Arla Foods, Hatfield Peverel

Air Quality Assessment

19 October 2016

Victory House
Trafalgar Place
Brighton BN1 4FY
United Kingdom

T +44 (0)1273 365000
F +44 (0)1273 365100
mottmac.com

Arla Foods, Hatfield Peverel

Air Quality Assessment

19 October 2016

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	October 2016	Julia Burnell	James Brookes	Christopher Mills	Draft

Information class: Standard

Contents

1 Introduction

1.1 Overview

An air quality assessment for a proposed housing development at the former Arla Foods site in Hatfield Peverel (hereafter referred to as the 'proposed development') has been undertaken.

The proposed development will consist of 188 residential units with associated green infrastructure and is planned to open in 2018.

This report provides an assessment of the following key impacts associated with the construction and operational phase of the proposed development

- Nuisance, loss of amenity and health impacts caused by construction dust on sensitive receptors;
- Changes in traffic related pollutant concentrations caused by the proposed development as a result of additional traffic; and,
- Suitability of air quality for the introduction of new receptors.

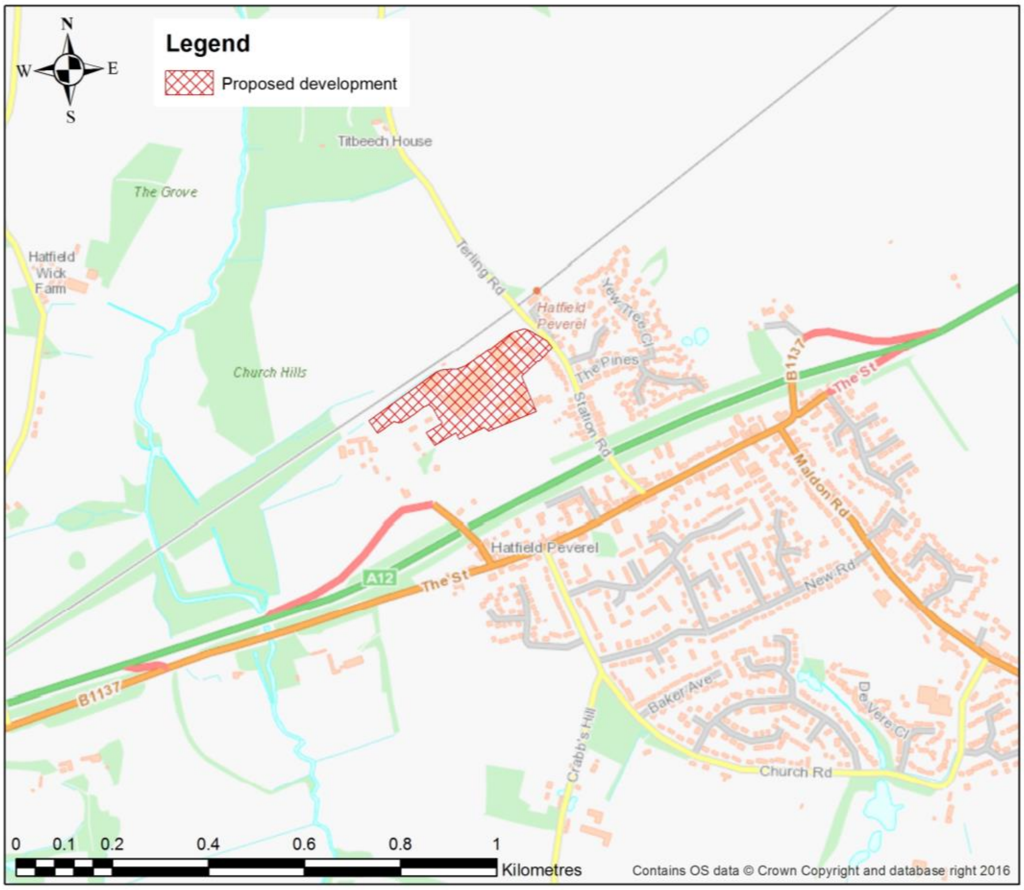
The assessment of impacts from construction dust considers the air quality impacts on existing sensitive receptors from construction related activities such as earth moving, site plant operation and traffic. A qualitative assessment is in accordance with guidance published by the Institute of Air Quality Management (IAQM): *Guidance on the assessment of dust from demolition and construction*[Ref 3] has been undertaken.

The assessment of impacts from changes in traffic considers the air quality impacts from changes in traffic flow characteristics on the local road network associated with the operation of the proposed development. A quantitative assessment has been undertaken and utilises the Design Manual for Roads and Bridges Screening Model [Ref18] and emission factors provided by the latest version of Defra's Emission Factor Toolkit to determine the impact of traffic emissions generated by the proposed development. In addition, the assessment considers the suitability of air quality at the site for the introduction of new receptors based on air quality objectives for the pollutants of concern in accordance with Environmental Protection UK (EPUK)/IAQM guidance: *Land-use Planning and Development Control: Planning for Air Quality* [Ref 1].

1.2 Study Location

The proposed development is located in Hatfield Peverel, Essex, on the former site of Arla Foods, approximately 150m north of the A12, as shown in Figure 1.

Figure 1: Proposed development location



1.3 Key Pollutants

The assessment considers concentrations of NO_2 and fine particulates (PM_{10} and $PM_{2.5}$) only as these are the key pollutants of concern associated with road traffic emissions within the study area. A description of these pollutants is provided below.

1.3.1 Oxides of nitrogen

Oxides of nitrogen is a term used to describe a mixture of nitric oxide (NO) and nitrogen dioxide (NO_2), referred to collectively as NO_x. These are primarily formed from atmospheric and fuel nitrogen as a result of high temperature combustion. The main sources in the UK are road traffic and power generation.

During the process of combustion, atmospheric and fuel nitrogen is partially oxidised via a series of complex reactions to NO. The process is dependent on the temperature, pressure, oxygen concentration and residence time of the combustion gases in the combustion zone. Most NO_x exhausting from a combustion process is in the form of NO, which is a colourless and tasteless gas. It is readily oxidised to NO_2, a more harmful form of NO_x, by chemical reaction with ozone and other chemicals in the atmosphere. NO_2 is a yellowish-orange to reddish-brown gas with a pungent, irritating odour and is a strong oxidant.

1.3.2 Particulates

Particulate matter is a complex mixture of organic and inorganic substances present in the atmosphere. Sources are numerous and include power stations, other industrial processes, road transport, domestic coal burning and trans-boundary pollution. Secondary particulates, in the form of aerosols, attrition of natural materials and, in coastal areas, the constituents of sea spray, are significant contributors to the overall atmospheric loading of particulates. In urban areas, road traffic is generally the greatest source of fine particulate matter, although localised effects are also associated with construction and demolition activity.

2 Legislation and Policy Context

2.1 Introduction

This section summarises the relevant international and national legislation, policy and planning guidance in relation to air quality for the proposed development. In addition, UK regional and local planning policy guidance has been reviewed in order to identify relevant air quality policy implications related to the proposed development.

2.2 Legislation

2.2.1 European Union

EU Framework Directive 96/62/EEC [Ref 4] on ambient air quality assessment and management came into force in November 1996 and had to be implemented by Member States by May 1998. This Directive aimed to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants. As a Framework Directive, it required the European Commission to propose 'Daughter' Directives which set air quality limit and target values, alert thresholds and guidance on monitoring and measurement for individual pollutants. The four Daughter Directives are as follows:

- Council Directive 1999/30/EC (the first Daughter Directive) relating to limit values for sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x), particulate matter (PM_{10}) and lead in ambient air;
- Directive 2000/69/EC (the second Daughter Directive) relating to limit values for benzene and carbon monoxide (CO) in ambient air;
- Directive 2002/3/EC (the third Daughter Directive) relating to ozone (O_3) in ambient air; and
- Directive 2004/107/EC (the fourth Daughter Directive) relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.

