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GLADMAN DEVELOPMENTS LIMITED

THE STREET, HATFIELD PEVEREL

AIR QUALITY ASSESSMENT

September 2016

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GLADMAN DEVELOPMENTS LIMITED

THE STREET, HATFIELD PEVEREL

AIR QUALITY ASSESSMENT

September 2016

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1 INTRODUCTION

1.1.1 Wardell Armstrong LLP has been commissioned to undertake an air quality assessment for a second application for the proposed residential development at land off The Street, Hatfield Peverel.

1.1.2 The proposed development site is located to the south west of Hatfield Peverel. To the north, the site is bordered by Stone Path Drive with existing residential dwellings beyond. To the east, the site is situated adjacent to Church Road and Crabb's Hill; with residential areas located beyond. The site is bordered to the south and west by open land and isolated residential properties. A small scale Sewage Treatment Works (STW) is located approximately 290m to the south of the proposed development site. The location of the site is shown on drawing number LE13315-003.

1.1.3 The development proposals are residential in nature and comprise approximately 140 dwellings and associated infrastructure, with access from Stone Path Drive to the east. The development proposals, for this second application, therefore represent an increase in the number of proposed dwellings by approximately 60 units.

1.1.4 This report details the results of the air quality assessment undertaken in support of an outline planning application for the proposed residential development. The report discusses the potential dust and fine particulate matter impacts associated with the construction phase, as well as an assessment of the potential air quality impacts of the additional road traffic generated by the proposed development. Air pollutant concentrations are considered at existing sensitive receptor locations in the vicinity of the proposed development, and also at proposed receptor locations within the residential development itself.

1.1.5 This report also considers the potential for odour impacts, as a result of the nearby Sewage Treatment Works, on future residents of the proposed development site.

1.1.6 The traffic data used within the assessment has considered the operation of 130 residential dwellings and associated infrastructure. Since the assessment has been completed the proposals have increased to 140 dwellings. Given that the increase of 10 dwellings is a very small portion of the whole development, it is considered that this small increase will not likely change the overall conclusions of our assessment.

2 LEGISLATION AND POLICY CONTEXT

2.1 Air Quality Legislation and National Air Quality Strategy

2.1.1 The Environment Act 1995 requires the UK government to prepare a National Air Quality Strategy. The UK National Air Quality Strategy (NAQS) was therefore published in March 1997 setting out policies for the management of ambient air quality. The Strategy sets objectives for eight pollutants, which may potentially occur in the UK at levels that give cause for concern. These pollutants are: nitrogen dioxide (NO_2), sulphur dioxide, carbon monoxide, lead, fine particulate matter (PM_{10}), benzene, 1, 3–butadiene and ozone.

2.1.2 The Strategy was reviewed and a Review Report[1] and Consultation Document[2] were published by the Department of the Environment, Transport and the Regions in 1999. A revised version (The Air Quality Strategy (AQS) 2000), which supersedes the 1997 Strategy, was published in January 2000. The AQS 2000 strengthens the objectives for a number of pollutants with the exception of that for particulates, which was replaced with the less stringent EU limit value.

2.1.3 The objectives for the eight pollutants in the Strategy provide the basis of the implementation of Part IV of the Environment Act 1995. The Air Quality Strategy objectives for each pollutant, except ozone, were given statutory status in the Air Quality (England) Regulations, 2000[3] and Air Quality (England) (Amendment) Regulations 2002[4] ('the Regulations').

2.1.4 In 2007 the Air Quality Strategy was revised. This latest strategy[5] does not remove any of the objectives set out in the previous strategy or its addendum, apart from replacing the provisional 2010 objective for PM_{10} in England, Wales and Northern Ireland with the exposure reduction approach for $PM_{2.5}$. The UK Government and the Devolved Administrations have now therefore set new national air quality objectives for particulate matter smaller than 2.5µm diameter ($PM_{2.5}$).

[1] Department of the Environment, Transport and the Regions, January 1999. Report on the Review of the National Air Quality Strategy, Proposals to amend the Strategy
[2] Department of the Environment, Transport and the Regions 1999, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. A consultation document
[3] The Air Quality (England) Regulations 2000. SI No 928
[4] The Air Quality (Amendment) Regulations 2002
[5] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007

2.1.5 EU Directive 2008/50/EC[6] came into force in June 2008 and was transposed into legislation in England on 11th June 2010 as 'The Air Quality Standards Regulations 2010'[7]. This EU Directive consolidates existing air quality legislation and makes achievement of the objectives a national objective rather than a local one. It also provides a new regulatory framework for $PM_{2.5}$.

2.1.6 The current Air Quality Standards and Objectives, as set out in the Air Quality Standards Regulations 2010, are detailed in Table 1.

Table 1: UK Air Quality Objectives and Pollutants

Pollutant	Objective	Averaging Period	Obligation
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m^3	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean	All local authorities
	50µg/m^3 not to be exceeded more than 7 times a year	24-hour mean	Scotland only
	40µg/m^3	Annual mean	All local authorities
	18µg/m^3	Annual mean	Scotland only
Particulate Matter ($PM_{2.5}$)	25µg/M^3	Annual mean	England only
	10µg/m^3	Annual mean	Scotland only
Sulphur Dioxide (SO_2)	266µg/m^3 not to be exceeded more than 35 times a year	15-minute mean	All local authorities
	350µg/m^3 not to be exceeded more than 24 times a year	1-hour mean	All local authorities
	125µg/m^3 not to be exceeded more than 3 times a year	24-hour mean	All local authorities
Benzene (C_6H_6)	16.25µg/m^3	Running annual mean	All local authorities
	5µg/m^3	Annual mean	England and Wales only
	3.25µg/m^3	Running annual mean	Scotland and Northern Ireland only
1,3-Butadiene (C_4H_6)	2.25µg/m^3	Running annual mean	All local authorities
Carbon Monoxide (CO)	10mg/m^3	Maximum daily running 8-hour mean	England, Wales and Northern Ireland only

[6] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe
[7] Statutory Instruments 2010 No. 1001 The Air Quality Standards Regulations 2010

Table 1: UK Air Quality Objectives and Pollutants			
Pollutant	**Objective**	**Averaging Period**	**Obligation**
	10mg/m^3	Running 8-hour mean	Scotland only
Lead (Pb)	0.5µg/m^3	Annual mean	All local authorities

2.2 Legislative Requirement for Local Air Quality Management Guidance

2.2.1 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007, establishes the framework for air quality improvements based on measures agreed at a national and international level. However, despite these measures, it is recognised that areas of poor air quality will remain and these should be dealt with through the Local Air Quality Management (LAQM) process using locally implemented measures.

2.2.2 LAQM legislation in the Environment Act 1995 requires local authorities to conduct periodic review and assessments of air quality. These aim to identify all those areas where the air quality objectives are being, or are likely to be, exceeded.

2.2.3 All authorities were required to undertake the first stage of review and assessment which concluded in September 2001. In those areas identified as having the potential to experience elevated levels of pollutants the authority was required to undertake a more detailed second stage review comprising two steps; Updating and Screening Assessments and Detailed Assessments. Where it was predicted that one or more of the air quality objectives would be unlikely to be met by the end of 2005, local authorities were required to proceed to a third stage and, if necessary, declare Air Quality Management Areas (AQMAs) and make action plans for improvements in air quality, in pursuit of the national air quality objectives.

2.2.4 An Evaluation Report, commissioned by the UK Government and Devolved Administrations in 2007, led to the publication of the LAQM Technical Guidance document LAQM.TG(09) in February 2009. This technical guidance was subsequently updated following a consultation process, and in January 2016 the LAQM Technical Guidance document LAQM.TG(16) was published by Defra.

2.2.5 LAQM.TG(16) presents the changes to the LAQM system across the UK. A new streamlined approach has been adopted in England and Scotland; however Wales and Northern Ireland are still considering changes to LAQM and therefore work according to the previous regimes.

2.2.6 The previous structure of Review and Assessment, comprising Updating and Screening Assessments and Detailed Assessments has been replaced by the introduction of an Annual Status Report (ASR) for England and an Annual Progress Report (APR) for Scotland.

2.2.7 The ASR replaces all other reports which previously had to be submitted as part of the LAQM system including review and assessment and action plan progress reports, updating and screening assessments and detailed assessments.

2.2.8 Local authorities now have the option of a fast track AQMA declaration. This allows more expert judgement to be used and removes the need for a detailed assessment where a local authority is confident of the outcome. Detailed assessments should still be used if there is any doubt.

