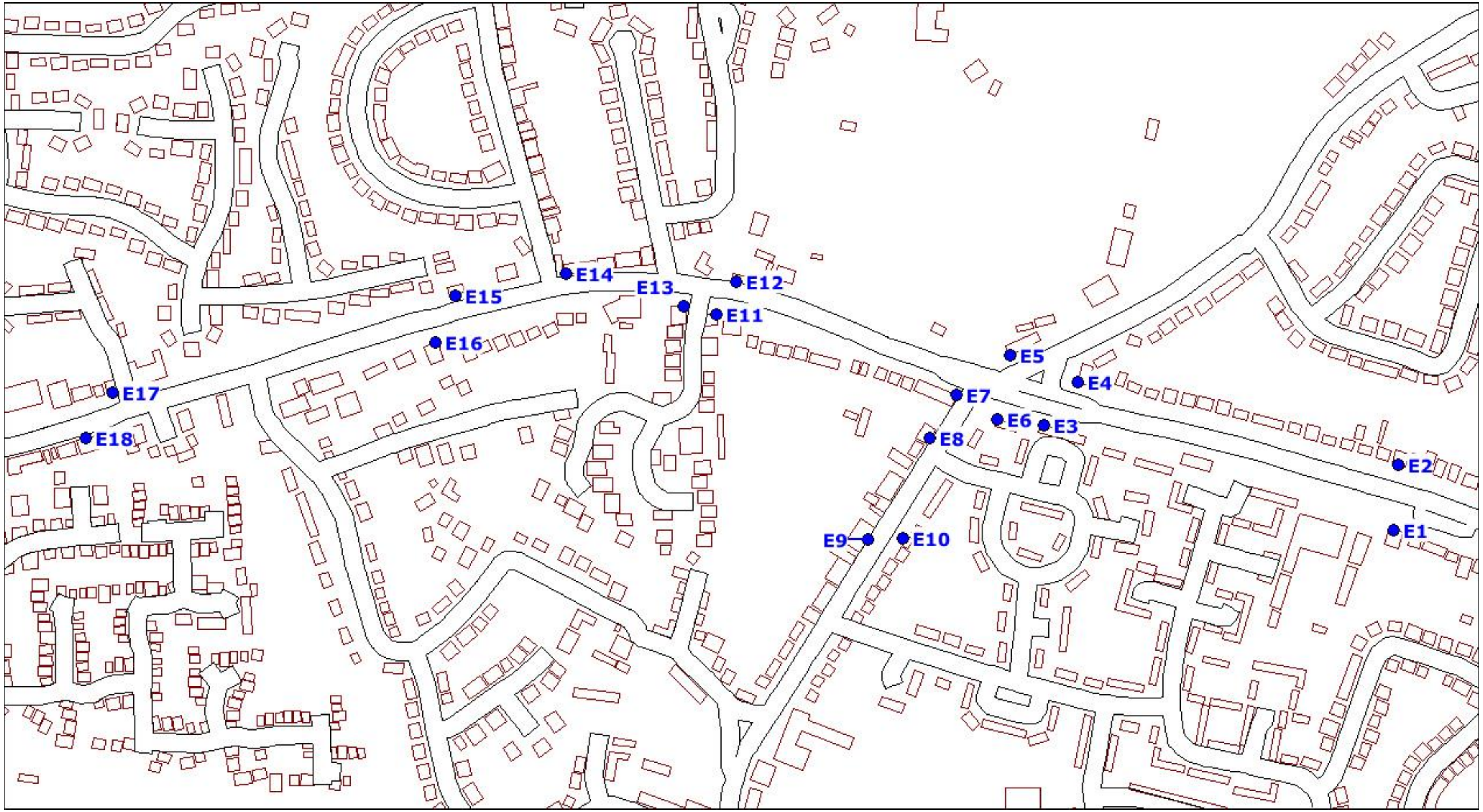
4.23 In order to assess the potential impact of the development on existing receptors, a number of receptors have been identified adjacent to the modelled road network. These receptors represent the façade of the property and have been chosen given their proximity to the modelled road network. The location of these receptors is provided in **Table 4.4** and **Figure 4.3**.

4.24 The receptors identified represent relevant exposure to air quality, such as residential properties, schools, hospitals or care homes. Not all receptors adjacent to a modelled road have been included in the assessment as the receptors selected will represent worst case locations e.g. closest to a road and/or modelled junction.