Directive 2008/50/EC on ambient air quality and cleaner air for Europe [Ref 5] was adopted in May 2008. This Directive merges the first three existing Daughter Directives and one Council Decision into a single Directive on air quality (it is anticipated that the fourth Daughter Directive will be brought within the new Directive at a later date). It also sets new standards and target dates for reducing concentrations of fine particles.

2.2.2 England

2.2.2.1 Air Quality

The Air Quality Standards Regulations 2010 [Ref 6] came into force in June 2010; they implement the EU's Directive 2008/50/EC on ambient air quality.

Part IV of the Environment Act 1995 [Ref 7] requires that every local authority shall periodically carry out a review of air quality within its area, including likely future air quality. As part of this review, the authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods. Any parts of an authority's area where the objectives are not being achieved, or are not likely to be achieved within the relevant period must be identified and declared as an AQMA. Once such a declaration has been made, Authorities are under a duty to prepare an Action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.

The air quality objectives specifically for use by local authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000 [Ref 8] and the Air Quality (England) (Amendment) Regulations 2002 [Ref 9]. In most cases, the air quality objectives are numerically synonymous with the limit values specified in the EU Directives although compliance dates differ.

The Environment Act also requires that the UK Government produces a national 'Air Quality Strategy' (AQS) containing standards, objectives and measures for improving ambient air quality and to keep these policies under review. Further details of the AQS are presented in Section 2.3.

2.2.2.2 Statutory Nuisance

Section 79(1)(d) of the Environmental Protection Act 1990 [Ref 10] defines one type of 'statutory nuisance' as "any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance". Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, it must serve an abatement notice. Failure to comply with an abatement notice is an offence. However, it is a defence if an operator employs the best practicable means to prevent or to counteract the effects of the nuisance.

2.3 Policy

2.3.1 UK Air Quality Strategy

As described above, the Environment Act 1995 requires the UK Government to produce a national AQS. The AQS establishes the UK framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. The first Air Quality Strategy was adopted in 1997 [Ref 11] and replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in January 2000 [Ref 12]. The 2000 Strategy has subsequently been replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 [Ref 13].

The Environment Act 1995 requires that the Environment Agency has regard to the AQS in exercising its pollution control functions. Local Authorities are also required to work towards the Strategy's objectives prescribed in regulations for that purpose.

The air quality objectives in the AQS are a statement of policy intentions and policy targets. As such, there is no legal requirement to meet these objectives except in as far as they mirror any equivalent legally binding Limit Values in EU Directives and English Regulations.

2.3.2 National Planning Policy Framework

The National Planning Policy Framework [Ref 14] sets out government planning policies for England. With regard to air quality it 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…"

And:

“To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.”

And:

“Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.”

2.3.2.1 National Planning Policy Framework Guidance

On 6 March 2014, the Department for Communities and Local Government (DCLG) published a national planning practice guidance web-based resource [Ref 15].

The National Planning Guidance includes a dedicated section on ‘Air Quality’. It notes that, for new planning applications, the local planning authority may want to know about:

- The ‘baseline’ local air quality;
- Whether the proposed development could significantly change air quality during the construction and operational phases; and/or
- Whether there is likely to be a significant increase in the number of people exposed to a problem with air quality, such as when new residential properties are proposed in an area known to experience poor air quality.

It also states the following in relation to determining whether air quality is relevant to a planning decision:

“Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).” [Ref 16]

2.3.3 Regional Planning Policy

The Essex Transport Strategy was published in June 2011 [Ref 24]. With regards to air quality, the strategy Development Management Policies details the need to reduce “pollution from transport to improve air quality in urban areas and along key corridors” through actions such as promoting the use of less polluting forms of travel and working with local businesses and logistic companies to ensure HGVs use the most appropriate routes.

2.3.4 Local Planning Policy

The current Braintree District Council (BDC) Core Strategy Local Development Document (CSLDD) was adopted on 19 September 2011 [Ref 20]. With regards to air quality, the Core Strategy states that:

“local road networks also need to be maintained and improved at key points to encourage more efficient local public transport, improve air quality and reduce local congestion.”

In addition, Policy CS8: Natural Environment and Biodiversity states that:

"All development proposals will take account of the potential impacts of climate change and ensure the protection and enhancement of the natural environment, habitats and biodiversity and geo-diversity of the District. This will include where appropriate protection from: Air, noise, light and other types of pollution …."

BDC is currently preparing the new Local Plan which is planned to be adopted in 2018. This new Local Plan sets out the vision, objectives and policies that will guide development within BDC up to 2033. In January 2015, BDC published an Issues and Scoping report which considered the main aims and objectives for the new Local Plan [Ref 23]. With regards to air quality, this document states:

"Transport and congestion can have a negative impact on air quality and this will need to be carefully monitored and managed. Encouraging alternative approaches to private vehicle travel such as electric cars and facilitating the infrastructure required such as charging points may assist in reducing harmful emissions which can impact on health."

The document also states how tree and hedge planting in new developments can be used to improve air quality.

2.4 Summary

This Section has identified the legislation and policy framework relevant to this report. On the basis of the above, applicable numerical environmental quality standards are summarised in Table 1.

It should be noted that the UK air quality objectives only apply at locations where the members of the public might reasonably be exposed to pollutants for the respective averaging periods.

Table 2 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to the assessment.

Table 1: Relevant Air Quality Standards

Pollutant	Averaging Period	Air Quality Standard		Attainment Date
		Concentration	Allowance	
Nitrogen Dioxide (NO_2)	1-hour	200 µg/m^3	18 per calendar year[(e)]	31 December 2005[(a)(b)] 1 January 2010[(c)]
	Annual	40 µg/m^3	-	31 December 2005[(a)(b)] 1 January 2010[(c)]
Particulates (PM_{10})	24-hour	50 µg/m^3	35 per calendar year[(f)]	31 December 2004[(a)(b)] 1 January 2005[(c)]
	Annual	40 µg/m^3	-	31 December 2004[(a)(b)] 1 January 2005[(c)(d)]
Particulates ($PM_{2.5}$)	Annual	25 µg/m^3	-	2020[(b)(e)] 1st January 2010[(c)]

Notes: [(a)] Air Quality (England) Regulations 2000 as amended.
[(b)] Air Quality Strategy 2007.
[(c)] EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO_2 limit values in some zones/agglomerations.
[(d)] Can be expressed as the 99.79th percentile of 1 hour means.
[(e)] Can be expressed as the 90.41st percentile of 24 hour means.
[(f)] Also a 'Target' of 15% reduction in annual mean concentrations at urban background between 2010 and 2020.

Table 2: Locations Where the Air Quality Objectives Apply

Averaging period	Objectives should apply at:	Objectives should not apply at:
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1 Hour	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Source: [Ref 2]

3 Methodology

3.1 Overview

This section sets out the approach that has been taken to assess the air quality effects of the construction and operation of the proposed development.

3.2 Construction

Construction activities can result in temporary effects from dust. ‘Dust’ is a generic term which usually refers to particulate matter in the size range 1-75 microns in diameter; the most common effects from dust emissions are soiling and increased ambient PM_{10} concentrations [Ref 17]. Assessment methodologies based on a qualitative approach are advocated in a range of guidance, including that produced by the Buildings Research Establishment (BRE) [Ref 17] and more recently guidance published by the IAQM [Ref 3]. Therefore, a qualitative approach has been adopted for this assessment based on key issues identified in the guidance described above, based on a review of likely dust raising activities and identification of sensitive receptors within 350m.

3.2.1 Construction Site Plant Emissions

Construction work requires the use of a range of site plant, such as excavators, piling equipment, cranes and on site generators. All construction plants have an energy demand and some may result in direct emissions to air from exhausts.

Guidance from the IAQM [Ref 3] notes that effects from exhaust emissions from on-site plant are unlikely to be significant. Given the local and temporary nature of site plant, effects of plant emissions on local air quality are considered to be of negligible significance relative to the surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further. Nevertheless, mitigation measures to reduce the effect of site plant on local air quality are presented in Section 6.