2.2.9 Examples of where the Air Quality Objectives should/should not apply are also detailed in LAQM.TG(16) and are included in Table 2 below.

Table 2: Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply at:	Objectives Should Generally Not Apply at:
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, car homes, etc.	Building facades 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 mean and 8-hour mean	All locations where the annual mean objectives would apply together with hotels. Gardens of residential properties[a]	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 mean	All locations where the annual mean and 24 and 8-hour objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more.	Kerbside sites where public would not be expected to have regular access

Table 2: Examples of Where the Air Quality Objectives Should Apply		
Averaging Period	**Objectives Should Apply at:**	**Objectives Should Generally Not Apply at:**
	Any outdoor locations to which the public might reasonably be expected to spend one hour or longer	
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer	
[a]: Such locations should represent parts of the garden where relevant public exposure is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied		

2.3 National Planning Policy and Guidance

2.3.1 The National Planning Policy Framework[8], introduced in March 2012 requires that planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in AQMAs is consistent with the local air quality action plan.

2.3.2 The Planning Practice Guidance[9] states that whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impacts 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).

2.3.3 Where a proposed development is anticipated to give rise to concerns about air quality an appropriate assessment needs to be carried out. Where the assessment concludes that the proposed development (including mitigation) will not lead to an unacceptable risk from air pollution, prevent sustained compliance with national objectives or fail to comply with the requirements of the Habitats Regulations, then the local authority should proceed to decision with appropriate planning conditions and/or obligations.

[8] Department for Communities and Local Government, March 2012, National Planning Policy Framework
[9] Department for Communities and Local Government, March 2014, Planning Practice Guidance: Air Quality

2.4 Braintree District Council Local Air Quality Management Review and Assessment

2.4.1 Braintree District Council (BDC) is responsible for the management of air quality in Hatfield Peverel and in the vicinity of the proposed development site. There are currently no AQMAs declared in the district.

2.4.2 The 2015 Updating and Screening Assessment, the most recent LAQM report available on the BDC website, includes details of the most recent air quality monitoring within the district. There are currently twelve passive monitoring locations in operation throughout the district. However, BDC do not currently employ any automatic continuous monitoring equipment within their administrative area.

2.4.3 The closest monitoring location to the proposed development is a roadside diffusion tube located adjacent to the A12 trunk road (Ref: Hatfield Peverel A12). In 2015, this recorded an annual mean NO_2 concentration of 46.0µg/m^3; however, this is not considered to be representative of the proposed development site.

2.4.4 The site itself is not located within an existing AQMA or known area of concern with regards to air quality.

2.5 Odour

2.5.1 The Environmental Protection Act 1990[10] is the legal framework dealing with odour from industrial, trade or business premises. If odour is present in sufficient quantity, this may constitute a statutory nuisance. The Local Authority is placed under a duty to inspect, detect any nuisance and to serve abatement notices where necessary.

2.5.2 NPPF sets out planning policy for England. Paragraph 120 advises planning policies and decisions should ensure that "*development is appropriate for its location"* and that "*the 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"*.

2.5.3 Pollution is defined within NPPF as "*anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including… odour"*.

[10] Environmental Protection Act, 1990

2.5.4 In addition, Section 11 of the NPPF advises 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"*.

3 ASSESSMENT METHODOLOGY

3.1 Consultation and Scope of Assessment

3.1.1 A written assessment methodology was provided, by email, to the Public Health and Housing Team at BDC on 8th January 2016 which included the following points:

- A construction phase dust assessment will be undertaken in accordance with Institute of Air Quality Management (IAQM) guidance;
- A detailed air quality assessment will be undertaken, using the air dispersion model ADMS-Roads, to consider the potential air quality impacts during the operational phase of the proposed development;
- Meteorological data will be obtained from the Andrewsfield recording station, which is considered to be the most representative of the proposed development site;
- There are no representative background monitoring locations in the vicinity of the site. Therefore, background pollutant concentrations will, be obtained from the Defra default concentration maps;
- Model verification will be undertaken using the roadside diffusion tube located adjacent to the A12 trunk road (i.e. Hatfield Peverel A12); and
- An odour sniff test will be taken to consider the potential for odour impacts, as a result of the nearby STW, on future residents of the proposed development site. Further details of this are provided in section 6.3 of this report.

3.1.2 A response was received from Ms Pam Sharp, Environmental Health Officer at BDC, on 12th January 2016. The proposed methodology was agreed; however further comments were provided as follows:

- The methodology should be in accordance with the requirements of LAQM.TG, including model verification;
- Details of appropriate mitigation should be included within the report, regardless of the degree of adverse effect; and
- It was confirmed that BDC holds no record of historical odour complaints over the last 10 years. It was however suggested that Anglian Water could be contacted, in case they hold any further information.

3.2 Construction Phase Assessment – Dust and Fine Particulate Emissions

3.2.1 To assess the impacts associated with dust and PM_{10} releases, during the construction phase of the development, an assessment has been undertaken in accordance with IAQM guidance[11].

Step 1

3.2.2 Step 1 of the assessment is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing human sensitive receptors within 350m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

3.2.3 With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing ecological receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

3.2.4 Where there are existing sensitive receptors locations within 350m of the site boundary, it is necessary to proceed to Step 2 of the assessment.

Step 2

3.2.5 Step 2 of the assessment determines the potential risk of dust and PM_{10} arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

[11] Institute of Air Quality Management 'Guidance on the Assessment of Dust from Demolition and Construction', February 2014

3.2.6 The risk of dust and PM_{10} effects is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon two factors:

- **Step 2A** – the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large; and
- **Step 2B** – the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity.

3.2.7 These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

3.2.8 The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the site, then it does not need to be assessed. The four types of activities to be considered are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

Step 3

3.2.9 Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority[12], recommended for use outside the capital by LAQM guidance and the IAQM guidance document itself. If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

3.2.10 Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

Existing Sensitive Receptors – Human Receptors

3.2.11 The closest sensitive receptor locations to the proposed development are residential in nature, and are detailed in Table 3.

[12] Greater London Authority (2006) The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance

Table 3: Existing Dust Sensitive Receptors – Human Receptors		
Receptor	**Direction from the Site**	**Approximate Distance from the Site Boundary (m)**
Existing residential dwellings on Stone Path Drive	North	c17m at closest point
Existing residential dwellings on Church Road	East	c22m at closest point
Existing residential dwellings on Crabb's Hill	South	C55m at closest point
Existing residential dwellings on The Street	West	C149m at closest point

Existing Sensitive Receptors – Ecological Receptors

3.2.12 There are no ecological receptors, or potentially dust sensitive statutory designated habitat sites, within 50m of the site and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s). Ecological effects do not therefore need to be considered within this assessment.

3.3 Operational Phase Assessment – Road Traffic Emissions

Modelling of Road Traffic Emissions

3.3.1 The air dispersion model ADMS-Roads (CERC, Version 3.4) has been used to assess the potential impact of development generated traffic on air quality at existing receptor locations. The air dispersion model has been used to predict NO_2, PM_{10} and $PM_{2.5}$ concentrations, as these are the pollutants considered most likely to exceed the air quality objectives for human health.

3.3.2 Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for three assessment years as follows:

- The verification and base year (2015): This is the most recent year for which traffic flow information, meteorological data and local pollution data are available;
- The proposed opening year of the development (2018): This is considered both without the development and with the development in place; and
- A future year (2023): This is considered both without the development and with the development in place.

Road Traffic Data

3.3.3 The ADMS-Roads model requires the input of detailed road traffic flow information for those routes which will be affected by the proposed development. The traffic flow information used in the assessment is included in Appendix A.

3.3.4 Detailed traffic flow information, for use in the ADMS-Roads air dispersion model, has been provided by WYG, the appointed transport consultant for the project.

3.3.5 Traffic flow information has been provided by the transport consultant as 24 hour Annual Average Daily Traffic (AADT) flows, with HGV percentages, for the following links:

- A12;
- The Street;
- Church Road; and
- Stone Path Drive.

3.3.6 Air quality modelling has been carried out to predict pollutant concentrations, due to road traffic emissions, for a total of five scenarios:

- 2015 Verification and Base Year;
- 2018 Opening Year (Without Development);
- 2018 Opening Year (With Development);
- 2023 Future Year (Without Development); and
- 2023 Future Year (With Development).