Table 4.4 – Modelled Receptor Locations

AQA ID	X	Y	Height (m)
E1	571628	158255	1.5
E2	571632	158312	
E3	571323	158347	
E4	571353	158384	
E5	571294	158408	
E6	571283	158352	
E7	571247	158373	
E8	571224	158336	
E9	571170	158247	
E10	571201	158248	
E11	571037	158443	
E12	571055	158472	
E13	571009	158451	
E14	570907	158478	
E15	570810	158460	
E16	570793	158419	
E17	570511	158375	
E18	570488	158335	

Figure 4.3 – Modelled Receptor Locations



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Significance Criteria

Construction Phase

4.25 The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts should be determined using four risk categories: negligible, low, medium and high risk. A development is allocated to a risk category based on two factors: -

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (see **Table 4.5**); and
- the sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity.

4.26 These two factors are combined to determine the risk of dust impacts with no mitigation applied (see **Table 4.6**). The risk category assigned to the development can be different for each of the four potential activities (demolition, earthworks, construction and trackout).

Table 4.5 – Dust Emission Magnitude

Activity	Dust Emission Class		
	Large	***Medium***	***Small***
Demolition	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level	Total building volume 20,000 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months
Earthworks	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes	Total site area 2,500 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10,000 tonnes, earthworks during wetter months
Construction	Total building volume >100,000 m^3, piling, on site concrete batching; sandblasting	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber)
Track out	>50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m	10–50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50– 100m;	<10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Table 4.6 – Risk of Dust Impacts

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

Operational Phase

4.27 The joint guidance released by EPUK and the IAQM provides impact descriptors for individual receptors. These descriptors are provided in **Table 4.7**.

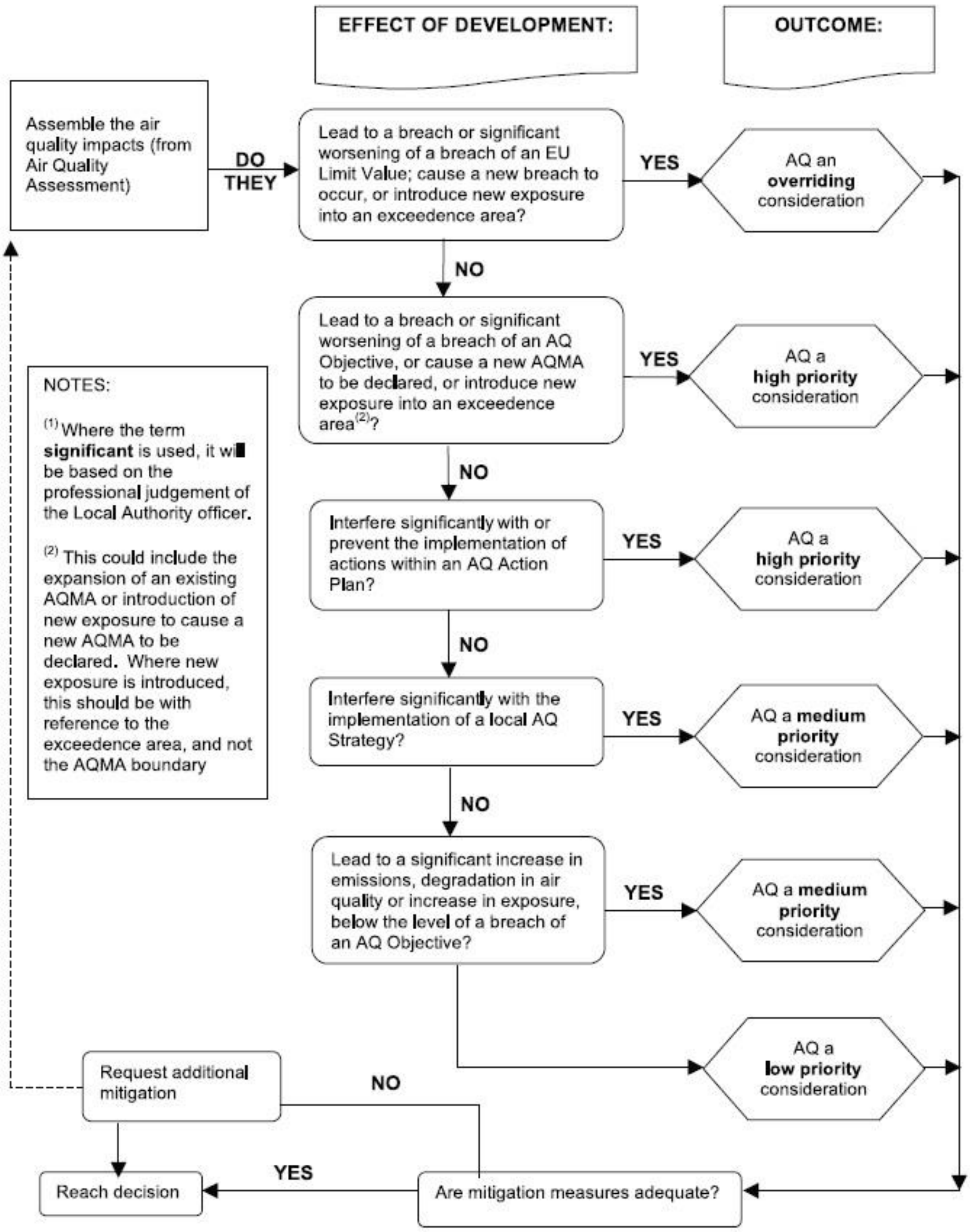
Table 4.7 – Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQ objective			
	1%	2-5%	6-10%	>10%
75% or less of AQ objective	Negligible	Negligible	Slight	Moderate
76-94% of AQ objective	Negligible	Slight	Moderate	Moderate
95-102% of AQ objective	Slight	Moderate	Moderate	Substantial
103-109% of AQ objective	Moderate	Moderate	Substantial	Substantial
110% or more of AQ objective	Moderate	Substantial	Substantial	Substantial