3.2.2 Construction Road Traffic Emissions

At this stage, detailed information related to traffic generated during construction is not available. EPUK and IAQM [Ref 1] indicates that assessment of construction traffic emissions is only likely to be required for large, long-term construction sites that will generate additional LDV movements greater than 500 AADT or changes in HDV movements greater than 100 AADT. Based upon available knowledge of the proposed development, it is not anticipated that HDV flows would exceed this limit at any point during the construction phase. On this basis no further consideration has been given to the effects of construction traffic on ambient air quality.

3.2.3 Construction Dust Assessment

Guidance from the IAQM recommends splitting the construction phase into four separate source categories and determining the dust risk associated with each of these individually. This assessment has determined the risk of each of the following source categories:

- Demolition;
- Earthworks;
- Construction; and
- Track out (the transport of dust and dirt onto the public road network).

The risk of each source for dust effects is described as 'negligible', 'low risk', 'medium risk' or 'high risk' depending on the nature and scale of the construction activities and the proximity of sensitive receptors to the construction site boundary. The assessment is used to define appropriate mitigation measures to reduce the level of effects such that they are not significant.

The assessment considers three separate effects from dust:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM_{10}.

Step 1 of the assessment applies screening criteria to the proposed development which states that an assessment will normally be required where there is:

- A 'human receptor' within:
  - 350m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- An 'ecological receptor' within:
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

No further assessment is required if there are no receptors within the defined boundaries.

Step 2A of the assessment is to determine the overall dust-raising magnitude (small, medium or large) from each of the dust sources identified (demolition, earthworks, construction and trackout) in accordance with the criteria outlined in Table 1 in Appendix A.

Step 2B of the assessment is to define the sensitivity of the area (as high, medium or low) in accordance with the criteria presented within Table 2 in Appendix A.

The sensitivity takes account of a number of factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The receptor sensitivity has been based on the highest of any of the criteria being met and therefore the assessment is considered robust. The sensitivity of the area is further determined for dust soiling, human health and ecosystem effects by considering the criteria in Table 3, Table 4 and Table 5 in Appendix A respectively. Criteria presented in these tables are based on the distance of the source to the closest receptors.

The final step of the assessment (Step 2C) takes the dust emission magnitude identified for each of the dust sources and the sensitivity of the area to determine the risk of effects on:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of health effects due to an increase in exposure to PM_{10}.

The criteria for each of the dust sources has been presented within Table 6,

Table 7, Table 8 and Table 9 in Appendix A respectively, determining the mitigation measures appropriate for the assessment.

Results of the dust assessment are presented in Section 5.2.

3.3 Operation

For effects on air quality arising from traffic emissions, guidance produced by Highways England advises that contributions from vehicle emissions are generally imperceptible above background concentrations farther than 200 metres from the source [Ref 18]. Therefore, for the assessment of road traffic emissions, consideration has not been given to receptors which are located further than 200 metres away from roads where increases in traffic are potentially significant. The assessment has primarily focused on those receptors likely to experience the highest concentrations and/or greatest change in concentrations as a result of the proposed development. The assessment has included all roads for which traffic data was provided: further details are available in Section 3.3.

3.3.1 Overview

This Section describes the approach taken to consider the air quality effects of the operation phase of the proposed development, key elements of which include model choice, traffic data, emission factors, NO_x to NO_2 conversion and dealing with assessment uncertainty.

3.3.2 Assessment Scenarios

As discussed within Section 3.3, the operation phase assessment focuses on the changes in concentrations of NO_2, PM_{10} and $PM_{2.5}$ caused by the proposed development and the suitability of air quality at the site for the introduction of new receptors.

To assess changes in pollutant concentrations the following scenarios have been considered:

- 2015 Base Year;
- 2018 Do Minimum; and
- 2018 Do Something.

A Base Year of 2015 has been used as this is the most recent year for which local authority monitoring data is available. In addition, this year has been used for model verification, presented in Appendix B.

The assessment has assumed that 2018 is the earliest opening year of the proposed development and it has been assumed that all development traffic will be present in this year. This is considered to be the worst case year as vehicle emission factors and background pollutant concentrations are predicted to improve year on year.

3.3.3 Traffic Data

Traffic flows in the form of 24 hour Annual Average Daily Traffic (AADT) flows have been provided by Mott MacDonald traffic consultants for the following scenarios:

- 2015 Base Year;
- 2018 Do Minimum (opening year without proposed development); and
- 2018 Do Something (opening year with proposed development).

Traffic data was collected in 2016 and adjusted using TEMPro growth forecasts to generate 2015 traffic data to allow comparison with the monitoring data for model verification purposes.

3.3.4 Model Selection

A modified Design Manual for Roads and Bridges (DMRB) [Ref18] Screening Model has been used to determine the annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations during the base, Do Minimum and Do Something Scenarios. The Screening Model has been modified to incorporate the latest Local Air Quality Management (LAQM) tools provided by Defra [Ref 2] including new emission factors from the Emission Factor Toolkit (EFT v7.0).

The DMRB Screening model is considered appropriate for this assessment due low background concentrations and the proposed development distance from roads, especially the A12. This approach was agreed during consultation with the BDC Environmental Health Officer responsible for Air Quality.

3.3.5 Background Pollutant Concentrations

Only road traffic emission sources have been explicitly included within the dispersion model. Non-road traffic related emission sources have been accounted for within the assessment by assigning appropriate ‘background’ concentrations to modelled receptor locations. Section 4.3.4 provides further details of background pollutant concentrations used within the assessment.

3.3.6 NO_X to NO_2 Relationship

The model used for this assessment provides outputs for NO_x which need to be converted to NO_2 to allow comparison with the relevant air quality objectives. Defra provides a spreadsheet based method which is available from Defra’s Air Information Resource Website [Ref 19] for calculating annual mean NO_x to NO_2 conversions. This method has been used within the assessment and is the most appropriate way of determining NO_2 concentrations from road NO_x contributions.

3.3.7 Predicted 1 Hour and 24 Hour Pollutant Concentrations

For all discrete receptors assessed, annual mean concentrations of NO_2 have been presented. Local Air Quality Management Technical Guidance 2016 (LAQM TG (16)) indicates that the hourly NO_2 air quality objective of 200 $\mu g/m^3$ (not to be exceeded more than 18 times per year) is unlikely to be exceeded at roadside locations where the annual mean concentration is less than 60$\mu g/m^3$ [Ref 2]. Following this guideline, the hourly objective has not been considered further within this assessment as the annual modelled mean NO_2 concentrations are less than 60$\mu g/m^3$.

The prediction of daily mean concentrations of PM_{10} is available as an output option within the ADMS roads dispersion model for comparison against the short-term air quality objective. However, as the model output for annual mean concentrations is considered more accurate than the modelling of the daily mean, an empirical relationship has been used to determine daily mean PM_{10} concentrations. In accordance with Government guidance [Ref 2] the following formula has been used. Based on this formula, an annual mean PM_{10} concentration of 32$\mu g/m^3$ equates to 35 days at or above 50$\mu g/m^3$:

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

3.3.8 Receptors – Human Health

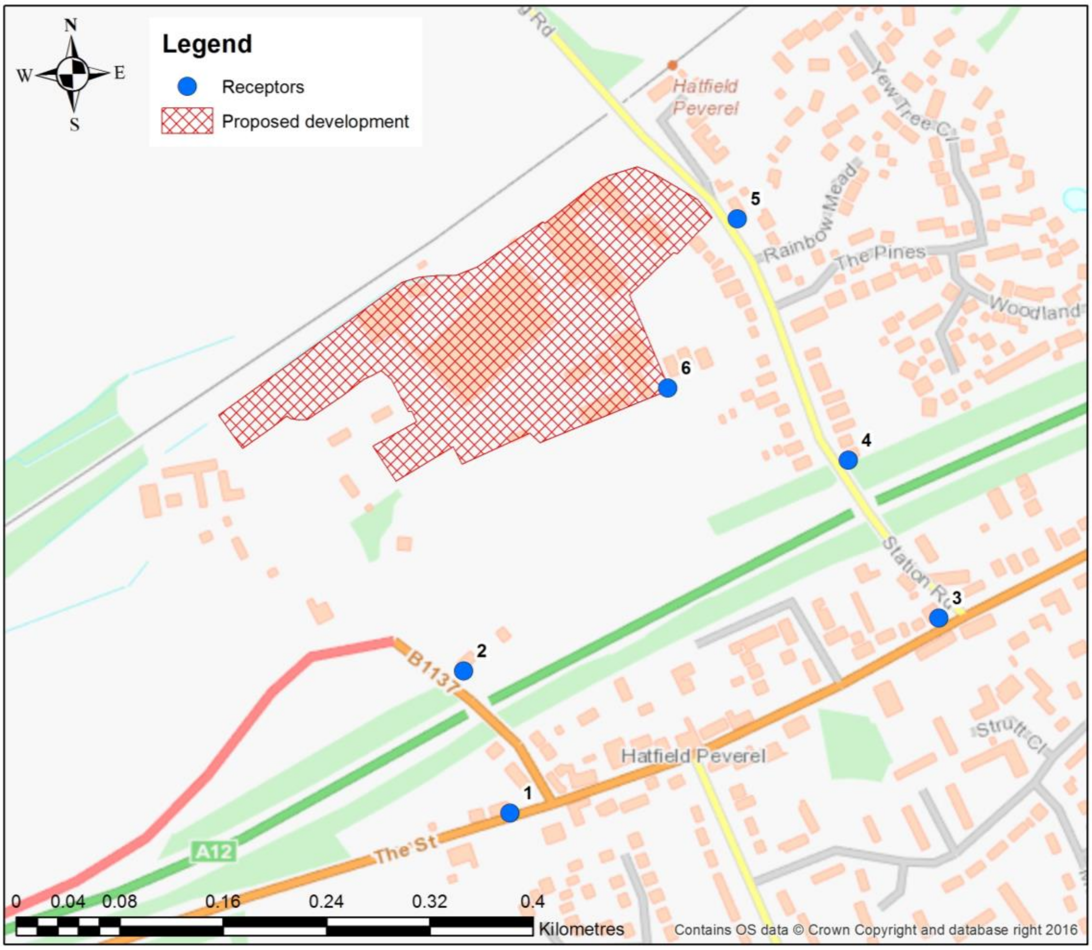
Six receptors have been identified for inclusion within the within the model to compares against the air quality objectives. These receptors have been chosen as they are expected to experience the greatest change due to changes in traffic numbers and also their close proximity to roads and junctions. Receptor 6 is representative of the proposed development boundary and is the location expected to experience the highest pollutant concentrations across the proposed development due to its proximity to the A12.Table 3 and Figure 2 show the locations of the receptors considered within this assessment.

Table 3: Modelled Receptors

Receptor Number	Receptor Name	National Grid Reference	
		X	Y
1	12 The Street	578777	211635
2	Sorrell's Cottages	578741	211745
3	Hatfield Cottage	579109	211786
4	Crofton	579039	211908
5	Yew Tree Cottage	578953	212095
6	Proposed Development	578899	211964

Note: Receptor 5 can also be used as indication of pollutant concentrations at the proposed development due to its close proximity to the site.

Figure 2: Modelled receptor locations



3.3.9 Ecologically Designated Receptors

There are no Ecological Designated Sites within 200m of the proposed development. The nearest Ecological Designated Site, Whet Mead (a Local Nature Reserve) is approximately 4km north east of the proposed development Therefore impacts on ecological sites have not been considered further.

3.4 Assessment Criteria

A number of approaches can be used to determine whether the potential air quality effects of a development are significant. However, there remains no universally recognised definition of what constitutes 'significance' for air quality effects.

Guidance is available from a range of regulatory authorities and advisory bodies on how best to determine and present the significance of effects within an air quality assessment. It is generally considered good practice that, where possible, an assessment should communicate effects both numerically and descriptively.

Any description of an effect of a development is informed by numerical results. However, an element of professional judgement must also be involved. To ensure that the descriptions of effects used within the assessment are clear, consistent and in accordance with the latest guidance, definitions for the assessment of air quality concentration changes at individual human health receptors have been adopted from the EPUK and IAQM 2015 guidance [Ref 1]. Table 4 provides effect descriptors for changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations as a result of the proposed development.

The magnitude of any concentration change identified must be considered in relation to the Air Quality Assessment Level (AQAL), which may be an air quality objective, EU limit or target value or an Environment Agency Environmental Assessment Level (EAL). For this report, the relevant AQAL have been presented in Table 1.The most important aspects to consider are the percentage of long term average concentrations at the individual receptor in the assessment year in relation to the AQAL and the percentage of change in concentration in relation to the AQAL.

EPUK guidance suggests that when assessing the suitability of air quality for the introduction of new receptors, impacts are in relation to *'whether or not an air quality objective will not be met, or is at risk of not being met.'* This assessment therefore considers an exceedance of any air quality objective at the proposed development boundary as 'significant'.

EPUK recognises that professional judgement is required in the interpretation of air quality assessment significance. Table 4 is intended as a tool to help interpret the results to the air quality assessment and will therefore be employed in conjunction with professional judgement.

Table 4: Effect descriptors for individual receptors

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

Source: [Ref 1]

3.5 Consultation

Consultation was undertaken with the Environmental Health Officer of BDC responsible for Air Quality on the 13 July 2016 via e-mail. During this consultation, the following was concluded / discussed:

- The approach outlined within this report for the assessment of construction and operational impacts was appropriate
- Significance criteria applied to the assessment would be adopted from the latest EPUK / IAQM guidance (April 2015): Land use planning and development control: Planning for Air Quality
- No assessment of diesel freight emissions will be carried out as too infrequent to cause impacts

3.6 Assumptions and limitations

The DMRB Screening Model has associated with it an inherent level of uncertainty, primarily as a result of:

- uncertainties with emissions data; and
- Simplifications made in the DMRB Screening Model calculations.

Uncertainty has been addressed within the assessment by carrying out model verification and conservative assumptions.

Model verification is a two stage process. First, predicted concentrations are compared with monitored concentrations to identify any disparity. Where disparity occurs, the model inputs are revisited to identify any potential errors or opportunity for improvement. . Second, where disparity remains following the first stage, model results can be adjusted to account for systematic bias.

4 Baseline information

4.1 Overview

Information on air quality in the UK can be obtained from a variety of sources including Local Authorities, national network monitoring sites and other published sources. For the purposes of this assessment, data has been obtained from Department for Environment, Food and Rural Affairs (Defra) Air Information Resource (AIR) website [Ref 19] and BDC Annual Status Report [Ref 21]. The most recent full year of monitoring data available from BDC is for 2015.

4.2 Baseline data with respect to EU Limit Values

DEFRA uses the Pollution Climate Mapping (PCM) model to report compliance with the EU limit values. The PCM model provides NO_2 concentrations for a number of roads across the UK for a number of future years. The PCM model data, released by DEFRA in 2015, has modelled concentrations incorporating the DEFRA action plan measures for 2013 (reference year), 2020 and 2025, with projected concentrations decreasing year on year in response to anticipated improvements in vehicle emissions. PCM data for the year 2015 and previous years can also be obtained from the DEFRA website.

There are no PCM links adjacent to the proposed development and PCM links in the surrounding area are currently below the limit values. Therefore assessment of compliance with EU limit values has not been considered further.

4.3 Baseline data with respect to air quality objectives

4.3.1 Overview of Air Quality Management Areas

Currently there are no AQMA's declared for exceedences of the NO_2 or PM_{10} air quality objectives by BDC.

4.3.2 Continuous Monitoring

There is currently no automatic monitoring being carried out by BDC.

