



Manor Farm and Copseys Nursery: Air Quality Assessment

**Prepared for
Barratt David Wilson &
Generator Group LLP**

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EXECUTIVE SUMMARY

A detailed air quality assessment based on the potential impacts of a proposed residential development located within Warblington (a suburb of Havant) to the east of Havant town centre, approximately 300m north east of Warblington Train Station and circa 400m northwest of the A27, has been undertaken. The assessment has focused on the increase in traffic flows along Southleigh Road and queuing traffic at the level crossing.

Nitrogen oxides (NO_x) and particulate matter (PM₁₀) have been modelled for the assessment using the most recent version of ADMS-Roads, including meteorological and background air quality data. The most up to date understanding of NO_x/NO₂ relationships have been applied to the modelled NO_x concentrations in order to derive NO₂ concentrations. The changes in predicted concentrations at existing receptors adjacent to the Southleigh Road level crossing have been compared against relevant significance criteria.

The magnitude of change in predicted concentrations of NO₂ and PM₁₀ in 2017 is considered imperceptible at all modelled receptors adjacent to the level crossing. The significance of this change is considered negligible. It has not been possible to verify the model output against local monitoring data meaning the absolute concentrations at these receptors should be treated with caution. However, the predicted change in NO₂ and PM₁₀ concentrations would still be considered imperceptible and the overall significance considered negligible regardless of the baseline conditions without the proposed development.

Overall, air quality (NO₂ and PM₁₀) is a “low priority consideration” at the modelled locations in each of the modelled years with regards to the impact of the development.

1 INTRODUCTION

1.1 Scope

GEM Air Quality Ltd has been appointed to undertake a detailed air quality assessment based on the potential impacts of a proposed residential development located within Warblington (a suburb of Havant) to the east of Havant town centre, approximately 300m north east of Warblington Train Station and circa 400m north west of the A27. The location of the proposed development is provided in Figure 1.

As requested by the Havant Borough Council the detailed air quality assessment will focus on the potential impacts on local traffic emissions once the development has been completed. More precisely the Council have indicated that the assessment should focus on the impact of queuing traffic at the level crossing along Southleigh Road, approximately 300 metres south of the proposed development.

The pollutants modelled as part of this assessment are nitrogen dioxide (NO₂) and particulate matter (PM₁₀). 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.TG09)². The impact of road traffic emissions will be assessed using the latest version of 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.

It should be noted that the short term impacts of NO₂ and PM₁₀ 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.