4.28 Furthermore, the guidance released by Environmental Protection UK[12] also provides steps for a Local Authority to follow in order to assess the significance of air quality impacts of a development proposal. This procedure, shown in **Figure 4.4**, has also been applied to the modelled results.

[12] Development Control: Planning for Air Quality (2010 Update), Updated guidance from Environmental Protection UK on dealing with air quality concerns within the development control process

Figure 4.4 – Assessing the Significance of Air Quality Impacts of a Development Proposal



5.0 AIR QUALITY ASSESSMENT

Impact of Construction Activities

5.1 The assessment of construction activities has focused on demolition, earthworks, construction and track out activities at the site. Using the criteria provided in **Table 4.5**, the dust emission magnitude for each activity is as follows: -

- Demolition = N/A;
- Earthworks = Large;
- Construction = Large; and
- Track out = Medium.

5.2 Based on the IAQM guidance the sensitivity of the surrounding area is summarised in **Table 5.1**.

Table 5.1 – Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	High	High	High
Human Health	N/A	Low	Low	Low

5.3 The dust emission magnitudes and sensitivity of the surrounding area are combined to determine the risk of dust impacts with no mitigation applied. These are summarised in **Table 5.2**.

Table 5.2 – Summary of Dust Risk

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	N/A	High Risk	High Risk	Low Risk
Human Health	N/A	Low Risk	Low Risk	Low Risk

5.4 It should also be noted that the likelihood of an adverse impact occurring is correlated to wind speed and wind direction. As such, unfavourable wind speeds and wind directions must occur at the same time as a dust generating activity in order to generate an adverse impact. The overall impacts also assume that the dust generating activities are occurring over the entirety of the site meaning that as an activity moves further away from a potential receptor the magnitude and significance of the impact will be further reduced.

Impact of Vehicle Emissions

Model Verification

5.5 Using the guidance provided in the Local Air Quality Management Technical Guidance TG(16), the modelled output has been verified against the monitoring data obtained from the sites listed in **Table 5.3**. The following tables provide a summary of the model verification process for NO_2 concentrations.

Table 5.3 – Comparison of Modelled and Monitored NO_2 Concentrations ($\mu g/m^3$), 2017

Verification Location	Modelled Concentration	Monitored Concentration	Difference [(modelled - monitored)/ monitored] x100
TN47	22.0	19.6	12.0%
TN64	22.1	29.4	-24.9%
TN89	21.2	24.1	-12.1%
TN92	28.7	43.2	-33.7%
TN49,53,54	21.9	31.3	-30.1%
TN57,58,59	23.4	31.4	-25.6%
DF4,5,6	22.3	31.9	-30.2%
DF7,8,9	23.6	35.0	-32.6%

5.6 As described in the Technical Guidance (LAQM.TG09), in order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within ±25% (ideally ±10%) of the monitored concentrations.

Since the modelled NO_2 concentrations are outside ±10% the predicted modelled concentrations will require adjustment in order to improve the confidence in modelled concentrations across the modelled domain. This is described further in the next section.