4.3.3 Diffusion Tube Monitoring

BDC carries out diffusion tube monitoring for NO_2 at 12 sites within their administrative boundary. However, there is only one diffusion tube located within close proximity to the proposed development to be considered relevant to this assessment. The diffusion tube, 'Hatfield Peverel A12', is located approximately 500m southwest of the proposed development and is located on an embankment, adjacent to the A12 (see Figure 3). Table 5 presents the most recent published monitoring data for the Hatfield Peverel A12 monitoring location.

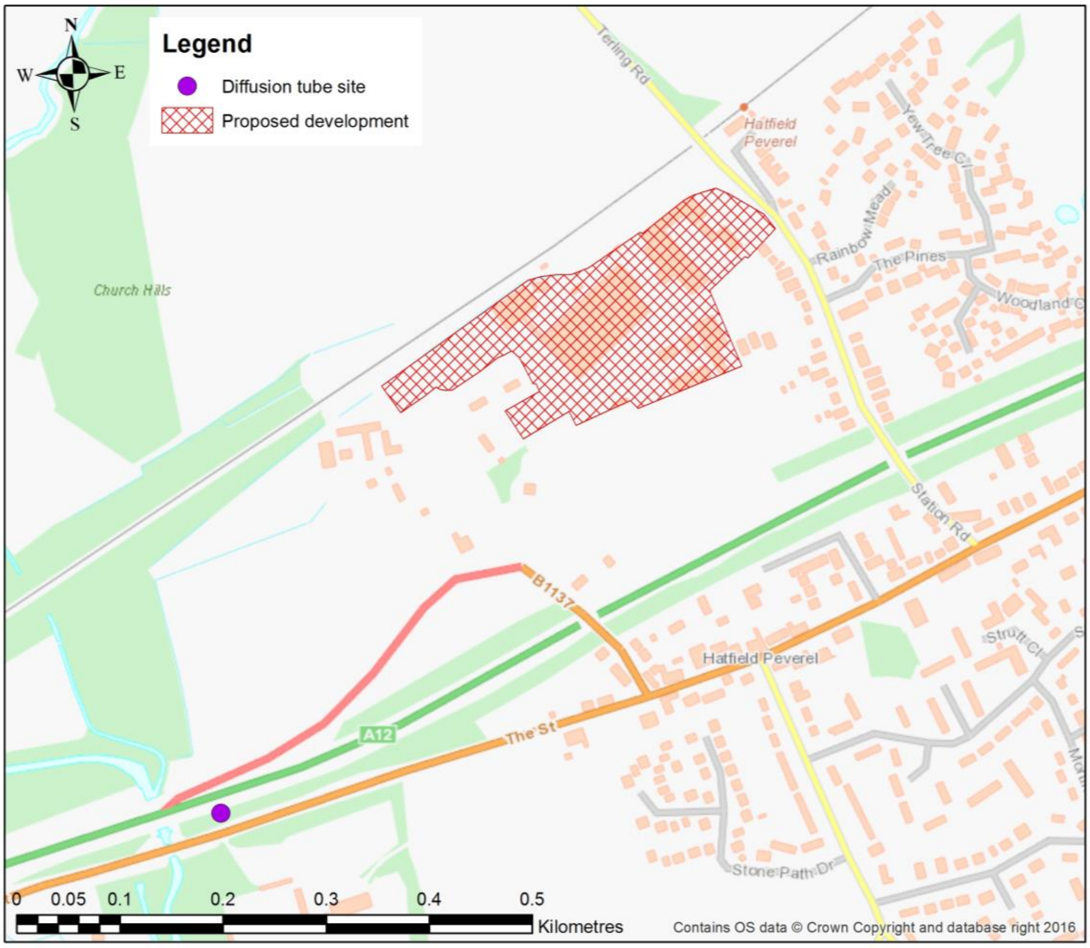
The monitoring results indicate that there are exceedences of the annual NO_2 objective in the vicinity of the proposed development, however there is no relevant exposure at this location and the exceedence is due to the close proximity of the diffusion tube to the A12 (approximately 2.4m from the kerb).

Table 5: NO_2 Diffusion Tube Data

Site ID and Name	Site Classification	National Grid Reference X	National Grid Reference Y	Distance from Proposed Development (m)	Bias Adjusted Annual Mean Concentration µg/m³ 2013	2014	2015[(a)]
Hatfield Peverel A12	Roadside	578675	211815	470	50.5 (0.95)	47.7 (0.91)	46.0 (0.81)

Source: BDC 2016 Air Quality Annual Status Report
Note: [(a)] Monitoring undertaken from April to December 2015. Results annualised by BDC in accordance with TG16 method.
Bias Adjustment Factor shown in brackets next to monitoring result
Data Capture is 75% in 2015

Figure 3: Diffusion tube monitoring location



4.3.4 Defra Projected Background Concentrations

Defra provides estimates of background pollution concentrations for NO_X, NO_2, PM_{10} and $PM_{2.5}$ across the UK for each one kilometre grid square for every year from 2013 to 2030. Future year projections have been developed from the base year for the background maps which is currently 2013. The maps include a breakdown of background concentrations by emission source, including road and industrial sources which have been calibrated against 2013 UK monitoring data.

Table 6 presents the predicted background concentrations for the proposed development site for 2015. The data shows that background concentration for all pollutants at the proposed development site are well below the relevant air quality objectives. As no background monitoring has been undertaken in the vicinity of the proposed development, the concentrations presented in Table 6 have been incorporated into the operation phase of the assessment.

Table 6: Defra Projected Background Concentrations for 2015 (µg/m3)

Grid Square	NO_X	NO_2	PM_{10}	$PM_{2.5}$
578500, 211500	23.3	16.4	18.4	12.6
578500, 212500	15.4	11.2	16.3	11.4
579500, 211500	19.2	13.8	16.6	11.8
579500, 212500	18.5	13.4	17.9	12.3

Source: [Ref 22]
Note: Derived from data relating to Ordinance Survey relevant Grid Squares
Background concentrations have been sector removed to avoid double counting of emissions in the model.

5 Potential Impacts

5.1 Overview

This section provides details of the likely impacts predicted to occur as a result of construction and operation of the proposed development.

5.2 Construction phase

Magnitude and sensitivity descriptors that have been applied to assess the overall effect of the construction phase are presented in Appendix A.

Table 7 presents a summary of the dust emission magnitude assigned to each construction activity based in the descriptors presented in Appendix A.

Table 7: Dust Emission Magnitude

Activity	Dust Emission Magnitude	Justification
Demolition	Large	Total building volume for demolition greater 50,000m^3, potentially dusty construction material
Earthworks	Large	Total site area greater than 10,000m^2 (40,300m^2)
Construction	Large	Total building volume between 25,000-100,000 (188 houses over a developable area of 3.31ha)
Track Out	Large	In the absence of any available data on HDV movements, the highest emission magnitude has been assumed.

Table 8 presents the sensitivity of the area to effects caused by construction activities and is based on the criteria presented in Table 1, Table 2 and Table 3 within Appendix A. Figure 4 and Figure 5 presents the dust assessment buffers. There are no ecological receptors within 500m of the proposed development, therefore construction effects on ecological receptors have not been considered further.

Table 8: Area Sensitivity

Activity	Dust soiling		Health effects of PM_{10}	
	Sensitivity	Comment	Sensitivity	Comment
Demolition	Medium	1-10 high sensitivity receptors (residential dwellings) less than 20m from the proposed site boundary	Low	Maximum annual mean PM_{10} concentration on site = 18.4µg/m^3. 1-10 high sensitivity receptors (residential dwellings) less than 20m from the proposed site boundary
Earthworks	Medium		Low	
Construction	Medium		Low	
Track Out	High	10-100 high sensitivity receptors (residential dwellings) less than 20m from the route used by construction vehicles on the public highway, up to 500m from the site entrance	Low	Maximum annual mean PM_{10} concentration on site = 18.4µg/m^3. 10-100 high sensitivity receptors (residential dwellings) less than 20m from the route used by construction vehicles on the public highway, up to 500m from the site entrance.