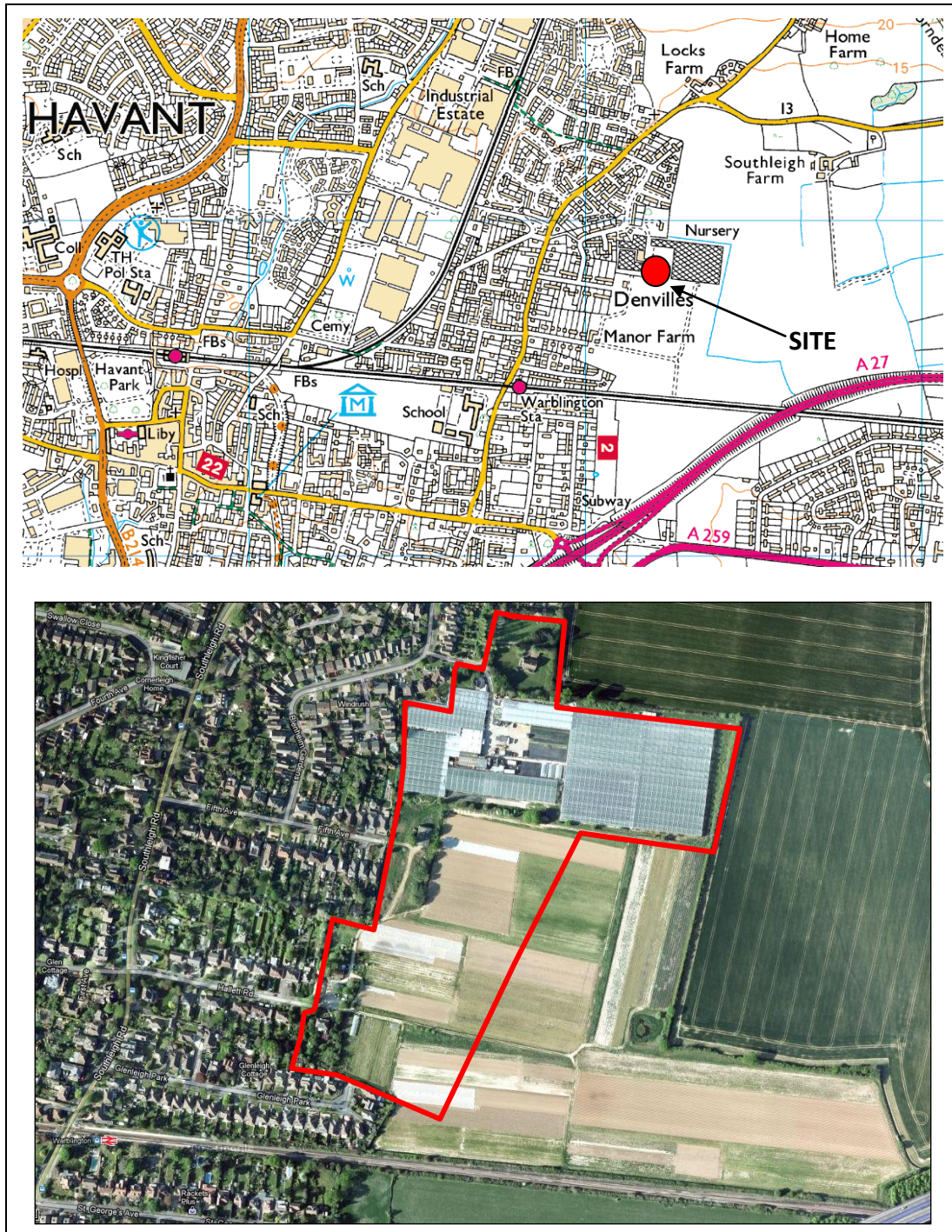
1.2 The Proposed Development

The proposed development lies within Havant Borough Council. The proposed development does not lie within or adjacent to an Air Quality Management Area (AQMA) as none have been declared by the Council.

¹ Design Manual for Roads and Bridges, Volume 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 (TG09), Defra, February 2009

Figure 1 – Site Location



2 POLLUTANTS & LEGISLATION

2.1 Pollutant Overview

In most urban areas of the UK, traffic generated pollutants have become the most common pollutants. These are nitrogen dioxide (NO₂), fine particulates (PM₁₀), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO₂). This air quality assessment focuses on NO₂ and PM₁₀, as these pollutants are least likely to meet their Air Quality Strategy objectives near roads. Table 1 provides an overview of NO₂ and PM₁₀.

Table 1 – Overview of NO₂ and PM₁₀

Pollutant	Properties	Anthropogenic Sources	Natural Sources	Potential Effects
Particulates (PM₁₀)	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 (NO₂)	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

2.2 Air Quality Strategy

The UK Government and the devolved administrations published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland on 17 July 2007³. The Strategy provides an over-arching strategic framework for air quality management in the UK by way of the following:

- setting out a way forward for work and planning on air quality issues;
- setting out the air quality standards and objectives to be achieved;
- introducing a new policy framework for tackling fine particles; and
- identifying potential new national policy measures which modelling indicates could give further health benefits and move closer towards meeting the Strategy's objectives.

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

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

objectives for nitrogen dioxide and particulates (PM₁₀ 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 required by EU Daughter Directives on Air Quality have been transposed into UK law through the Air Quality Standards Regulations 2007 which came into force on 15th February 2007. Table 2 provides the UK Air Quality Objectives for NO₂ and PM₁₀.

Table 2 – UK Air Quality Objectives for Nitrogen Dioxide and Particulate Matter

Pollutant	Objective	Concentration measured as	Date to be achieved by and maintained thereafter
Particulates (PM₁₀)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	40µg/m ³	Annual mean	31 December 2004
Nitrogen Dioxide (NO₂)	200µg/m ³ not to be exceeded more than 18 times a year	1 hour mean	31 December 2005
	40µg/m ³	Annual mean	31 December 2005

Objectives for PM_{2.5} have also been introduced by the UK Government and the Devolved Administrations, but these are not included in Regulations. As such, this assessment has not considered the impact on PM_{2.5}.

2.3 Local Air Quality Management

Part IV of the Environment Act 1995 requires local authorities to review and assess existing air quality within their boundaries, as well as predict future air quality as part of an ongoing Review and Assessment process. The current timetable for Review and Assessment (rounds 4, 5 and 6) requires every local authority to report to Defra up to and including 2017, with the different elements repeated over a three year cycle. The elements required to be undertaken as part of the Review and Assessment process are as follows:

- **Updating and Screening Assessment (USA)** – the first step in the Review and Assessment process. The main objective of the USA is to identify those matters that have changed since the last Review and Assessment, which might lead to a risk of an air quality objective being exceeded. Using a checklist format, the USA covers assessment of new monitoring data, new objectives, new sources or significant changes to existing sources (either locally or in neighbouring authorities) and other local changes that might affect air quality. All local authorities in the United

Kingdom should have completed a USA by April 2009 with the next USA due by April 2012.