Meteorological Data

3.3.7 The meteorological data used in the air quality modelling has been obtained from ADM Limited. Meteorological data has been obtained for 2015 from the Andrewsfield recording station. This is located approximately 16.5km from the proposed development site and is considered to be the most representative of the conditions at the proposed development.

3.3.8 The meteorological data provides hourly wind speed and direction information. The 2015 wind rose for the Andrewsfield meteorological recording station is included in Appendix B.

Existing Sensitive Receptor Locations

3.3.9 Four representative existing sensitive receptor locations (identified as ESR 1 to ESR 4) have been considered in the air quality assessment. These are residential in nature and have been selected as they are locations at which the annual mean air quality objectives apply and are the most likely to be impacted by the proposed development.

3.3.10 Details of these receptors are given in Table 4, and their locations are shown on drawing LE13315-003.

Table 4: Existing Sensitive Receptor Locations

Receptor	Address	Grid Reference		Receptor Type
		Easting	Northing	
ESR 1	10 Stone Path Drive	578927	211482	Residential
ESR 2	27 Church Road	579022	211497	Residential
ESR 3	3 Oliver's Corner, Church Road	578929	211676	Residential
ESR 4	Walnut Tree Cottage	578747	211630	Residential

Proposed Sensitive Receptor Location

3.3.11 One proposed sensitive receptor location has been selected within the proposed development site. This location has been selected at a point along the site boundary adjacent to Church Road and Stone Path Drive.

3.3.12 Pollutant concentrations at the proposed receptor location has been predicted for scenarios 3 and 5 (as detailed in paragraph 3.3.6). It is only necessary to consider the 'with development' scenarios for the proposed receptor location as it will not experience any 'without development' conditions. It is not therefore necessary to consider the change in pollutant concentrations at the proposed receptor location.

3.3.13 Details of the proposed sensitive receptor location is provided in Table 5, and the location is shown on drawing LE13315-003.

Table 5: Proposed Sensitive Receptor Locations

Receptor Point	Location	Grid Reference	
		Easting	Northing
PR 1	Location on the eastern site boundary, at the closest point to Stone Path Drive and Church Road	578990	211469

3.4 Model Validation, Verification and Adjustment

3.4.1 DEFRA Local Air Quality Management Technical Guidance, 2016, (LAQM.TG(16)) recognises that model validation generally refers to detailed studies that have been carried out by the model supplier or a regulatory agency. The ADMS-Roads model has been validated by the supplier CERC.

3.4.2 Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads model is achieved by modelling concentrations at existing monitoring locations in the vicinity of the proposed development and comparing the modelled concentrations with the measured concentrations.

3.4.3 The monitoring data that has been used in the model verification procedure is detailed in Table 6.

Table 6: NO_2 Monitoring Data Used for Verification Purposes

Monitoring Location Reference	Type	Grid Reference		2015 Bias Adjusted NO_2 Annual Average Concentration (µg/m³)
		Easting	Northing	
A12 Hatfield Peverel	Diffusion Tube	578375	211515	46.0
NO_2 monitoring data obtained from BDC				

3.4.4 As no particulate monitoring locations are situated along roads where traffic flow data was available, model verification could not be carried out for modelled PM_{10} or $PM_{2.5}$ concentrations.

3.4.5 Further details of the model verification can be found within Appendix C.

3.5 Information Sources

3.5.1 The following sources of information have been used in the preparation of this report:

- Braintree District Council, 2015 Updating and Screening Assessment;
- Braintree District Council, 2015 Bias-Adjusted Pollution Data;
- Meteorological data for 2015 from the Andrewsfield recording station, obtained from ADM Limited; and
- Traffic flow information, provided by WYG.

3.6 Assumptions and Limitations

3.6.1 Given the scale of the proposed development it has been assumed that the number of vehicles generated by the construction phase will not be significant. Therefore, the

impact on air quality during the construction phase, as a result of exhaust emissions from construction vehicles, has not been assessed.

4 ASSESSMENT OF SIGNIFICANCE CRITERIA

4.1 Construction Phase Assessment – Dust and Fine Particulate Emissions

4.1.1 The IAQM guidance details criteria for assessing the sensitivity of an area to dust soiling and health effects of PM_{10}, as summarised in Tables 7 to 9 below.

4.1.2 The guidance then goes on to provide significance criteria for the classification of dust soiling and human health effects from demolition, earthworks, construction activities and trackout, as summarised in Tables 10 to 12 below.

Sensitivity of the Area – Human Receptors

4.1.3 The sensitivity categories for different types of receptors, to both dust soiling effects and the health effects of PM_{10}, are described in Table 7.

Table 7: Sensitivity Categories for Human Receptors

Sensitivity Category	Dust Soiling Effects	Health effects of PM_{10}
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms.	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM_{10}; Examples include residential properties, hospitals, schools, and residential care homes.
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work.	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM_{10}; Examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}.
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would expected to be present only for limited periods of time; Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets.

4.1.4 Based upon the category of receptor sensitivity, the sensitivity of the area to dust soiling effects is determined using the criteria detailed in Table 8.

Table 8: Sensitivity of the Area to Dust Soiling Effects on People and Property					
Receptor Sensitivity	**Number of Receptors**	**Distance from Source (m)**			
		<20m	**<50m**	**<100m**	**<350m**
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

4.1.5 Based upon the category of receptor sensitivity, the sensitivity of the area to the health effects of PM_{10} is determined using the criteria detailed in Table 9.

Table 9: Sensitivity of the Area to Human Health Impacts							
Receptor Sensitivity	**Annual Mean PM_{10} Concentration**	**Number of Receptors**	**Distance from Source (m)**				
			<20m	**<50m**	**<100m**	**<200m**	**<350m**
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28µg/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

Risk of Dust Impacts

4.1.6 The risk of dust being generated by demolition activities at the site is determined using the criteria in Table 10.

Table 10: Risk of Dust Impacts - Demolition			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

4.1.7 The risk of dust being generated by earthworks and construction activities at the site is determined using the criteria in Table 11.

Table 11: Risk of Dust Impacts – Earthworks and Construction			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

4.1.8 The risk of dust being generated by trackout from the site is determined using the criteria in Table 12.

Table 12: Risk of Dust Impacts – Trackout			
Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

4.2 Operational Phase Assessment – Road Traffic Emissions

Assessing the Impact of a Proposed Development on Human Health

4.2.1 Guidance has been prepared by Environmental Protection UK (EPUK) and the IAQM with relation to the assessment of the air quality impacts of proposed developments and their significance[13].

4.2.2 The impact of a development is usually assessed at specific receptors, and takes into account both the long term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

4.2.3 The impact descriptors for individual receptors are detailed in Table 13.

Table 13: Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor in Assessment Year*	Percentage 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

**Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.2µg/m^3) should be described as negligible*

Determining the Significance of Effects

4.2.4 Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

4.2.5 Once the impact of the proposed development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account a number of factors such as:

- The existing and future air quality in the absence of the development;

[13] Environmental Protection UK and the Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality, May 2015

- The extent of the current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

4.2.6 A discussion of the impacts of the proposed development, and their significance, is included in sections 6 and 7 of this report, respectively.

5 BASELINE SITUATION

5.1 Operational Phase Assessment – Road Traffic Emissions

Background Air Pollutant Concentrations

5.1.1 The ADMS assessment needs to take into account background concentrations upon which the local, traffic derived pollution is superimposed. The data may be derived through long term ambient measurements at background sites, remote from immediate sources of air pollution, or alternatively from the default concentration maps which have been provided for use by Defra with the revised LAQM.TG(16) guidance.

5.1.2 In the absence of representative background monitoring data being available for the local area, background pollutant concentrations have been obtained from the 2013-based default concentration maps provided by Defra on their Local Air Quality Management webpages[14]. As the receptors are located in more than one grid square, the highest pollutant concentrations have been used in order to provide a robust assessment.

5.1.3 Current evidence suggests that background NO_2 concentrations are not decreasing in accordance with expected reductions. A sensitivity analysis has therefore been undertaken whereby baseline background concentrations and vehicle emission factors (i.e. 2015) have been applied to the 2018 Opening Year and 2023 Future Year scenarios. This is considered to be a conservative approach, as it is likely that there will be some improvement in background air quality, and vehicle emissions, before 2023.