5.7 Verification location "TN47" has been removed from the model verification process as it is the only receptor that is showing a model over prediction. Furthermore, the recorded concentration at this site is very close to the modelled background, which is inconsistent with other results in the area.

Model Adjustment

5.8 In order to undertake model adjustment, it is first necessary to derive the monitored and modelled road contributions of NOx (excluding background). The modelled road contribution NOx is taken directly from the ADMS-Roads output before it has been converted to NO_2 using the NOx to NO_2 calculator described in paragraph 4.18. The NOx to NO_2 calculator can also be used to derive monitored road contributions of NOx from NO_2 diffusion tube results. A summary of these calculations is provided in **Table 5.4**.

Table 5.4 – Monitored NOx and NO_2 concentrations, 2017

Site ID	Monitored Total NO_2	Defra Background NO_2	Monitored road contribution NO_2 (total – background)	Monitored road contribution NOx (total – background)	Modelled road contribution NOx (excludes background)	Ratio of monitored road contribution NOx / modelled road contribution NOx
TN64	29.4	18.2	11.2	22.1	7.4	3.0
TN89	24.1	18.2	5.9	11.4	5.7	2.0
TN92	43.2	18.2	25	52.8	20.6	2.6
TN49,53,54	31.3	18.2	13.1	26.1	7.0	3.7
TN57,58,59	31.4	18.2	13.2	26.3	9.9	2.6
DF4,5,6	31.9	18.2	13.7	27.3	7.8	3.5
DF7,8,9	35	18.2	16.8	34.0	10.3	3.3

5.9 Once the monitored and modelled road contributions of NOx (excluding background) have been derived the contributions of NOx are compared using a linear regression. This is shown in **Figure 5.1**. The equation of this line is 2.8157 and is used to adjust the modelled road contribution of NOx. This is shown in **Table 5.5**.

Figure 5.1 – Linear Regression of Modelled and Monitored NOx Road Contributions, 2017