- **Detailed Assessment** – where the USA has identified a risk that an air quality objective will be exceeded at a location with relevant public exposure, the local authority will be required to undertake a Detailed Assessment. The main objective of the Detailed Assessment is to identify with reasonable certainty whether or not a likely exceedence will occur. Such conclusions should be sufficiently detailed to allow the designation or amendment of any necessary Air Quality Management Areas (AQMAs). Should a local authority be required to undertake a Detailed Assessment based on the outcome of their USA, it should be completed within 12 months of being initiated.
- **Progress Reports** – undertaken to maintain continuity from year to year, as part of the reporting process. As such, Progress Reports are required in those years when a USA is not being completed. The last deadline for the completion of a Progress Report was 30th April 2011.
- **Further Assessments** – supplement data provided in the Detailed Assessment. As such, it should aim to confirm the exceedence of the objectives as well as define what improvement in air quality and corresponding reduction in emissions is required to attain the objectives. In order to better assist in the development of an Air Quality Action Plan, the Further Assessment should also provide information on source contributions. A Further Assessment is required within 12 months of an AQMA being declared.

2.3.1 Havant Borough Council

Havant Borough Council is currently completing its most recent Updating and Screening Assessment. The most recent Progress Report, completed in June 2011, concluded that there had been measured exceedences of the annual mean objective for NO₂ in 2010. These exceedences were recorded within Havant town centre and the Council are currently performing a Detailed Assessment for the Havant area.

No exceedences of the NO₂ annual mean objective have been recorded outside of Havant town centre. As such, no further detailed assessments are considered necessary.

3 PLANNING POLICY & GUIDANCE

3.1 National Planning Policy & Guidance

3.1.1 National Planning Policy Framework

On a national level, air quality can be a material consideration in planning decisions. The National Planning Policy Framework (NPPF) for England, released on 27th March 2012, 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. The NPPF replaces the Planning Policy Statement 23 (PPS23) *Planning and Pollution Control*⁴.

The NPPF states that the “planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”.

It goes on to state that “planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan”.

3.1.2 Environmental Protection UK

In 2006, the National Society for Clean Air and Environmental Protection (NSCA) issued a guidance document with regards to assisting both developers and planning authorities on air quality issues⁵. In April 2010, this guidance was updated by Environmental Protection UK (formerly known as the National Society for Clean Air and Environmental Protection)⁶.

The updated guidance provides a set of criteria used to determine whether a development will have a significant impact on air quality. If the Proposed development results in a significant change in air quality or results in a change of relevant exposure to air quality then it is reasonable to expect an air quality assessment to be undertaken. The report describes how, in all cases, professional judgement is required when deciding if an air quality assessment is necessary, as it is not possible to apply an exact and precise set of criteria to all development proposal situations.

⁴ Planning Policy Statement 23: Planning and Pollution Control, Office of the Deputy Prime Minister (ODPM), November 2004

⁵ Development Control: Planning for Air Quality, An Updated guidance from NSCA on dealing with air quality concerns within the development control process, NSCA, 2006

⁶ 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, Environmental Protection UK, April 2010

3.1.3 The Air Quality Expert Group

The Air Quality Expert Group (AQEG) is an advisory group that provides independent scientific advice on air quality. AQEG published *Air Quality and Climate Change: A UK Perspective*⁷ in 2007. The report recognises the potential for both local and global air quality improvements. Local authorities will be looking towards reductions in both and developers should take this into account throughout the design, construction and operational phases of a development, bearing in mind any potential trade-offs between global and local air quality improvements.

3.2 Local Planning Policy

3.2.1 Havant Borough Council

The Planning and Compulsory Purchase Act 2004 introduced significant changes to the planning system. It provided details for replacing the Local Plan, Unitary Development Plan (UDP) and Structure Plan policies with a Local Development Framework (LDF). The LDF consists of a portfolio of local development documents (LDDs), made up from Development Plan Documents (DPDs) and Supplementary Planning Documents (SPDs).

Details relating to Havant Borough Councils local planning air quality policies are provided in Section 6 of the Councils most recent Air Quality Progress Report.

⁷ Air Quality Expert Group (AQEG) report – Air quality and climate change: a UK perspective, published for the Department for Environment, Food and Rural Affairs, Scottish Executive, Welsh Assembly Government and Department of the Environment in Northern Ireland, 2007

4 ASSESSMENT METHODOLOGY

4.1 Operational Phase (Traffic Emissions)

4.1.1 ADMS-Roads

Modelling the impact of traffic emissions on the proposed development will be undertaken using the latest version of the ADMS-Roads model⁸. 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.