5.1.4 The background pollutant concentrations used in this assessment are detailed in Table 14.

Table 14: Background Pollutant Concentrations Used in the Air Quality Assessment Obtained from the 2013-Based Defra Default Concentration Maps (Grid Square: 578500, 211500)

Pollutant	Annual Mean Concentrations (µg/m^3)		
	2015	2018	2023
Oxides of Nitrogen (NO_x)	23.26	19.57	15.72
Nitrogen Dioxide (NO_2)	16.42	14.05	11.52

[14] Department for Environment, Food and Rural Affairs, Local Air Quality Management webpages (http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html)

Table 14: Background Pollutant Concentrations Used in the Air Quality Assessment Obtained from the 2013-Based Defra Default Concentration Maps (Grid Square: 578500, 211500)			
Pollutant	**Annual Mean Concentrations (µg/m^3)**		
	2015	**2018**	**2023**
Particulate matter (PM_{10})	18.36	17.91	17.48
Particulate matter ($PM_{2.5}$)	12.63	12.22	11.82

Modelled Baseline Concentrations

5.1.5 The baseline assessment (i.e. scenarios 1, 2 and 4) has been carried out for the four existing sensitive receptors considered (i.e. ESR 1 to ESR 4). The NO_2, PM_{10} and $PM_{2.5}$ concentrations are detailed in Table 15 and are also included in Appendix D.

Table 15: Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at Existing Sensitive Receptor Locations for 2014, 2018 and 2023 'Without Development' Scenarios									
Receptor	**Calculated Annual Mean Concentrations (µg/m^3)**								
	NO_2* (Corrected)			**PM_{10} (Uncorrected)**			**$PM_{2.5}$ (Uncorrected)**		
	Scenario 1: 2015	**Scenario 2: 2018**	**Scenario 3: 2023**	**Scenario 1: 2015**	**Scenario 2: 2018**	**Scenario 3: 2023**	**Scenario 1: 2015**	**Scenario 2: 2018**	**Scenario 3: 2023**
ESR 1	19.38	16.23	12.92	18.78	18.32	17.88	12.89	12.45	12.03
ESR 2	19.88	16.58	13.10	18.85	18.38	17.95	12.93	12.49	12.07
ESR 3	34.25	26.97	19.27	20.82	20.22	19.75	14.14	13.55	13.04
ESR 4	34.05	26.79	19.19	20.95	20.34	19.88	14.22	13.62	13.11
**NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator[15] in accordance with LAQM.TG(16)*									

Scenario 1: 2015 Verification and Base Year

5.1.6 The 2015 baseline annual mean NO_2 concentrations (corrected) are predicted to range from 19.38 to 34.25µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted to occur.

[15] NO_x to NO_2 Calculator, Defra Local Air Quality Management web pages (http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html)

5.1.7 The 2015 baseline annual mean PM_{10} concentrations (uncorrected) are predicted to range from 18.78 to 20.95µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur.

5.1.8 The 2015 baseline annual mean $PM_{2.5}$ concentrations (uncorrected) are predicted to range from 12.89 to 14.22µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur.

Scenario 2: 2018 Opening Year, Without Development

5.1.9 The 2018 'without development' annual mean NO_2 concentrations (corrected) are predicted to range from 16.23 to 26.97µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted to occur.

5.1.10 The 2018 'without development' annual mean PM_{10} concentrations (uncorrected) are predicted to range from 18.32 to 20.34µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur.

5.1.11 The 2018 'without development' annual mean $PM_{2.5}$ concentrations (uncorrected) are predicted to range from 12.45 to 13.62µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur.

Scenario 4: 2023 Future Year, Without Development

5.1.12 The 2023 'without development' annual mean NO_2 concentrations (corrected) are predicted to range from 12.92 to 19.27µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m^3) is not predicted to occur.

5.1.13 The 2023 'without development' annual mean PM_{10} concentrations (uncorrected) are predicted to range from 17.88 to 19.88µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur.

5.1.14 The 2023 'without development' annual mean $PM_{2.5}$ concentrations (uncorrected) are predicted to range from 12.03 to 13.11µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur.

6 IMPACT ASSESSMENT

6.1 Construction Phase Assessment – Dust and Fine Particulate Emissions

6.1.1 The main activities involved with the construction phase of works are as follows:

- **Earthworks** which may be required prior to the construction phase of works. Sources of dust can include:
  - Cleaning the site;
  - Stripping and stockpiling of topsoil and subsoil;
  - Ground excavation;
  - Bringing in, tipping and spreading materials on site;
  - Stockpiling materials;
  - Levelling ground;
  - Trenching;
  - Road construction;
  - Vehicle movements on site roads; and
  - Windblown materials from site.
- **Construction** which will involve the construction of individual building access roads, the car parking areas and the buildings themselves; and
- **Trackout** which is the transport of dust and dirt by vehicles travelling from a construction site on to the public road network. This may occur through the spillage of dusty materials onto road surfaces or through the transportation of dirt by vehicles that have travelled over muddy ground on the site. This dust and dirt can then be deposited and re-suspended by other vehicles.

6.1.2 There are no proposed demolition activities associated within the development site. Demolition activities are not therefore considered within this assessment.

Step 2A

6.1.3 Step 2A of the construction phase dust assessment has defined the potential dust emission magnitude from earthworks, construction and trackout in the absence of site specific mitigation. Examples of the criteria for the dust emission classes are detailed in the IAQM guidance.

Step 2B

6.1.4 Step 2B of the construction phase dust assessment has defined the sensitivity of the area, taking into account the significance criteria detailed in Tables 7 to 9, for earthworks, construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling and human health effects.

6.1.5 For earthworks and construction, there are between 10 and 100 residential receptor locations within 50m of where these activities may take place.

6.1.6 For trackout, there are between 10 and 100 receptor locations within 20m of where trackout may occur for a distance of up to 500m from the site entrance.

Step 2C

6.1.7 Step 2C of the construction phase dust assessment has defined the risk of impacts from each activity. The dust emission magnitude is combined with the sensitivity of the surrounding area. The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in Tables 10 to 12.

Summary

6.1.8 Table 16 details the results of Step 2 of the construction phase assessment.

Table 16: Construction Phase Dust Assessment

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	N/A	Large[a]	Large[b]	Medium
Step 2B				
Sensitivity of Closest Receptors	N/A	High	High	High
Sensitivity of Area to Dust Soiling Effects	N/A	Medium	Medium	High
Sensitivity of Area to Human Health Effects	N/A	Low[d]	Low[d]	Low[d]
Step 2C				
Dust Risk: Dust Soiling	N/A	Medium Risk	Medium Risk	Medium Risk
Dust Risk: Human Health	N/A	Low Risk	Low Risk	Low Risk

a. Total site area estimated to be more than 10,000m^2.
b. Total building volume estimated to be greater than 100,000m^3.
c. Number of construction phase vehicles estimated to be between 10 and 50 movements per day.

Table 16: Construction Phase Dust Assessment				
	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
d. Background annual mean PM_{10} concentration below 24µg/m^3, as taken from the LAQM Defra default concentration maps (see Table 14).				

6.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

6.2.1 The impact assessment has been carried out for the four representative existing sensitive receptor locations (i.e. ESR 1 to ESR 4).

6.2.2 Table 17 shows the changes in NO_2 concentrations for the 2018 Opening Year and 2023 Future Year, for both the 'Without Development' and 'With Development' scenarios. These are also included in Appendix D.

Table 17: Predicted NO_2 Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios (Corrected)			
Receptor	**Level of Development**	**Calculated Annual Mean Concentrations (µg/m^3)**	
		2018	**2023**
ESR 1	Without development	16.23	12.92
	With development	16.45	13.08
	Percentage Change Relative to AQAL	*+0.55%*	*+0.40%*
ESR 2	Without development	16.58	13.10
	With development	16.78	13.25
	Percentage Change Relative to AQAL	*+0.50%*	*+0.38%*
ESR 3	Without development	26.97	19.27
	With development	27.29	19.52
	Percentage Change Relative to AQAL	*+0.80%*	*+0.63%*
ESR 4	Without development	26.79	19.19
	With development	26.89	19.27
	Percentage Change Relative to AQAL	*+0.25%*	*+0.20%*

6.2.3 Table 18 shows the changes in PM_{10} concentrations for the 2018 Opening Year and 2023 Future Year, for both the 'Without Development' and 'With Development' scenarios. These are also included in Appendix D.