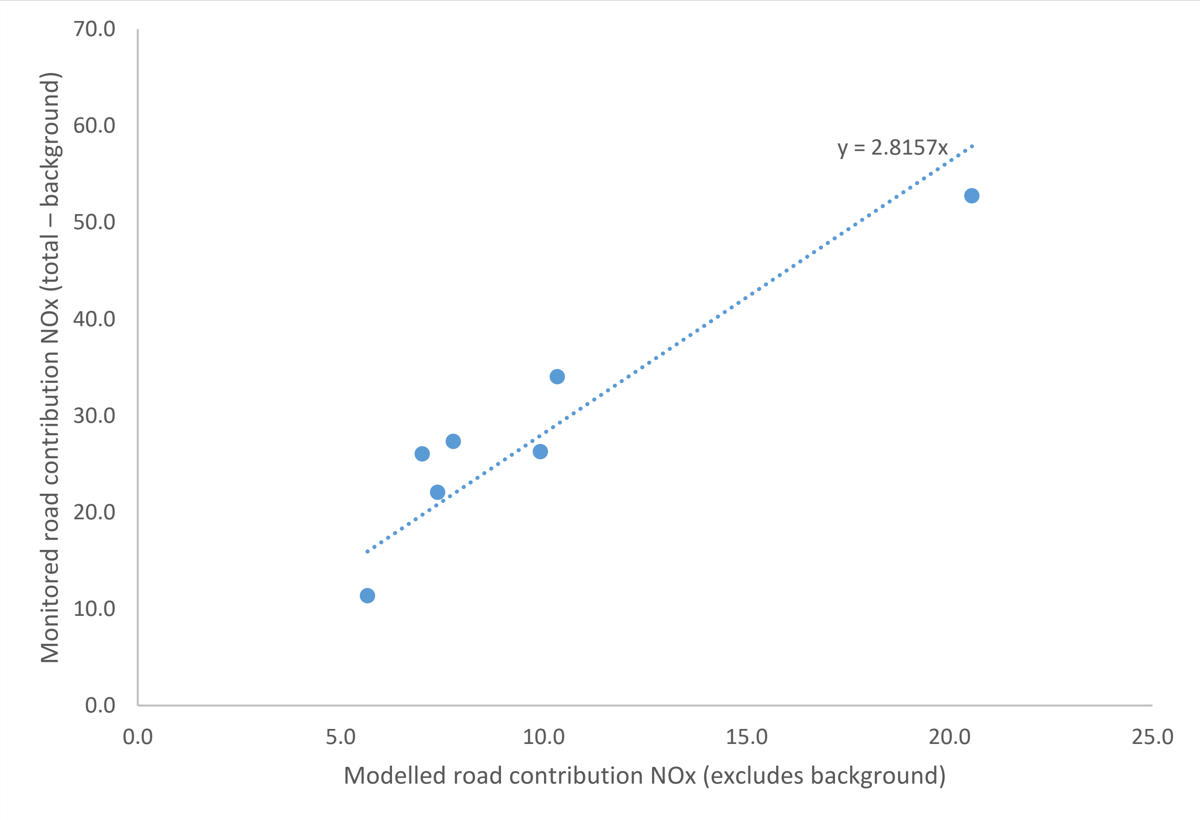


Table 5.5 – Adjustment of Modelled NOx Contributions, 2017

AQA ID	Adjustment factor for modelled road contribution	Adjusted modelled road contribution NOx	Modelled total NO_2 (based on empirical NOx/NO_2 relationship)	Monitored total NO_2	% Difference [(modelled – monitored) / monitored] x 100
TN64	2.8157	20.8	28.8	29.4	-2.1%
TN89	2.8157	15.9	26.4	24.1	9.5%
TN92	2.8157	57.9	45.3	43.2	4.9%
TN49,53,54	2.8157	19.7	28.3	31.3	-9.7%
TN57,58,59	2.8157	27.9	32.2	31.4	2.5%
DF4,5,6	2.8157	21.9	29.3	31.9	-8.2%
DF7,8,9	2.8157	29.1	32.7	35.0	-6.5%

5.10 Following adjustment of the modelled NOx concentrations by a factor of 2.8157 the total NO_2 concentration at the model verification location has been calculated using the method described in paragraph 4.18. The revised NO_2 concentration, shown in **Table 5.5**, indicates a more acceptable model performance when compared against the monitored NO_2 concentrations with the majority of modelled concentrations within ±10% of the monitored concentration. As such, an adjustment factor of 2.8157 has been applied to all modelled NOx concentrations across the model domain before conversion to NO_2.

Nitrogen Dioxide

5.11 Predicted annual mean concentrations for NO_2 at existing receptors using all future scenarios (2022) are provided in **Table 5.6** (Proposed Development flows only) and **Table 5.7** (Proposed + Committed flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

Table 5.6 – Comparison of Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) at Existing Receptors, Proposed Development Traffic Only (2031)

Receptor	Future Baseline	Future Baseline + Proposed Development	% of AQ Objective	Change	% Change	Impact Descriptor
E1	21.4	21.5	53.8%	0.1	0.25%	Negligible
E2	24.8	25.0	62.5%	0.2	0.50%	Negligible
E3	26.7	27.0	67.5%	0.3	0.75%	Negligible
E4	31.5	31.9	79.8%	0.4	1.00%	Negligible
E5	29.6	30.0	75.0%	0.4	1.00%	Negligible
E6	25.6	26.0	65.0%	0.4	1.00%	Negligible
E7	30.7	32.0	80.0%	1.3	3.25%	Slight
E8	23.2	24.2	60.5%	1.0	2.50%	Negligible
E9	20.9	21.9	54.8%	1.0	2.50%	Negligible
E10	20.2	20.7	51.8%	0.5	1.25%	Negligible
E11	24.1	24.3	60.8%	0.2	0.50%	Negligible
E12	35.0	35.5	88.8%	0.5	1.25%	Negligible
E13	25.1	25.3	63.3%	0.2	0.50%	Negligible
E14	33.7	34.2	85.5%	0.5	1.25%	Negligible
E15	30.5	30.8	77.0%	0.3	0.75%	Negligible
E16	24.5	24.7	61.8%	0.2	0.50%	Negligible
E17	29.2	29.5	73.8%	0.3	0.75%	Negligible
E18	30.7	31.0	77.5%	0.3	0.75%	Negligible
Objective	**40.0**					

Table 5.7 – Comparison of Predicted Annual Mean NO_2 Concentrations (µg/m^3) at Existing Receptors, Proposed +Committed Flows (2031)