4.1.2 Emission Factors

Defra and the Devolved Administrations have provided an updated Emission Factors Toolkit (Version 5.1) which incorporates updated NO_x emissions factors and vehicle fleet information⁹. Currently, the most up to date version of ADMS-Roads incorporates version 4.2 of the Emission Factors Toolkit. However, ADMS-Roads allows users to enter vehicle emission rates manually. Defra have devised a toolkit that allows the user to calculate vehicle emissions for multiple road links based on vehicle fleet composition, traffic speeds and road type¹⁰. These emissions can then be entered into the ADMS-Roads model. This approach has been adopted as part of this assessment.

4.1.3 Modelled Scenarios

A future year has been chosen (2017) for the assessment, along with the baseline year (2011). The future year represents the year of completion. Overall, three scenarios have been adopted as part of the assessment. These are as follows:

- Existing levels of air quality (2011);
- 2017 Do-Minimum (excluding development traffic flows); and
- 2017 Do-Something (including development traffic flows).

The change in modelled concentrations between the Do-Minimum and Do-Something scenarios was used to determine the potential impact on existing receptors adjacent to the modelled road network as a result of increased traffic levels generated by the development once completed. The impact of local road traffic emissions on the proposed development itself was determined using the Do-Something scenarios.

⁸ Interface Version 3.1.0, Build 2.39, Release Date 17 August 2011

⁹ <http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#eft>, August 2012

¹⁰ http://laqm.defra.gov.uk/documents/EFT2012_v5.1.3.zip, August 2012

4.1.4 Traffic Data

Baseline (2011) traffic flows along the Southleigh Road has been provided by Vectos¹¹. Annual Average Daily Traffic flows (AADT) and vehicle compositions (percentage Heavy Duty Vehicles – HDV) for these roads are provided in Table 3.

The annual average speed modelled for the modelled roads are also provided in Table 3. The modelled speed is based on individual speed limits. However, where a link approaches a junction e.g. to the north and south of the Southleigh Road level crossing, a speed of 5 kph has been modelled in order to account for slow moving traffic at the junction.

Table 3 – Annual Average Daily Traffic Flows, Percentage HDV and Speeds for Selected Roads, Baseline (2011)

Road / Link	AADT	%HDV	Speed (kph)
Southleigh Road	5,069	1.0%	48

Baseline data for 2011 has been projected to 2017. Projection of traffic data has been undertaken using growth factors specific to Havant Borough Council, obtained from Temprow¹² and National Road Traffic Forecasts (NRTF)¹³. These projected traffic flows include a Do-Minimum traffic flow (excluding development traffic) and a Do-Something traffic flow (including development traffic provided by Vectos). The projected AADT flows are provided in Table 4. It has been assumed that the percentage HDV and vehicle speeds in 2017 will remain unchanged from the 2011 baseline data.

Table 4 – Projected Annual Average Daily Traffic Flows for Selected Roads, 2017

Road / Link	AADT Do-Minimum 2017	AADT Do-Something 2017	Change	% Change
Southleigh Road	5,622	6,692	1,070	19.0%

4.1.5 Queuing Traffic

Queuing data related to the level crossing has been provided by K&M Traffic Surveys. Based on this data the average number of vehicles queuing to the north and south of the level crossing during AM and PM peak periods is 14 and 15, respectively. It has been assumed that each vehicle takes up 5 metres. This has been based on typical car parking space

¹¹ <http://www.vectos.co.uk>

¹² Temprow (Trip End Model Presentation Program) version 6, dataset v5.4 Department for Transport

¹³ National Road Traffic Forecasts (Great Britain) 1997, Department for Transport

requirements (4.8 metres) for a typical vehicle (car) issued by Local Authorities across the UK. As such, the length of queue to the north and south of the level crossing is 70 metres and 75 metres, respectively. As discussed in the previous section, a speed of 5 kph has been modelled in order to account for queuing traffic at the level crossing. This is the lowest speed that can be modelled within the ADMS-Roads model.

4.1.6 Street Canyons

A street canyon may be defined as a relatively narrow street with buildings on both sides. 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 considered as part of this assessment.

4.2 Background Concentrations

Background NO₂ and PM₁₀ concentrations have been obtained from the National Air Quality Archive UK Background Air Pollution Maps¹⁴. These 1 km x 1 km grid resolution maps are derived from a base year of 2010 (for NO_x, NO₂, PM₁₀ and PM_{2.5} only), which are then projected to future years. These are provided in Table 5. In order to undertake a worst case assessment the 2011 background concentrations have been used for all modelled years.