Table 18: Predicted PM_{10} Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios (Uncorrected)

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m³)	
		2018	2023
ESR 1	Without development	18.32	17.88
	With development	18.36	17.93
	Percentage Change Relative to AQAL	*+0.12%*	*+0.11%*
ESR 2	Without development	18.38	17.95
	With development	18.42	17.99
	Percentage Change Relative to AQAL	*+0.10%*	*+0.10%*
ESR 3	Without development	20.22	19.75
	With development	20.29	19.82
	Percentage Change Relative to AQAL	*+0.16%*	*+0.15%*
ESR 4	Without development	20.34	19.88
	With development	20.37	19.91
	Percentage Change Relative to AQAL	*+0.06%*	*+0.06%*

6.2.4 Table 19 shows the changes in $PM_{2.5}$ concentrations for the 2018 Opening Year and 2023 Future Year, for both the 'Without Development' and 'With Development' scenarios. These are also included in Appendix D.

Table 19: Predicted $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios (Uncorrected)

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m³)	
		2018	2023
ESR 1	Without development	12.45	12.03
	With development	12.48	12.06
	Percentage Change Relative to AQAL	*+0.11%*	*+0.10%*
ESR 2	Without development	12.49	12.07

Table 19: Predicted $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios (Uncorrected)			
Receptor	**Level of Development**	**Calculated Annual Mean Concentrations (µg/m³)**	
		2018	**2023**
	With development	12.51	12.09
	Percentage Change Relative to AQAL	*+0.09%*	*+0.09%*
ESR 3	Without development	13.55	13.04
	With development	13.59	13.08
	Percentage Change Relative to AQAL	*+0.15%*	*+0.13%*
ESR 4	Without development	13.62	13.11
	With development	13.63	13.13
	Percentage Change Relative to AQAL	*+0.05%*	*+0.05%*

Scenario 3: 2018 Opening Year, With Development

6.2.5 The 2018 'with development' annual mean NO_2 concentrations (corrected) are predicted to range from 16.45 to 27.29µg/m³ for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur.

6.2.6 The 2018 'with development' annual mean PM_{10} concentrations (uncorrected) are predicted to range from 18.36 to 20.37µg/m³ for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted to occur.

6.2.7 The 2018 'with development' annual mean $PM_{2.5}$ concentrations (uncorrected) are predicted to range from 12.48 to 13.63µg/m³ for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m³) is not predicted to occur.

Scenario 5: 2023 Opening Year, With Development

6.2.8 The 2023 'with development' annual mean NO_2 concentrations (corrected) are predicted to range from 13.08 to 19.52µg/m³ for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur.

6.2.9 The 2023 'with development' annual mean PM_{10} concentrations (uncorrected) are predicted to range from 17.93 to 19.91µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur.

6.2.10 The 2023 'with development' annual mean $PM_{2.5}$ concentrations (uncorrected) are predicted to range from 12.06 to 13.13µg/m^3 for the four existing sensitive receptor locations considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur.

Assessment of Impact

6.2.11 Using the descriptors detailed in Table 13, the impact of the proposed development can be assessed at each of the four existing sensitive receptors considered.

6.2.12 The impact on NO_2 concentrations in the 2018 Opening Year and 2023 Future Year is detailed in Table 20.

Table 20: Impact on NO_2 Concentrations in 2018 Opening Year and 2023 Future Year

Receptor	2018 Opening Year			2023 Future Year		
	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1	1%	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 2	1%	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 3	1%	<75%	Negligible	1%	<75%	Negligible
ESR 4	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible						

6.2.13 The impact on PM_{10} concentrations in the 2018 Opening Year and 2023 Future Year is detailed in Table 21.

Table 21: Impact on PM_{10} Concentrations in 2018 Opening Year and 2023 Future Year						
Receptor	**2018 Opening Year**			**2023 Future Year**		
	Percentage Change	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 2	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 3	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 4	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible						

6.2.14 The impact on $PM_{2.5}$ concentrations in the 2018 Opening Year and 2023 Future Year is detailed in Table 22.

Table 22: Impact on $PM_{2.5}$ Concentrations in 2018 Opening Year and 2023 Future Year						
Receptor	**2018 Opening Year**			**2023 Future Year**		
	Percentage Change	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 2	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 3	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 4	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible						

Proposed Sensitive Receptor Location

6.2.15 Air pollutant concentrations have also been modelled at one proposed receptor location, for the 2018 Opening Year and 2023 Future Year 'With Development' scenarios, as detailed in Table 23. The NO_2, PM_{10} and $PM_{2.5}$ concentrations are included in Appendix D.

Table 23: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at the Proposed Sensitive Receptor Location for 2018 and 2023 'With Development' Scenarios

Receptor	Calculated Annual Mean Concentrations (µg/m³)					
	NO_2* (Corrected)		PM_{10} (Uncorrected)		$PM_{2.5}$ (Uncorrected)	
	Scenario 3: 2018	Scenario 5: 2023	Scenario 3: 2018	Scenario 5: 2023	Scenario 3: 2018	Scenario 5: 2023
PR 1	16.73	13.25	18.40	17.96	12.50	12.08

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*

Scenario 3: 2018 Opening Year, With Development

6.2.16 The 2018 'with development' annual mean NO_2 concentration (corrected) is predicted to be 16.73µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur.

6.2.17 The 2018 'with development' annual mean PM_{10} concentration (uncorrected) is predicted to be 18.40µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted to occur.

6.2.18 The 2018 'with development' annual mean $PM_{2.5}$ concentration (uncorrected) is predicted to be 12.50µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m³) is not predicted to occur.

Scenario 3: 2023 Future Year, With Development

6.2.19 The 2023 'with development' annual mean NO_2 concentration (corrected) is predicted to be 13.25µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur.

6.2.20 The 2023 'with development' annual mean PM_{10} concentration (uncorrected) is predicted to be 17.96µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted to occur.

The 2023 'with development' annual mean $PM_{2.5}$ concentration (uncorrected) is predicted to be 12.08µg/m^3 for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur.

6.3 Operational Phase Assessment – Odour from Sewage Treatment Works

6.3.1 The Sewage Treatment Works (STW) is located approximately 300m to the south of the proposed development site. Therefore, an odour screening assessment has been undertaken which comprises a review of any historical complaints relating to odour and a site observation visit.

6.3.2 On 12th January 2016, BDC confirmed that there have been no historical complaints relating to odour from the sewage treatment works. The closest existing residential receptors are located approximately 300m from the STW, to the south east of the proposed development site.

6.3.3 A site visit was undertaken on 28th January 2016. On-site observations found no evidence of any odour within, or in the immediate vicinity, the proposed development site.

7 SENSITIVITY ANALYSIS

7.1 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

7.1.1 Current evidence suggests that NO_2 background concentrations are not decreasing in accordance with expected reductions. At present, there is uncertainty about how background NO_2 concentrations will change in future years.

7.1.2 To provide a robust assessment, a sensitivity analysis has been undertaken for the 2018 Opening Year and 2023 Future Year scenarios. This analysis assumes that there will be no improvement in background air quality between 2015 and 2023. Background pollutant concentrations and vehicle emission factors, for 2015, have therefore been applied to the 2018 Opening Year and 2023 Future Year scenarios.

7.1.3 Table 24 shows the changes in NO_2 concentrations for the 2018 Opening Year and 2023 Future Year, for both the 'Without Development' and 'With Development' scenarios. These are also included in Appendix E.

Table 24: Predicted NO_2 Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality (Corrected)

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m^3)	
		2018	2023
ESR 1	Without development	19.51	19.72
	With development	19.77	19.98
	Percentage Change Relative to AQAL	*+0.65%*	*+0.65%*
ESR 2	Without development	20.03	20.26
	With development	20.28	20.52
	Percentage Change Relative to AQAL	*+0.63%*	*+0.65%*
ESR 3	Without development	34.95	36.02
	With development	35.32	36.40
	Percentage Change Relative to AQAL	*+0.92%*	*+0.95%*
ESR 4	Without development	34.73	35.85
	With development	34.84	35.96
	Percentage Change Relative to AQAL	*+0.28%*	*+0.27%*

7.1.4 Table 25 shows the changes in PM_{10} concentrations for the 2018 Opening Year and 2023 Future Year, for both the 'Without Development' and 'With Development' scenarios. These are also included in Appendix E.