Receptor	Future Baseline	Future Baseline + Proposed & Committed Developments	% of AQ Objective	Change	% Change	Impact Descriptor
E1	21.4	21.9	54.8%	0.5	1.25%	Negligible
E2	24.8	25.9	64.8%	1.1	2.75%	Negligible
E3	26.7	27.9	69.8%	1.2	3.00%	Negligible
E4	31.5	33.5	83.8%	2.0	5.00%	Slight
E5	29.6	30.6	76.5%	1.0	2.50%	Slight
E6	25.6	26.5	66.3%	0.9	2.25%	Negligible
E7	30.7	31.7	79.3%	1.0	2.50%	Slight
E8	23.2	24.2	60.5%	1.0	2.50%	Negligible
E9	20.9	21.9	54.8%	1.0	2.50%	Negligible
E10	20.2	20.7	51.8%	0.5	1.25%	Negligible
E11	24.1	23.8	59.5%	-0.3	-0.75%	Negligible
E12	35.0	33.9	84.8%	-1.1	-2.75%	Negligible
E13	25.1	24.7	61.8%	-0.4	-1.00%	Negligible
E14	33.7	32.7	81.8%	-1.0	-2.50%	Negligible
E15	30.5	29.6	74.0%	-0.9	-2.25%	Negligible
E16	24.5	24.1	60.3%	-0.4	-1.00%	Negligible
E17	29.2	28.4	71.0%	-0.8	-2.00%	Negligible
E18	30.7	29.8	74.5%	-0.9	-2.25%	Negligible
Objective	**40.0**					

5.12 When comparing the predicted NO_2 concentrations in 2022 with and without the proposed development the impact is considered negligible or slight, depending on the location of the modelled receptor. When taking into account the proposed and committed development flows the impact is also considered negligible or slight, depending on the location of the modelled receptor. However, the total predicted concentrations when taking into account the proposed and committed developments are below the relevant air quality objective.

5.13 Nitrogen dioxide also has an hourly objective of 200 µg/m^3 not to be exceeded more than 18 times in one year. However, the hourly mean concentration has not been calculated directly by ADMS Roads. This is as a result of an evaluation of continuous monitoring data from across the UK that revealed that the relationship between the annual mean and hourly mean NO_2 concentrations was very weak. Nonetheless, research undertaken in 2003[13] has indicated that the hourly NO_2 objective is unlikely to be exceeded at a roadside location where the annual mean NO_2 concentration is less than 60 µg/m^3. Given that predicted NO_2 concentrations in 2017 and 2031 are below 60 µg/m^3 the likelihood of the short-term objective being exceeded is considered low.

Particulate Matter

5.14 Predicted annual mean concentrations for PM_{10} at existing receptors using all future scenarios (2022) are provided in **Table 5.8** (Proposed Development flows only) and **Table 5.9** (Proposed + Committed flows). The change in predicted concentrations at existing receptors has also been provided, together with the impact descriptor for each receptor.

[13] Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

Table 5.8 – Comparison of Predicted Annual Mean PM_{10} Concentrations ($\mu g/m^3$) at Existing Receptors, Proposed Development Traffic Only (2031)

Receptor	Future Baseline	Future Baseline + Proposed Development	% of AQ Objective	Change	% Change	Impact Descriptor
E1	18.1	18.1	45.3%	0.0	0.0%	Negligible
E2	18.3	18.3	45.8%	0.0	0.0%	Negligible
E3	18.2	18.2	45.5%	0.0	0.0%	Negligible
E4	18.4	18.4	46.0%	0.0	0.0%	Negligible
E5	18.3	18.4	46.0%	0.1	0.2%	Negligible
E6	18.2	18.2	45.5%	0.0	0.0%	Negligible
E7	18.4	18.5	46.3%	0.1	0.3%	Negligible
E8	18.1	18.2	45.5%	0.1	0.2%	Negligible
E9	18.0	18.1	45.3%	0.1	0.3%	Negligible
E10	18.0	18.0	45.0%	0.0	0.0%	Negligible
E11	18.3	18.3	45.8%	0.0	0.0%	Negligible
E12	19.0	19.1	47.8%	0.1	0.3%	Negligible
E13	18.3	18.4	46.0%	0.1	0.2%	Negligible
E14	19.0	19.0	47.5%	0.0	0.0%	Negligible
E15	18.7	18.7	46.8%	0.0	0.0%	Negligible
E16	18.3	18.3	45.8%	0.0	0.0%	Negligible
E17	18.6	18.6	46.5%	0.0	0.0%	Negligible
E18	18.6	18.6	46.5%	0.0	0.0%	Negligible
Objective	**40.0**					

Table 5.9 – Comparison of Predicted Annual Mean PM_{10} Concentrations (µg/m^3) at Existing Receptors, Proposed +Committed Flows (2031)