The overall risk of receptors to dust soiling effects and PM_{10} effects are presented in Table 9. Risk is based on the criteria presented in Table 4 to Table 9 within Appendix A.

Table 9: Summary of the risk of construction effects

Activity	Dust Soiling Effects	PM_{10} Effects
Demolition	High	Medium
Earthworks	Medium	Low
Construction	Medium	Low
Track Out	High	Low

Dust soiling effects are Medium to High Risk and PM_{10} effects Low to Medium Risk without mitigation. Mitigation measures appropriate for the proposed development have been presented in Section 6 and will be incorporated within a Construction Environmental Management Plan (CEMP) will reduce the predicted risk further.

Figure 4: Construction dust assessment buffers (demolition, earthworks and construction)

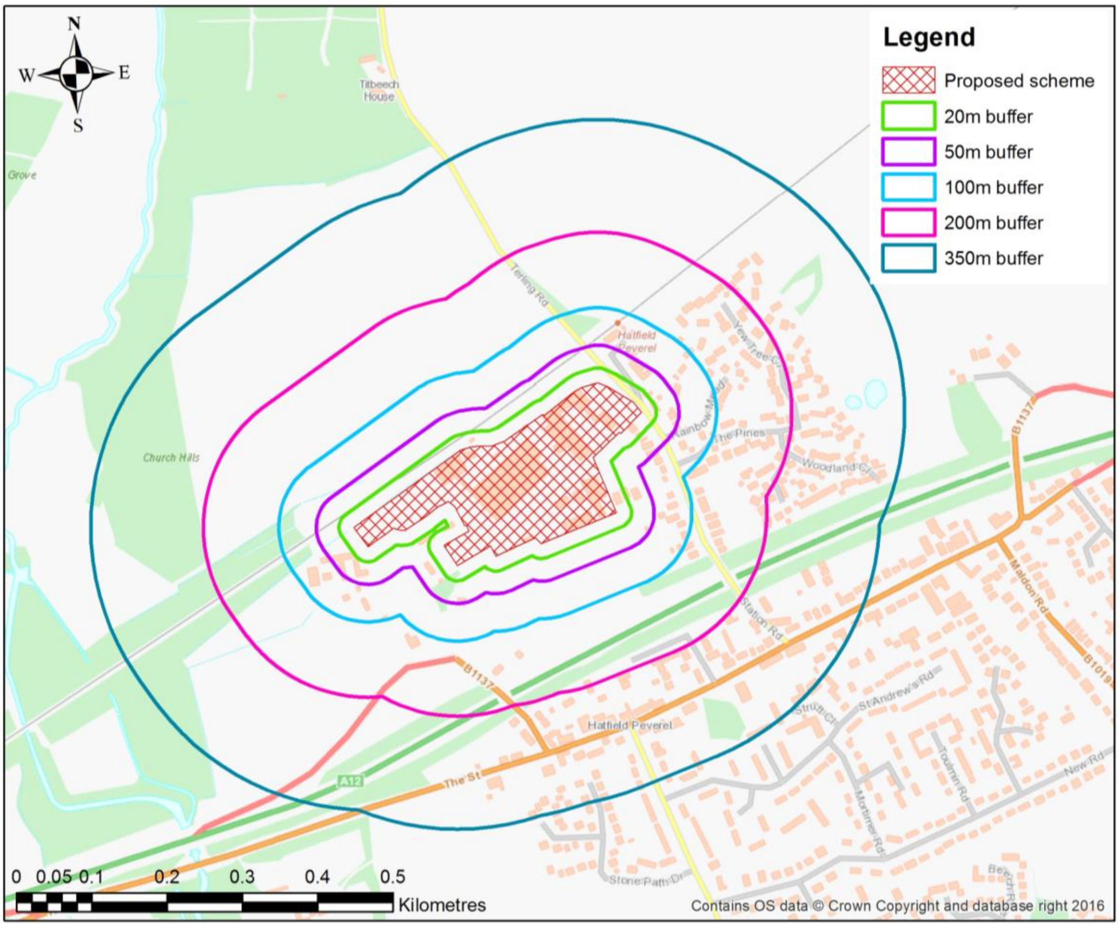
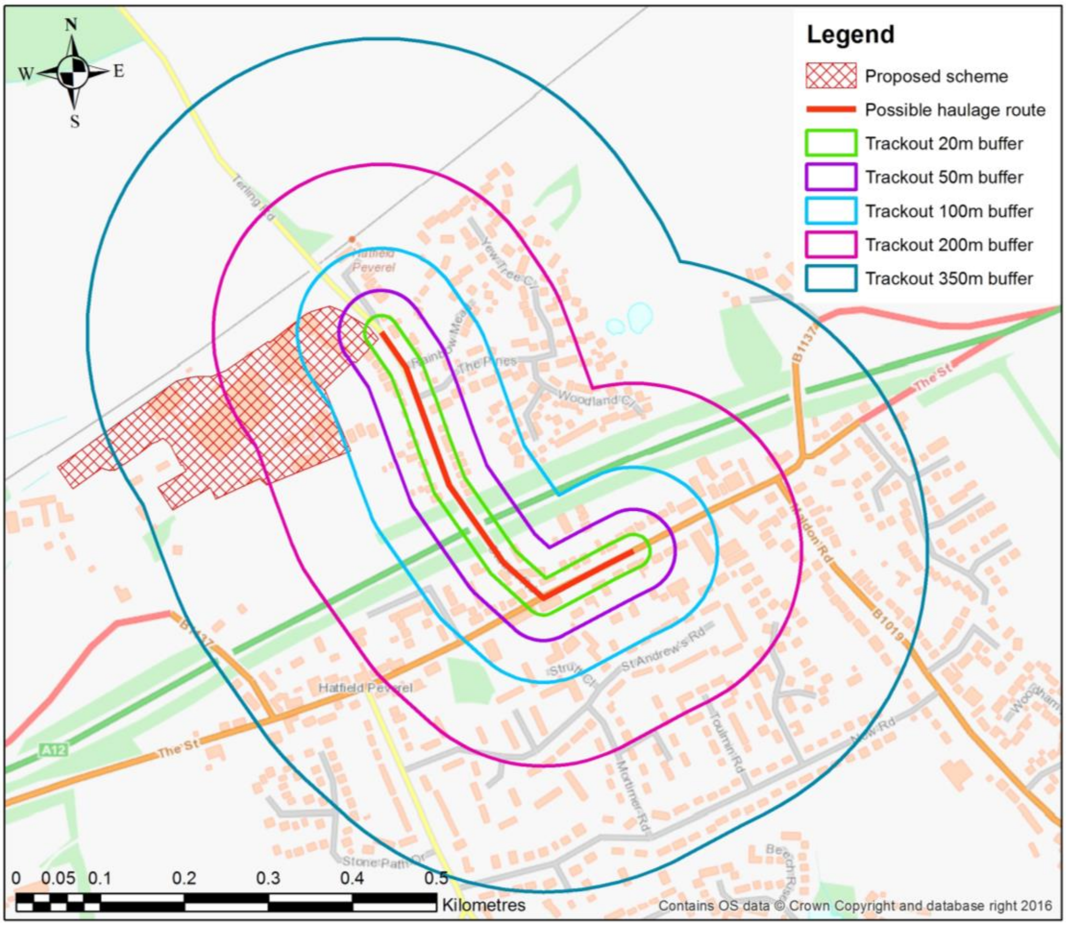


Figure 5: Construction dust assessment buffers (trackout)



5.3 Operation phase

5.3.1 Nitrogen Dioxide (NO_2) concentrations

NO_2 pollutant concentrations have been predicted at the receptors identified within Table 3 and are presented within Table 10. The greatest difference in annual mean NO_2 pollutant concentrations, as a result of the proposed development, is predicted to be 'negligible', where the largest change in concentration predicted to be 0.3µg/m^3 at Hatfield Cottage. Resultant NO_2 concentrations are predicted to be below the annual mean air quality objective at all assessed receptors. The annual mean concentration at the receptors 5 and 6 are well below the annual NO_2 air quality objective and therefore the proposed development site is acceptable for the introduction of new receptors. In accordance with the EPUK/IAQM significance criteria [Ref 1] adopted for the assessment and presented within Section 3.4, it is concluded that the proposed development would result in 'negligible' impacts at all receptors and is therefore 'not significant'.