Table 5 – Background NO_x, NO₂ and PM₁₀ Concentrations Nearest to the Southleigh Road Level Crossing

Pollutant	X	Y	2011	2017
NO ₂	472500	106500	22.7	18.3
NO _x			33.7	25.7
PM ₁₀			16.0	14.8

4.3 Surface Roughness

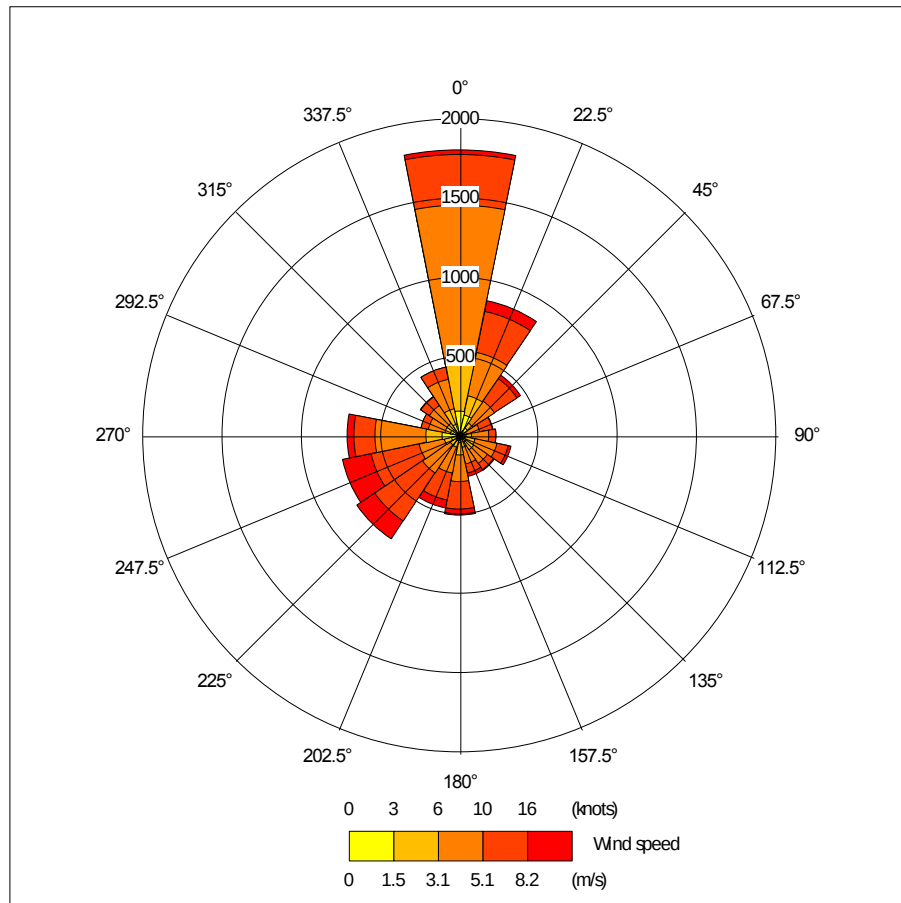
A surface roughness of 0.5 metres has been used in the model. This value is provided by ADMS-Roads as a typical roughness length for “open suburbia”. This value has been used across the modelled domain.

4.4 Meteorological Data

Hourly sequential meteorological data from the Shoreham meteorological station has been used for all modelled years. Wind speed and direction data from the Shoreham meteorological station has been plotted as a wind rose in Figure 2.

¹⁴ <http://laqm.defra.gov.uk/maps/maps2010.html>

Figure 2 – Wind Speed and Direction Data, Shoreham



4.5 Model Output

4.5.1 NO_x/NO₂ Relationship

Following recent evidence that shows the proportion of primary NO₂ in vehicle exhaust has increased¹⁵ a new NO_x to NO₂ calculator has been devised¹⁶. This new calculator has been used to determine NO₂ concentrations for this assessment, based on predicted NO_x concentrations using ADMS-Roads.

Once the above conversion is performed, annual mean NO₂ concentrations can then be added to the annual mean background. This value can then be compared to the annual mean air quality objective for NO₂.

4.5.2 Predicted Short Term Concentrations

As discussed in the introduction, it has not been possible to model the short term impacts of NO₂ and PM₁₀. Research undertaken in 2003¹⁷ has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³.