Receptor	Future Baseline	Future Baseline + Proposed & Committed Developments	% of AQ Objective	Change	% Change	Impact Descriptor
E1	18.1	18.1	45.3%	0.0	0.0%	Negligible
E2	18.3	18.4	46.0%	0.1	0.2%	Negligible
E3	18.2	18.3	45.8%	0.1	0.3%	Negligible
E4	18.4	18.5	46.3%	0.1	0.3%	Negligible
E5	18.3	18.4	46.0%	0.1	0.2%	Negligible
E6	18.2	18.2	45.5%	0.0	0.0%	Negligible
E7	18.4	18.4	46.0%	0.0	0.0%	Negligible
E8	18.1	18.2	45.5%	0.1	0.2%	Negligible
E9	18.0	18.1	45.3%	0.1	0.3%	Negligible
E10	18.0	18.0	45.0%	0.0	0.0%	Negligible
E11	18.3	18.2	45.5%	-0.1	-0.3%	Negligible
E12	19.0	19.0	47.5%	0.0	0.0%	Negligible
E13	18.3	18.3	45.8%	0.0	0.0%	Negligible
E14	19.0	18.9	47.3%	-0.1	-0.3%	Negligible
E15	18.7	18.7	46.8%	0.0	0.0%	Negligible
E16	18.3	18.3	45.8%	0.0	0.0%	Negligible
E17	18.6	18.5	46.3%	-0.1	-0.3%	Negligible
E18	18.6	18.5	46.3%	-0.1	-0.3%	Negligible
Objective	**40.0**					

5.15 When comparing the predicted PM_{10} concentrations in 2022 with and without the proposed development the impact is considered negligible at all modelled receptors. When taking into account and proposed and committed development flows the impact is also considered negligible at all modelled receptors.

5.16 When comparing the predicted PM_{10} concentrations in 2031 with and without the proposed development the impact is considered negligible. In addition, the maximum number of days when PM_{10} concentrations are more than 50 µg/m^3 is 2, less than the 35 exceedences allowed in the regulations.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Impact from Construction Activities

6.1 A qualitative assessment of dust levels associated with the proposed development has been undertaken. The impact of dust soiling and PM_{10} can be reduced to negligible through appropriate mitigation measures, which are listed in **Table 6.1** and are applicable to a high risk site. Implementation of these Best Practice Measures will help reduce the impact of the construction activities to an acceptable level.

6.2 With these mitigation measures enforced, the likelihood of nuisance dust episodes occurring at those receptors adjacent to the development are considered low. Notwithstanding this, the developer should take into account the potential impact of air quality and dust on occupational exposure standards (in order to minimise worker exposure) and breaches of air quality objectives that may occur outside the site boundary. Continuous visual assessment of the site should be undertaken and a complaints log maintained in order determine the origin of a particular dust nuisance. Keeping an accurate and up to date complaints log will isolate particular site activities to a nuisance dust episode and help prevent it from reoccurring in the future.

Table 6.1 – Mitigation of Construction Activities

Construction Activity	Mitigation Measures
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make a complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and air quality pollutant emissions, either on or off the site, and the action taken to resolve the situation is recorded in the log book.
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
	Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by those accountable for dust and air quality pollutant emissions issues when activities with a high potential to produce dust and emissions and dust are being carried out, and during prolonged dry or windy conditions.
Preparing and maintaining the site	Plan site layout: machinery and dust causing activities should be located away from receptors.
	Erect solid screens or barriers around dust activities or the site boundary that are, at least, as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping
Operating vehicle/machinery	Ensure all non-road mobile machinery (NRMM) comply with standards.
	Ensure all vehicles switch off engines when stationary – no idling vehicles.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where possible.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter mitigation (using recycled water where possible).
	Use enclosed chutes, conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods
Waste Management	Reuse and recycle waste to reduce dust from waste materials
	Avoid bonfires and burning of waste materials.

Impact of Vehicle Emissions

6.3 The change in predicted PM_{10} concentrations at existing receptors in 2022 following completion of the proposed and committed developments is considered negligible at all modelled receptors. Overall, using the flow chart presented in Figure 6, air quality (PM_{10}) is a low priority consideration with regards to the impact of the proposed development.

6.4 When considering the proposed development alone the impact is considered negligible or slight for NO_2, depending on the location of the modelled receptors. However, the total predicted concentrations at all modelled receptors are below the relevant air quality objective. Using the flow chart presented in Figure 6, air quality (NO_2) is a low priority consideration with regards to the impact of the proposed development alone.