Table 25: Predicted PM_{10} Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality (Uncorrected)

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m³)	
		2018	2023
ESR 1	Without development	18.80	18.83
	With development	18.85	18.89
	Percentage Change Relative to AQAL	*+0.12%*	*+0.13%*
ESR 2	Without development	18.87	18.91
	With development	18.92	18.95
	Percentage Change Relative to AQAL	*+0.11%*	*+0.11%*
ESR 3	Without development	20.93	21.10
	With development	21.00	21.17
	Percentage Change Relative to AQAL	*+0.17%*	*+0.18%*
ESR 4	Without development	21.06	21.24
	With development	21.08	21.27
	Percentage Change Relative to AQAL	*+0.06%*	*+0.07%*

7.1.5 Table 26 shows the changes in $PM_{2.5}$ concentrations for the 2018 Opening Year and 2023 Future Year, for both the 'Without Development' and 'With Development' scenarios. These are also included in Appendix E.

Table 26: Predicted $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality (Uncorrected)

Receptor	Level of Development	Calculated Annual Mean Concentrations (µg/m³)	
		2018	2023
ESR 1	Without development	12.90	12.92
	With development	12.93	12.95
	Percentage Change Relative to AQAL	*+0.12%*	*+0.12%*

Table 26: Predicted $PM_{2.5}$ Concentrations at Existing Sensitive Receptor Locations for 2018 and 2023 'Without Development' and 'With Development' Scenarios, Assuming no Improvement in Air Quality (Uncorrected)			
Receptor	**Level of Development**	**Calculated Annual Mean Concentrations (µg/m³)**	
		2018	**2023**
ESR 2	Without development	12.94	12.96
	With development	12.97	12.99
	Percentage Change Relative to AQAL	*+0.11%*	*+0.11%*
ESR 3	Without development	14.21	14.31
	With development	14.25	14.35
	Percentage Change Relative to AQAL	*+0.16%*	*+0.17%*
ESR 4	Without development	14.28	14.39
	With development	14.30	14.41
	Percentage Change Relative to AQAL	*+0.06%*	*+0.06%*

Assessment of Impact

7.1.6 Using the descriptors detailed in Table 13, the impact of the proposed development can be assessed at each of the four existing sensitive receptors considered.

7.1.7 The impact on NO_2 concentrations in the 2018 Opening Year and 2023 Future Year, assuming no improvement in air quality, is detailed in Table 27.

Table 27: Impact on NO_2 Concentrations in 2018 Opening Year and 2023 Future Year, Assuming no Improvement in Air Quality						
Receptor	**2018 Opening Year**			**2023 Future Year**		
	Percentage Change	**Annual Mean Concentration in Relation to AQAL**	**Impact**	**Percentage Change**	**Annual Mean Concentration in Relation to AQAL**	**Impact**
ESR 1	1%	<75%	Negligible	1%	<75%	Negligible
ESR 2	1%	<75%	Negligible	1%	<75%	Negligible
ESR 3	1%	88.3%	Negligible	1%	91.0%	Negligible
ESR 4	<0.5%*	87.1%	Negligible	<0.5%*	89.9%	Negligible
* Changes of less than 0.5% should be described as negligible						

7.1.8 The impact on PM_{10} concentrations in the 2018 Opening Year and 2023 Future Year, assuming no improvement in air quality, is detailed in Table 28.

Table 28: Impact on PM_{10} Concentrations in 2018 Opening Year and 2023 Future Year, Assuming no Improvement in Air Quality

Receptor	2018 Opening Year			2023 Future Year		
	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 2	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 3	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 4	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible						

7.1.9 The impact on $PM_{2.5}$ concentrations in the 2018 Opening Year and 2023 Future Year, assuming no improvement in air quality, is detailed in Table 29.

Table 29: Impact on $PM_{2.5}$ Concentrations in 2018 Opening Year and 2023 Future Year, Assuming no Improvement in Air Quality

Receptor	2018 Opening Year			2023 Future Year		
	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact	Percentage Change	Annual Mean Concentration in Relation to AQAL	Impact
ESR 1	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 2	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 3	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
ESR 4	<0.5%*	<75%	Negligible	<0.5%*	<75%	Negligible
* Changes of less than 0.5% should be described as negligible						

7.2 Proposed Sensitive Receptor Location

7.2.1 Air pollutant concentrations have also been modelled for the proposed receptor location, for the 2018 Opening Year and 2023 Future Year 'With Development' scenario, as detailed in Table 30. The NO_2, PM_{10} and $PM_{2.5}$ concentrations are included in Appendix E.

Table 30: Predicted NO_2, PM_{10} and $PM_{2.5}$ Concentrations at the Proposed Sensitive Receptor Location for 2018 and 2023 'With Development' Scenarios, Assuming no Improvement in Air Quality

Receptor	Calculated Annual Mean Concentrations (µg/m³)					
	NO_2* (Corrected)		PM_{10} (Uncorrected)		$PM_{2.5}$ (Uncorrected)	
	Scenario 3: 2018	Scenario 5: 2023	Scenario 3: 2018	Scenario 5: 2023	Scenario 3: 2018	Scenario 5: 2023
PR 1	20.15	20.37	18.89	18.92	12.95	12.97

** NO_2 concentrations obtained by inputting predicted NO_x concentrations into the NO_x to NO_2 calculator in accordance with LAQM.TG(16)*

Scenario 3: 2018 Opening Year, With Development

7.2.2 The 2018 'with development' annual mean NO_2 concentration (corrected) is predicted to be 20.15µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur.

7.2.3 The 2018 'with development' annual mean PM_{10} concentration (uncorrected) is predicted to be 18.89µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m³) is not predicted to occur.

7.2.4 The 2018 'with development' annual mean $PM_{2.5}$ concentration (uncorrected) is predicted to 12.95µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m³) is not predicted to occur.

Scenario 3: 2023 Future Year, With Development

7.2.5 The 2023 'with development' annual mean NO_2 concentration (corrected) is predicted to be 20.37µg/m³ for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for NO_2 (40µg/m³) is not predicted to occur.

7.2.6 The 2023 'with development' annual mean PM_{10} concentration (uncorrected) is predicted to be 18.92µg/m^3 for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for PM_{10} (40µg/m^3) is not predicted to occur.

7.2.7 The 2023 'with development' annual mean $PM_{2.5}$ concentration (uncorrected) is predicted to be 12.97µg/m^3 for the proposed sensitive receptor location considered. Exceedance of the annual mean objective concentration for $PM_{2.5}$ (25µg/m^3) is not predicted to occur.

8 ASSESSMENT OF SIGNIFICANCE

8.1 Operational Phase Assessment – Road Traffic Emissions

8.1.1 The significance of the overall effects of the proposed development has been assessed. This assessment is based on professional judgement and takes into account a number of factors, including:

- Baseline pollutant concentrations in the 2015 Verification and Base Year are below the relevant annual mean objectives at all four existing sensitive receptor locations considered;
- With regard to the future baseline (i.e. the 2018 Opening Year and 2023 Future Year 'without development' scenarios), the assessment predicts that pollutant concentrations will be below the objectives;
- The assessment predicts a negligible impact on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all four existing sensitive receptor locations, with the development in place;
- A sensitivity analysis has been undertaken whereby 2015 background concentrations and vehicle emission factors have been used in the 2018 Opening Year and 2023 Future Year scenarios. The sensitivity analysis comprises a conservative approach and also predicts a negligible impact on NO_2, PM_{10} and $PM_{2.5}$ concentrations at all four existing sensitive receptor locations, with the development in place; and
- The assessment predicts that all on-site pollutant concentrations will be below the relevant air quality objectives.

8.1.2 Based on these factors, the overall effect of the proposed development on human health is considered to be 'not significant'.

9 MITIGATION MEASURES

9.1 Construction Phase Assessment – Dust Emissions

Step 3

9.1.1 During the construction phase the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and particulate matter to be generated.

9.1.2 Step 2C of the construction phase assessment identified that:

- The risk of dust soiling effects is classed as medium for earthworks, construction and trackout; and
- The risk of human health effects is classed as low for earthworks, construction and trackout.

9.1.3 This assumes that no mitigation measures are applied, except those required by legislation. Site specific mitigation measures do not need to be recommended if the risk category is negligible.

9.1.4 The risk of dust soiling and human health effects is not negligible, therefore site specific mitigation will need to be implemented to ensure dust effects from these activities will be 'not significant'.

9.1.5 A best practice dust mitigation plan will be written and implemented for the site. This will set out the practical measures that could be incorporated as part of a best working practice scheme. This will take into account the recommendations included within the IAQM guidance, which may include but are not limited to:

- Dampening down of exposed stored materials, which will be stored as far from sensitive receptors as possible;
- Avoidance of activities that generate large amounts of dust during windy conditions;
- Ensuring 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;
- Avoiding dry sweeping of large areas;
- Using 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;

- Ensuring that all vehicles will be sheeted when loaded;
- Confining vehicles to areas of the site where appropriate dust control measures can be in operation; and
- Minimising vehicle movements and limitation of vehicle speeds – the slower the vehicle speeds, the lower the dust generation.