For PM₁₀, a relationship between the annual mean and the number of 24-hour mean exceedences has been devised and is as follows:

- No. 24-hour mean exceedences = $-18.5 + 0.00145 \times \text{annual mean}^3 + (206/\text{annual mean})$

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

4.5.3 Model Verification

Havant Borough Council undertakes monitoring of NO₂ at a number of locations across the Borough. However, there are no monitoring locations adjacent to the modelled road network meaning it has not been possible to verify modelled NO₂ concentrations. Furthermore, the Council do not undertake monitoring of PM₁₀ meaning it has not been possible to verify modelled PM₁₀ concentrations.

4.5.4 Receptor Locations

In order to assess the potential impact of emissions from queuing traffic at the level crossing along Southleigh Road a number of receptors have been identified. A description of these receptors, together with their height above ground level (modelled at 0 metres) is provided

¹⁵ Trends in Primary Nitrogen Dioxide in the UK, Air Quality Expert Group, 2007

¹⁶ <http://laqm.defra.gov.uk/documents/NOx-NO2-Calculator-v3.1.xls>, August 2012

¹⁷ Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

in Table 6. Their location is provided in Figure 3, together with the modelled road network (in blue). Receptors have been chosen that represent residential properties or other sensitive receptors.

Table 6 – Modelled Receptor Locations

Receptor	Coordinate Location		Receptor Height (m)	Receptor Description
	X	Y		
R1	472755	106519	1.5	23 Southleigh Road
R2	472792	106519	1.5	42 Southleigh Road
R3	472774	106558	1.5	37 Southleigh Road
R4	472758	106465	1.5	34 Southleigh Road
R5	472738	106421	1.5	2A St George's Avenue
R6	472698	106455	1.5	Warblington School
NOTE: Some receptor descriptions are based on Google Maps and may not be accurate. Please refer to Figure 2 for exact receptor locations.				

Figure 3 – Receptor Locations



4.6 Significance Criteria

4.6.1 Operational Phase

The guidance released by Environmental Protection UK 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, has also been applied to the modelled results.

The guidance released by Environmental Protection UK also provides descriptors for impact magnitude and impact significance in air quality assessments. This is important when determining the magnitude and significance of any changes in air quality as a result of the proposed development. Table 7 provides descriptions for changes in ambient annual mean concentrations of NO₂ and PM₁₀. Descriptors for changes to the number of days with PM₁₀ concentration greater than 50 µg/m³ are also provided in Table 7. Table 8 provides air quality impact descriptors for changes to the annual mean NO₂ and PM₁₀ concentrations. Table 9 provides air quality impact descriptors for changes to the number of days with PM₁₀ concentration greater than 50 µg/m³.

Figure 4 – Assessing the Significance of Air Quality Impacts of a Development Proposal