6.5 At worst, the cumulative impacts of predicted NO_2 concentrations from both the proposed and committed developments is considered negligible or slight depending on the location of the existing receptor. The total predicted concentrations at all modelled receptors are below the relevant air quality objective. Furthermore, the committed development flows also show an improvement in predicted concentrations at a number of receptors. Using the flow chart presented in Figure 6, air quality (NO_2) is a low priority consideration with regards to the impact of the proposed and committed developments.

6.6 When using the Kent and Medway Air Quality Planning Guidance, the proposed development alone, as well as the combined impacts from the proposed and committed developments are considered to have a medium impact on local air quality. For a development with a medium impact the guidance goes on to state the following in relation to mitigation:

"*Seek mitigation to reduce air quality impacts.*

Mitigation to include reducing exposure through various measures, emissions reduction technologies and/or development redesign".

Mitigation of Vehicle Emissions

6.7 Based on the outcome of this assessment the minimum level of mitigation is recommended, as outlined in the joint IAQM/EPUK air quality planning guidance. These are as follows: -

- The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 1000m^2 of commercial floorspace; and
- Provision of a travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety.

6.8 In addition to this, the guidance issued by the Kent and Medway Air Quality Partnership also defines the proposed development as a major development. As such, an emissions mitigation assessment should also be undertaken. This is summarised in the next section.

Emissions Mitigation Assessment

6.9 The emissions mitigation assessment has been undertaken in accordance with the methodology outlined within the guidance issued by the Kent and Medway Air Quality Partnership. In addition to an assessment of the impacts during demolition/construction, which has already been considered as part this air quality assessment, it states that the emissions mitigation assessment must include the following:

- Development traffic input data for emissions mitigation calculation
- Emissions calculation and totals
- Mitigation proposed to be equivalent to the value of emissions calculation (appropriate to the type and size of development and local policy requirements)

6.10 The emissions A damage cost calculation was undertaken for NOx, PM_{10} and $PM_{2.5}$ to determine the level of mitigation to be implemented as part of the scheme. Using the methodology supplied within the guidance issued by the Kent and

Medway Air Quality Partnership the damage cost (without mitigation) was calculated using the following procedure:

1. Identifying the additional trip rates generated by the proposed development;

2. The emissions calculated for the pollutants of concern (NOx, PM_{10} and $PM_{2.5}$) using the latest Emissions Factor Toolkit (EFT)[14];

3. The air quality damage costs calculation for the specific pollutant emissions.

6.11 The damage cost (without mitigation) has been calculated over five years from a base year of 2017. This is an estimate of the costs to society due to the impact of increases in vehicle emissions associated with the proposed development. It should be noted that this calculation assumes no improvement in vehicle emissions (as contained in the EFT) following completion of the proposed development and is therefore worst case, with the base year equivalent to the modelled baseline (2017) in the main air quality assessment as vehicle emissions in this year have been verified against local monitoring data.

6.12 The proposed development would generate 1,669 daily vehicle movements (2.0% HDVs). This input is summarised in **Table 6.2** along with the subsequent calculations.

6.13 The total damage cost is £347,396 over five years from 2017. This is an estimate of the costs to society due to the impact of increases in emissions associated with the proposed development. As defined by the IAQM/EPUK guidance[15] the damage cost relates to the value of mitigation that should be applied, preferably on-site.

[14] https://laqm.defra.gov.uk/documents/EFT2017_v8.0.1.xlsb.zip
[15] Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. EPUK & IAQM. January 2017

Table 6.2 – Input Data and Calculations for Damage Costs

EFT Input Parameter	EFT Input
Road Type	Urban (not London)
Traffic flow	1,669
%HDV	2.0%
Speed (kph)	48
No of Hours	24
Link Length (km)	10
EFT Output (NOx)	
Annual Emissions	2,361 kg/annum
IGCB Damage Costs (Central Estimate)	£25,252/tonne (or £21,044 if PM is also valued)
1-year Damage Cost	£49,679
5-year Damage Cost	£248,396
EFT Output (PM_{10})	
Annual Emissions	217 kg/annum
IGCB Damage Costs (Central Estimate)	£58,125
1-year Damage Cost	£12,591
5-year Damage Cost	£62,956
EFT Output ($PM_{2.5}$)	
Annual Emissions	126 kg/annum
IGCB Damage Costs (Central Estimate)	£58,125
1-year Damage Cost	£7,326
5-year Damage Cost	£36,629