Table 10: Annual Mean NO_2 Predicted Pollutant Concentrations (µg/m³) and Significance

Receptor Name	Annual Mean concentration (µg/m^3)		Predicted Pollutant Concentration Change (µg/m^3)	Effect of Change
	2018 Do Minimum	2018 Do Something		
12 The Street	20.0	20.2	0.2	Negligible
Sorrell's Cottages	34.6	34.7	0.1	Negligible
Hatfield Cottage	17.7	18.0	0.3	Negligible
Crofton	33.5	33.7	0.2	Negligible
Yew Tree Cottage	10.5	10.7	0.2	Negligible
Proposed Development	-	12.5	-	Negligible

Note: Do Minimum and predicted concertation change not included for the proposed development as the receptor does not currently exist.

Where outdoor amenities are available, such as balconies and gardens, the short term objective should be applied. However, as the NO_2 annual mean concentration is not predicted to exceed 60µg/m^3, the short term objective is not likely to be exceeded, as discussed in Section 3.3.7, and has therefore not been considered further.

5.3.2 Particulate Matter (PM_{10}) Concentrations

PM_{10} pollutant concentrations have been predicted at the receptors identified within Table 3 and are presented within Table 11. The greatest difference in annual mean PM_{10} pollutant concentrations, as a result of the proposed development, at all existing receptors is predicted to be 'negligible', with the largest change in concentration predicted to be 0.06µg/m^3 at Hatfield Cottage. PM_{10} concentrations are predicted to be below the annual mean air quality objective at all modelled receptors. The annual mean concentration at receptors 5 and 6 are well below the annual PM_{10} air quality objective and therefore the proposed development site is acceptable for the introduction of new receptors. In accordance with the EPUK/IAQM significance criteria [Ref 1] adopted for the assessment and presented within Section 3.4, it is concluded that the proposed development would result in 'negligible' impacts at all receptors and is therefore 'not significant'.

Table 11: Annual Mean PM_{10} Predicted Pollutant Concentrations (µg/m³) and Significance

Receptor Name	Annual Mean concentration (µg/m^3)		Predicted Pollutant Concentration Change (µg/m^3)	Effect of Change
	2018 Do Minimum	2018 Do Something		
12 The Street	19.30	19.33	0.03	Negligible
Sorrell's Cottages	21.74	21.75	0.01	Negligible
Hatfield Cottage	17.19	17.25	0.06	Negligible
Crofton	19.77	19.81	0.04	Negligible
Yew Tree Cottage	16.04	16.08	0.04	Negligible
Proposed Development	-	18.03	-	Negligible

Note: Results shown to two decimal places to indicate change and is not an indication of model accuracy.
Do Minimum and predicted concertation change not included for the proposed development as the receptor does not currently exist.

The predicted number of days when PM_{10} concentrations exceed the short term objective of 50µg/m^3 are well below 35 days, with changes between the Do Minimum and Do Something scenarios ‘imperceptible’. Impacts are therefore concluded to be of ‘negligible’ significance.

5.3.3 Particulate Matter ($PM_{2.5}$) Concentrations

$PM_{2.5}$ pollutant concentrations have been predicted at the receptor points identified within Table 3 and are presented within Table 12. The greatest difference in annual mean $PM_{2.5}$ pollutant concentrations, as a result of the proposed development, at all existing receptors is predicted to be ‘negligible’ with the largest change in concentration predicted to be 0.04 µg/m^3 at Hatfield Cottage. $PM_{2.5}$ concentrations are predicted to be below the annual mean air quality objective at all modelled receptors. The annual mean concentration at receptors 5 and 6 are well below the annual $PM_{2.5}$ air quality objective and therefore the proposed development site is acceptable for the introduction of new receptors. In accordance with the EPUK/IAQM significance criteria [Ref 1] adopted for the assessment and presented within Section 3.4, it is concluded that the proposed development would result in ‘negligible’ impacts at all receptors and is therefore ‘not significant’..

Table 12: Annual Mean $PM_{2.5}$ Predicted Pollutant Concentrations (µg/m³) and Significance

Receptor Name	Annual Mean concentration (µg/m^3)		Predicted Pollutant Concentration Change (µg/m^3)	Effect of Change
	2018 Do Minimum	2018 Do Something		
12 The Street	13.02	13.04	0.02	Negligible
Sorrell's Cottages	14.52	14.53	0.01	Negligible
Hatfield Cottage	12.01	12.04	0.04	Negligible
Crofton	13.60	13.63	0.03	Negligible
Yew Tree Cottage	11.12	11.15	0.03	Negligible
Proposed Development	-	12.25	-	Negligible

Note: Results shown to two decimal places to indicate change and is not an indication of model accuracy.
Do Minimum and predicted concertation change not included for the proposed development as the receptor does not currently exist.

5.3.4 Site Suitability

The results presented in the tables above show that annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations are below the relevant air quality objectives at receptor 5 and 6. Therefore, the site is suitable for the introduction of new receptors from an air quality perspective.

6 Mitigation measures

6.1 Construction Phase

The phased construction activities are predicted to have a 'Medium to High Risk' in terms of dust soiling and a 'Low to Medium Risk' for PM_{10} effects withno mitigation in place. Best practice mitigation measures will be introduced including techniques such as those outlined in IAQM guidance. These are presented below:

- General
  - 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 application site boundary.
  - Display head or regional office contact information.
  - Develop and implement a Dust Management plan, including regular site inspections.
  - Record all dust and air quality complaints, identify causes and take appropriate action and record measures to reduce emissions.
  - Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust.
  - Plan site layout so that machinery and dust causing activities are away from receptors, as far as is possible.
  - Erect solid screens or barriers around dusty activities or the application site boundary that are at least as high as any stockpiles on site. Keep clean using wet methods.
  - Avoid site run-off of water or mud. A record of any site run off should be kept and actions to prevent reoccurrence.
  - Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site.
  - Cover, seed or fence stockpiles to prevent wind whipping.
  - Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques.
  - Use enclosed chutes and conveyors and covered skips.
  - Ensure equipment is readily available on site to clean any dry spillages.
  - No burning of waste.
- Operating vehicle/machinery and sustainable travel
  - 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 practicable.
  - Impose and signpost a maximum speed limit.
  - Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing) for site staff.
- Demolition

  - Ensure effective water suppression is used during demolition operations.
  - Bag and remove any biological debris or damp down such material before demolition.
- Earthworks
  - Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
  - Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
  - Only remove the cover in small areas during work and not all at once.
- Construction, where appropriate
  - Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
  - Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
  - For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
- Track Out
  - Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
  - Avoid dry sweeping of large areas.
  - Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport.
  - Inspect on-site haul routes for integrity and instigate necessary repairs to the surfaces as soon as reasonably practicable. Record all inspections of haul routes and any subsequent action in a site log book.
  - Implement a wheel washing system.
  - Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
  - Access gates to be located at least 10m from receptors where possible.

6.2 Operation Phase

Based on the operational air quality assessment, no mitigation measures are required during the operation phase of the proposed development.

7 Summary

This report provides an assessment of the following key impacts associated with the construction and operational phases of the proposed development:

- Nuisance, loss of amenity and health impacts caused by construction dust on sensitive receptors;
- Changes in traffic related pollutant concentrations caused by the proposed development; and,
- Suitability of air quality for the introduction of new receptors.