9.1.6 All dust and air quality complaints should be recorded and appropriate measures be taken to identify causes and reduce emissions in a timely manner. Exceptional incidents which cause dust and/or emissions, and the action taken to resolve the situation, should be recorded in a log book and made available to BDC on request.

9.1.7 It is recognised that the final design solutions will be developed with the input of the contractor to maximise construction efficiencies, to use modern construction techniques and sustainable materials, and to incorporate the particular skills and experience offered by the successful contractor.

Step 4

9.1.8 Step 4 of the construction phase dust assessment has been undertaken to determine the significance of the dust effects arising from earthworks, construction and trackout associated with the proposed development.

9.1.9 The implementation of effective mitigation measures during the construction phase, such as those detailed in Step 3, will substantially reduce the potential for nuisance dust and particulate matter to be generated and any residual impact should be 'not significant'

9.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

9.2.1 An air quality assessment and sensitivity analysis have been undertaken to consider the potential impact of development-generated vehicles on air quality at four existing sensitive receptor locations.

9.2.2 The air quality assessment and sensitivity analysis both predict that there will be a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all four of the existing sensitive receptors considered in 2018 and 2023, with the development in place.

Proposed Sensitive Receptor Location

9.2.3 The assessment has also predicted pollutant concentrations at one proposed receptor location within the proposed residential development site. This location has been selected along the closest site boundary to both Stone Path Drive and Church Road.

9.2.4 Both the air quality assessment and sensitivity analysis predicts that all on-site pollutant concentrations will be below the relevant air quality objectives.

Recommendations for Mitigation

9.2.5 The impact of the operation of the proposed development is predicted to be negligible and not significant, even when a worst case approach is adopted which assumes no improvement in backgrounds or emission factors. It may however be possible to further reduce the impact with the implementation of various mitigation strategies, which could include a green travel plan.

10 CONCLUSIONS

10.1 Construction Phase Assessment – Dust Emissions

10.1.1 The construction phase assessment has been undertaken to determine the risk and significance of dust effects from earthworks, construction and trackout associated with the proposed development. The assessment has been undertaken in accordance with the guidance on assessing the impacts of construction phase dust published by the IAQM.

10.1.2 The risk of dust soiling effects is classed as medium for earthworks, construction and trackout. The risk of human health effects is classed as low for earthworks, construction and trackout.

10.1.3 With site specific mitigation measures in place, such as those detailed in Section 9 of this report, the significance of dust effects from earthworks, construction and trackout are considered to be 'not significant'.

10.2 Operational Phase Assessment – Road Traffic Emissions

Existing Sensitive Receptor Locations

10.2.1 An air quality assessment and sensitivity analysis have been undertaken to consider the potential impact of development-generated vehicles on air quality at four existing sensitive receptor locations.

10.2.2 Both the air quality assessment and sensitivity analysis predict that there will be a negligible impact on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at all four of the existing sensitive receptors considered in 2018 and 2023, with the development in place.

Proposed Sensitive Receptor Location

10.2.3 The assessment has also predicted pollutant concentrations at one proposed receptor location within the proposed residential development site. This location has been selected along the closest site boundary to Stone Path Drive and Church Road.

10.2.4 Both the air quality assessment and sensitivity analysis predict that all on-site pollutant concentrations will be below the relevant air quality objectives.

Recommendations for Mitigation

10.2.5 The impact of the operation of the proposed development is predicted to be negligible and not significant, even when a worst case approach is adopted which assumes no improvement in backgrounds or emission factors. It may, however, be possible to

further reduce the impact with the implementation of various mitigation strategies, which could include a green travel plan.

10.3 Operational Phase Assessment – Odour from Sewage Treatment Works

10.3.1 The Sewage Treatment Works (STW) is located approximately 300m to the south of the proposed development site. Therefore, an odour screening assessment has been undertaken. On 12th January 2016, BDC confirmed that there have been no historical complaints relating to odour from the sewage treatment works. A site visit was undertaken on 28th January 2016. On-site observations found no evidence of any odour within, or in the immediate vicinity, the proposed development site.

10.4 Summary

10.4.1 The assessment has demonstrated that the proposed development will not lead to an unacceptable risk from air pollution, or to a failure to comply with the Habitats Regulations as required by national policy. There are no material reasons in relation to air quality why the proposed scheme should not proceed, subject to appropriate planning conditions.

10.4.2 The traffic data used within the assessment has considered the operation of 130 residential dwellings and associated infrastructure. Since the assessment has been completed the proposals have increased to 140 dwellings. Given that the increase of 10 dwellings is a very small portion of the whole development, it is considered that this small increase will not likely change the overall conclusions of our assessment. Therefore, it is highly anticipated that the proposed development will still have a negligible impact and not significant effect.

Appendix A:
Traffic Flow Information
Used in the Air Quality Assessment

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24 Hour Annual Average Daily Traffic (AADT) Flows, Provided by WYG on 5th August 2016

Link	Link Name	Road Width (m)	Speed Limit (kph)	Scenario 1: 2015 Verification and Base Year		Scenario 2: 2018 Opening Year, Without Development		Scenario 3: 2018 Opening Year, With Development		Scenario 4: 2023 Future Year, Without Development		Scenario 5: 2023 Future Year, With Development	
				LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV	LGV	HGV
1	Stone Path Drive	6.5	48	236	10	247	10	1271	10	263	11	1288	11
2	Church Road, North of Stone Path Drive	6.5	48	2564	476	2678	497	3620	497	2864	531	3806	531
	Church Road, South of Stone Path Drive	6.5	48	2564	476	2678	497	3620	497	2864	531	3806	531
3	The Street, East of Church Road	6.5	48	15101	3770	15771	3937	16242	3937	16864	4209	17335	4209
	The Street, West of Church Road	6.5	48	12388	4139	12939	4322	13410	4322	13837	4621	14309	4621
4	A12 Eastbound	22	112 LGV / 96 HGV	34240	2879	35758	3007	36016	2922	38232	3215	38405	3215
	A12 Westbound	22		34240	2879	35758	3007	36016	2922	38232	3215	38405	3215

* Queue zones and slow down sections modelled at 15kph.

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Appendix B:
2015 Wind Rose for Andrewsfield
Meteorological Recording Station

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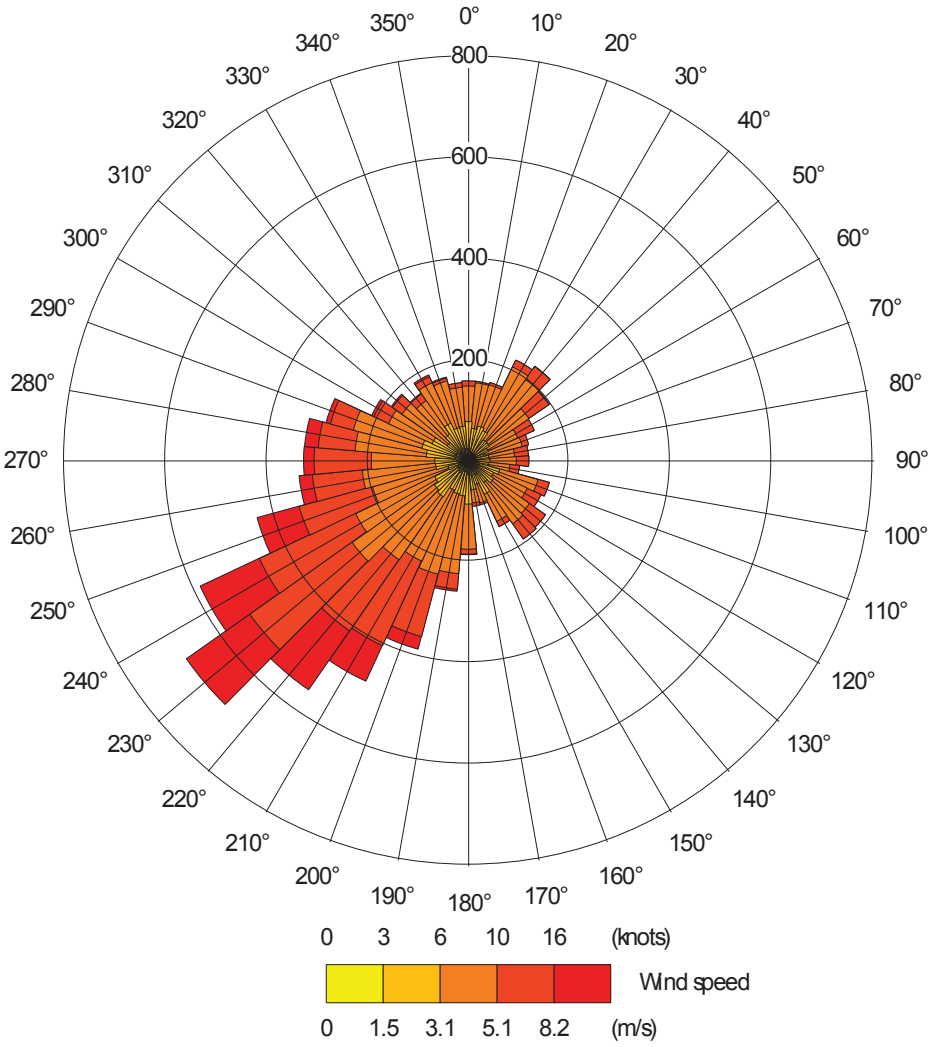
0°
10°
20°
30°
40°
50°
60°
70°
80°
90°
100°
110°
120°
130°
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150°
160°
170°
180°
190°
200°
210°
220°
230°
240°
250°
260°
270°
280°
290°
300°
310°
320°
330°
340°
350°
800
600
400
200
0 3 6 10 16 (knots)
Wind speed
0 1.5 3.1 5.1 8.2 (m/s)