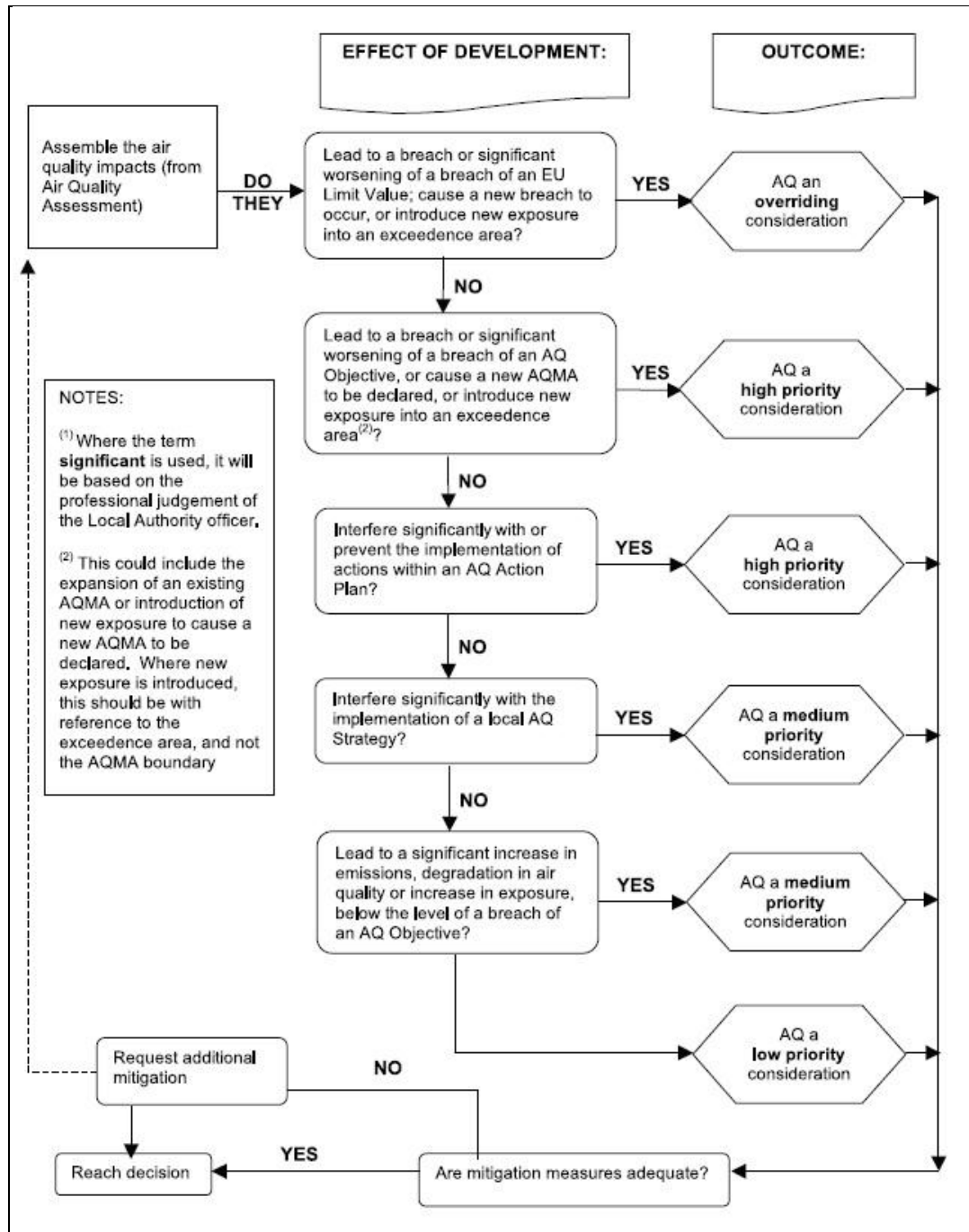


Table 7 – Descriptors for Changes in Ambient Concentrations of NO₂ and PM₁₀

Magnitude of Change	Annual Mean NO ₂ / PM ₁₀	Days PM ₁₀ >50 µg/m ³
Large	Increase/decrease >4 µg/m ³	Increase/decrease >4 days
Medium	Increase/decrease 2 – 4 µg/m ³	Increase/decrease 2 – 4 days
Small	Increase/decrease 0.4 – 2 µg/m ³	Increase/decrease 1 – 2 days
Imperceptible	Increase/decrease <0.4 µg/m ³	Increase/decrease <1 day

Table 8 – Descriptors for Impact Significance for Annual Mean NO₂ and PM₁₀

Absolute Concentration in Relation to Objective	Change in Concentration		
	Small	Medium	Large
Increase with the Scheme			
Above Objective With Scheme (>40 µg/m ³)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective With Scheme (36-40µg/m ³)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective With Scheme (30-36 µg/m ³)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective With Scheme (<30 µg/m ³)	Negligible	Negligible	Slight Adverse
Decrease with the Scheme			
Above Objective Without Scheme (>40 µg/m ³)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective Without Scheme (36-40µg/m ³)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective Without Scheme (30-36 µg/m ³)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective Without Scheme (<30 µg/m ³)	Negligible	Negligible	Slight Beneficial

Table 9 – Air Quality Impact Descriptors for Changes to Number of Days with PM₁₀ Concentration Greater than 50 µg/m³

Absolute Concentration in Relation to Objective	Change in Concentration		
	Small	Medium	Large
Increase with the Scheme			
Above Objective With Scheme (>35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective With Scheme (32-35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective With Scheme (26-32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with the Scheme			
Above Objective Without Scheme (>35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective Without Scheme (32-35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective Without Scheme (26-32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective Without Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

5 AIR QUALITY ASSESSMENT

5.1 Impact of Vehicle Emissions

5.1.1 Nitrogen Dioxide

Predicted annual mean concentrations for NO₂ in 2011 and 2017 are provided in Table 10. As mentioned in Section 4.6.1, NO₂ concentrations have been calculated from the predicted NO_x concentrations using the latest NO_x-NO₂ conversion spreadsheet available from the Air Quality Archive. The change in predicted concentrations with and without the development in 2017 has also been provided, together with the magnitude and significance of the predicted change.

Table 10 – Comparison of Predicted Annual Mean NO₂ Concentrations (µg/m³), Baseline 2011, Do-Minimum and Do-Something 2017

Receptor	Baseline 2011	Do-Minimum 2017	Do-Something 2017	Change (2017)	Magnitude / Significance of Change (2017)
R1	24.0	24.2	24.4	0.2	Imperceptible/ Negligible
R2	23.7	23.8	24.1	0.3	Imperceptible/ Negligible
R3	23.8	23.9	24.1	0.2	Imperceptible/ Negligible
R4	24.0	24.2	24.5	0.3	Imperceptible/ Negligible
R5	23.9	24.0	24.3	0.3	Imperceptible/ Negligible
R6	23.0	23.1	23.1	0.0	Imperceptible/ Negligible
Objective	40.0				

When comparing the predicted concentrations in 2017 with and without the proposed development the magnitude of change at the modelled receptors is considered imperceptible. The significance of this change is considered to be negligible.