A qualitative assessment of construction dust effects was undertaken for the proposed development to identify the risk to sensitive receptors from construction activities. Using the best practice guidance from the IAQM, construction activities for the proposed development was deemed to cause a ‘Medium’ to ‘High’ risk to nearby sensitive receptors (Section 5.2). Mitigation measures, consistent with best practice guidance, were therefore recommended in line with ‘High Risk’ construction sites (Section 6).

Modelled results of the operation phase show that changes in NO_2, PM_{10} and $PM_{2.5}$ concentrations at existing receptors will be ‘negligible’ in accordance with the IAQM guidance adopted for this assessment. Therefore the impact of the proposed development on air quality at existing receptors is ‘not significant’. The predicted concentrations at the proposed development boundary are well below the air quality objectives and therefore the site is considered suitable for the introduction of new receptors.

The proposed development is not considered to conflict with any national, regional or local planning policy within BDC.

8 References

1. Environmental Protection UK and Institute of Air Quality Management (May 2015), 'Land-Use Planning and Development Control: Planning for Air Quality' 2015
2. Department for Environment, Food and Rural Affairs (2016), Local Air Quality Management – Technical Guidance (16).
3. Institute of Air Quality Management (2014). 'Guidance on the assessment of dust from demolition and construction.
4. European Union. (1996), 'Ambient air quality assessment management', Framework Directive 96/62/EC.
5. European Union. (April 2008), 'Directive on Ambient Air Quality and cleaner Air for Europe', Directive 2008/50/EC Official Journal, vol. 152, pp. 0001-0044.
6. Statutory Instrument. (2010), 'The Air Quality Standards Regulations', No. 1001. Queen's Printer of Acts of Parliament.
7. Department for Environment Food and Rural Affairs. (2003), 'Part IV of the Environment Act 1995 Local Air Quality Management', Department for Environment Food and Rural Affairs.
8. Statutory Instrument. (2000), 'Air Quality (England) Regulations', No. 928. Queen's Printer of Acts of Parliament.
9. Statutory Instrument. (2002), 'Air Quality (England) (Amendment) Regulations', No. 3043. Queen's Printer of Acts of Parliament.
10. Parliament of the United Kingdom. (1990), 'Environmental Protection Act', Chapter 43. Queen's Printer of Acts of Parliament.
11. Department for Environment Food and Rural Affairs. (March 1997), 'The United Kingdom National Air Quality Strategy', Cm 3587, Department for Environment Food and Rural Affairs.
12. Department for Environment Food and Rural Affairs. (January 2000), 'The Environment Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air', Cm 4548, Department for Environment Food and Rural Affairs.
13. Department for Environment Food and Rural Affairs. (July 2007), 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007'
14. Department of Communities and Local Government (March 2012). Planning Policy Framework.
15. National Planning Practice Guidance web-based resource. Accessible at: http://planningguidance.planningportal.gov.uk/
16. National Planning Practice Guidance 'Air Quality Section'. Accessible at: http://planningguidance.planningportal.gov.uk/blog/guidance/air-quality-new/why-should-planning-be-concerned-about-air-quality/
17. Building Research Establishment (2003). The 'Control of Dust from Construction and Demolition Activities'.
18. Highways Agency (2007), Design Manual for Roads and Bridges, Volume 11 Section 3 Part 1 Air Quality.
19. Department for Environment Food and Rural Affairs. Air Quality Information Resource (Air) Website, available at: http://uk-air.defra.gov.uk/

20. Braintree District Council (2011). Local Development Framework: Core Strategy.
21. Braintree District Council (2016). Air Quality Annual Status Report.
22. Department for Environment Food and Rural Affairs. Background mapping data for local authorities – 2013, available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013
23. Braintree District Council (2015). Local Plan – Issues and Scoping.
24. Essex County Council (2011). Essex Transport Strategy: the Local Transport Plan for Essex

Appendices

A. Dust Assessment Criteria

Table 1: Determination of Dust Raising Magnitude

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

Source: IAQM

Table 2: Receptor Sensitivity

Source	High	Medium	Low
Sensitivities of people to dust soiling effects	Users can reasonably expect an enjoyment of a high level of amenity; or The appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks[b] and car showrooms.	Users would expect[a] to enjoy a reasonable level of amenity, but would not reasonably expect[a] to enjoy the same level of amenity as in their home; or The appearance, aesthetics or value of their property could be diminished by soiling; or The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative examples include parks and places of work.	The enjoyment of amenity would not reasonably be expected[a]; or property would not reasonably be expected[a] to be diminished in appearance, aesthetics or value by soiling; or There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks[b] and roads.

Source	High	Medium	Low
Sensitivities of people to the health effects of PM_{10}	Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).[c] Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	Locations where the people exposed are workers[d], and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	Locations where human exposure is transient[e] Indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of receptors to ecological effects from PM_{10}	Locations with an international or national designation and the designated features may be affected by dust soiling; or Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain[f,g]. Indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition. • Indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	Locations with a local designation where the features may be affected by dust deposition. Indicative example is a local Nature Reserve with dust sensitive features.

[a] People's expectations will vary depending on the existing dust deposition in the area

[b] Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.

[c] This follows Defra guidance as set out in LAQM.TG(09).

[d] Notwithstanding the fact that the air quality objectives and limit values do not apply to people in the workplace, such people can be affected to exposure of PM_{10}. However, they are considered to be less sensitive than the general public as a whole because those most sensitive to the effects of air pollution, such as young children are not normally workers. For this reason workers have been included in the medium sensitivity category.

[e] There are no standards that apply to short-term exposure, e.g. one or two hours, but there is still a risk of health impacts, albeit less certain.

[f] A Habitat Regulation Assessment of the site may be required as part of the planning process, if the site lies close to an internationally designated site i.e. Special Conservation Areas (SACs), Special Protection Areas (SPAs) designated under the Habitats Directive (92/43/EEC) and RAMSAR sites.

[g] Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

Table 3: Sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from the source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 4: Sensitivity of the area to human health effects

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 5: Sensitivity of the area to ecological effects

Receptor Sensitivity	Distance from the source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Table 6: Risk of Dust Effects - Demolition

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Low Risk

Table 7: Risk of Dust Effects - Earthworks

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 8: Risk of Dust Effects - Construction

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 9: Risk of Dust Effects – Trackout

Sensitivity of Area	Dust Emissions Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

B. Model Verification

B.1 Methodology

Guidance produced by Defra (TG16) [Ref 2] provides a methodology for model verification including calculation methods and directions on the suitability of modelling data.

Verification of NO_2 concentrations has been carried out using 2015 monitoring results from a single roadside monitor. No other monitoring was available within the study area.

As no monitoring data is available to verify modelled PM_{10} or $PM_{2.5}$ results within the study area, verification has been carried out for NO_2 only. Given the low PM_{10} and $PM_{2.5}$ concentrations within the study area, and relatively low potential for impact associated with the proposed development in comparison with NO_2, verification of PM_{10} or $PM_{2.5}$ is not considered necessary.

Table 10 presents the bias adjusted, annualised monitored NO_2 concentration used within the model verification.

Table 10: Monitoring Data used within the Model Verification

Site Location	Monitor Type	Annual NO_2 Mean Concentration ($\mu g/m^3$) in 2015	
		NO_x [(a)]	NO_2
Hatfield Peverel A12	Diffusion Tube	92.2	46.0

Notes: [(a)] Derived from NO_2 to NO_x calculator

B.2 Results

Table 11 presents the monitored and modelled annual mean NO_2 concentrations, following adjustment of modelled NO_x, and the percentage difference between them. The results show that the model is over-predicting annual mean NO_2 concentrations.

Table 11: Model Verification Results

Site Location	Monitored Total NO_2 ($\mu g/m^3$)	Modelled Total NO_2 ($\mu g/m^3$)	% Difference
Hatfield Peverel A12	46.0	54.2	17.7

As the model is over-predicting annual mean NO_2 and applying an adjustment factor would reduce predicted concentrations, no adjustment of predicted NO_x contributions have been made. This approach is considered conservative and robust for this assessment.