Using the flow chart presented in Figure 4, air quality (NO₂) is a “low priority consideration” at the modelled locations in each of the modelled years with regards to the impact of the development.

Nitrogen dioxide also has an hourly objective of 200 µg/m³ not to be exceeded more than 18 times in one year. However, the hourly mean concentration is not calculated directly by

the DMRB method. 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 NO₂ concentrations was very weak. Nonetheless, research undertaken in 2003¹⁸ has indicated that the hourly NO₂ objective is unlikely to be exceeded at a roadside location where the annual mean NO₂ concentration is less than 60 µg/m³. Given that predicted NO₂ concentrations in all years are well below 60 µg/m³ at all the modelled receptors, the short term objective for NO₂ is unlikely to be exceeded.

5.1.2 Particulate Matter

Predicted annual mean concentrations for PM₁₀ in 2011 and 2017 are provided in Table 11. Table 12 provides the number of days when the 24-hour mean objective is exceeded. It should be noted that some changes in predicted PM₁₀ concentrations between the different scenarios are very small and not shown when presenting values to 1 decimal place.

When comparing the predicted concentrations in 2017 with and without the proposed development the magnitude of change at the modelled receptors is considered imperceptible. The significance of this change is considered to be negligible.

Using the flow chart presented in Figure 4, air quality (PM₁₀) is a “low priority consideration” at the modelled locations in each of the modelled years with regards to the impact of the development.

¹⁸ Analysis of Relationship between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, Laxen and Marner, 2003

Table 11 – Comparison of Predicted Annual Mean PM₁₀ Concentrations (µg/m³), Baseline 2011, Do-Minimum and Do-Something 2017

Receptor	Baseline 2011	Do-Minimum 2017	Do-Something 2017	Change (2017)	Magnitude / Significance of Change (2017)
R1	16.3	16.3	16.4	0.1	Imperceptible/ Negligible
R2	16.2	16.2	16.3	0.1	Imperceptible/ Negligible
R3	16.2	16.2	16.3	0.1	Imperceptible/ Negligible
R4	16.3	16.3	16.4	0.1	Imperceptible/ Negligible
R5	16.3	16.3	16.3	0.0	Imperceptible/ Negligible
R6	16.1	16.1	16.1	0.0	Imperceptible/ Negligible
Objective	40.0				

Table 12 – Comparison of Predicted PM₁₀ 24-Hour Mean Exceedences, Baseline 2011, Do-Minimum and Do-Something 2017

Receptor	Baseline 2011	Do-Minimum 2017	Do-Something 2017	Change (2017)	Magnitude / Significance of Change (2017)
R1	0	0	0	0	Imperceptible/ Negligible
R2	0	0	0	0	Imperceptible/ Negligible
R3	0	0	0	0	Imperceptible/ Negligible
R4	0	0	0	0	Imperceptible/ Negligible
R5	0	0	0	0	Imperceptible/ Negligible
R6	0	0	0	0	Imperceptible/ Negligible
Objective	35				

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Impact of Vehicle Emissions

The change in predicted NO₂ and PM₁₀ concentrations at existing receptors in 2017 following completion of the proposed development is considered imperceptible. The significance of this change is considered to be negligible. Overall, using the flow chart presented in Figure 3, air quality (NO₂ and PM₁₀) is a “low priority consideration” at the modelled locations in each of the modelled years with regards to the impact of the development.

As discussed in Section 4.5.3 it has not been possible to verify the modelled concentrations against local monitoring data. As such, the predicted concentrations should be treated with some caution. However, the change in predicted concentrations following completion of the proposed development in 2017 is less than 0.4 µg/m³ at all modelled receptors. Based on the guidance discussed within this document, such a change would still be considered imperceptible and the overall significance considered negligible regardless of the baseline concentrations (without development). Furthermore, it has been assumed that the queuing traffic at the level crossing is occurring continuously as daily variation has not been modelled. As such, the predicted concentrations are a worst case assessment.

6.1.1 Mitigation of Vehicle Impacts

It is important to ensure that mitigation measures are related to the scale of the impact of the development. The proposed development is considered to have an imperceptible impact on existing levels of air quality. As such, no mitigation measures have been proposed.