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Appendix C:
Model Verification Procedure

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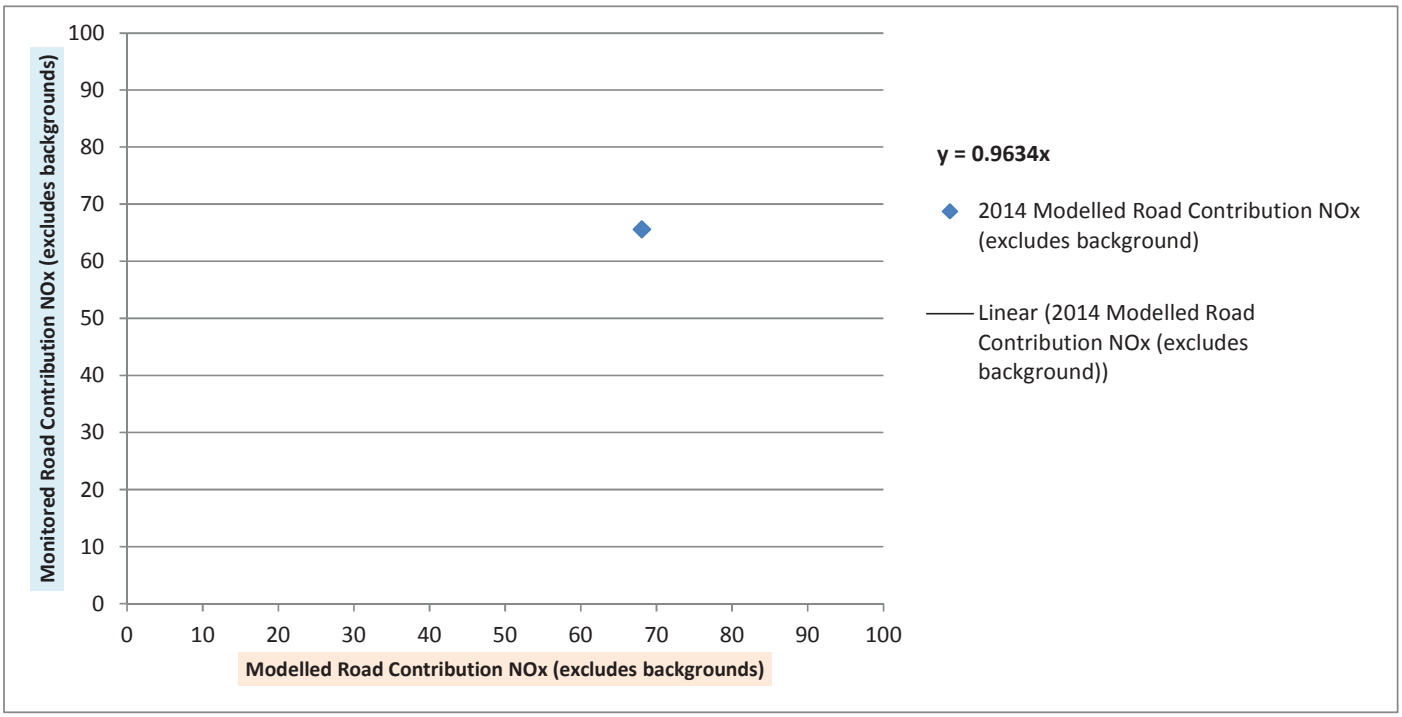
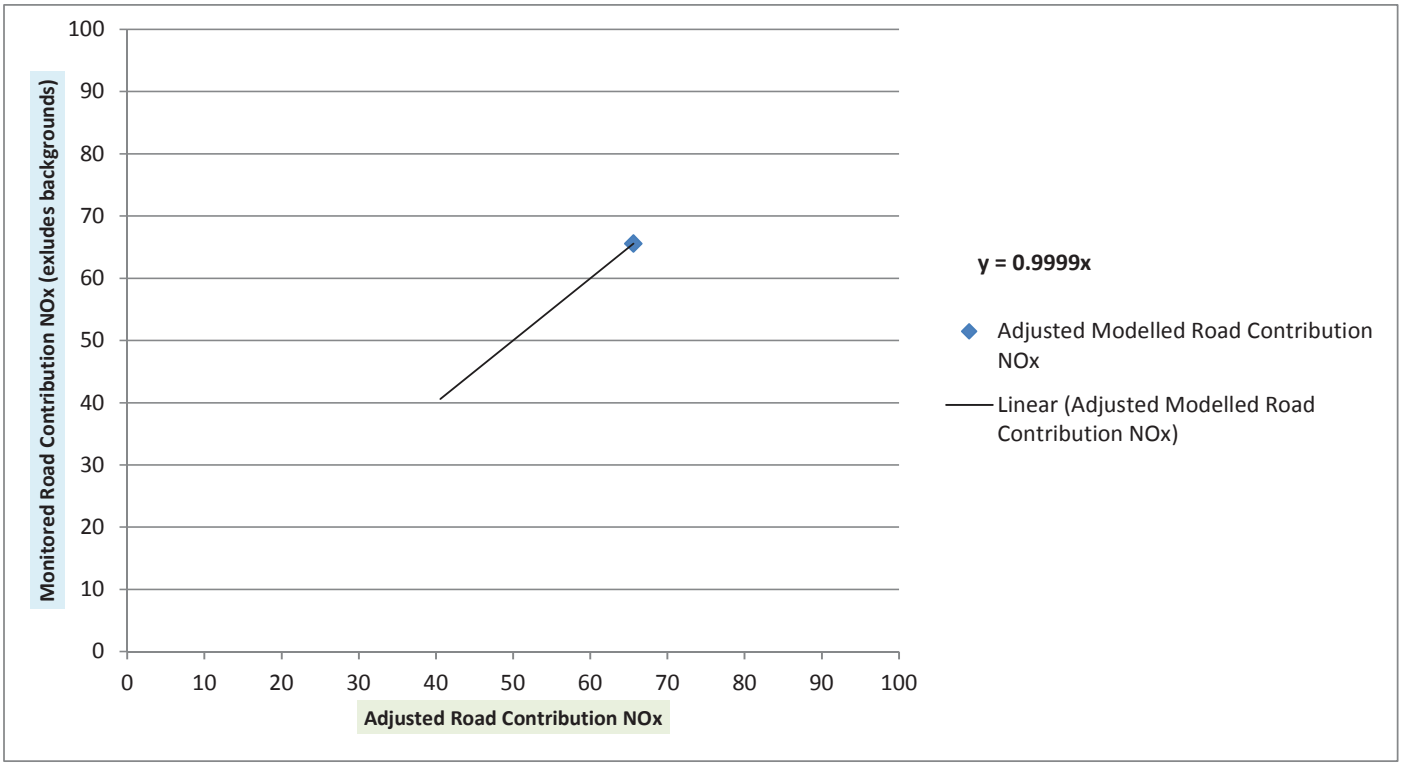
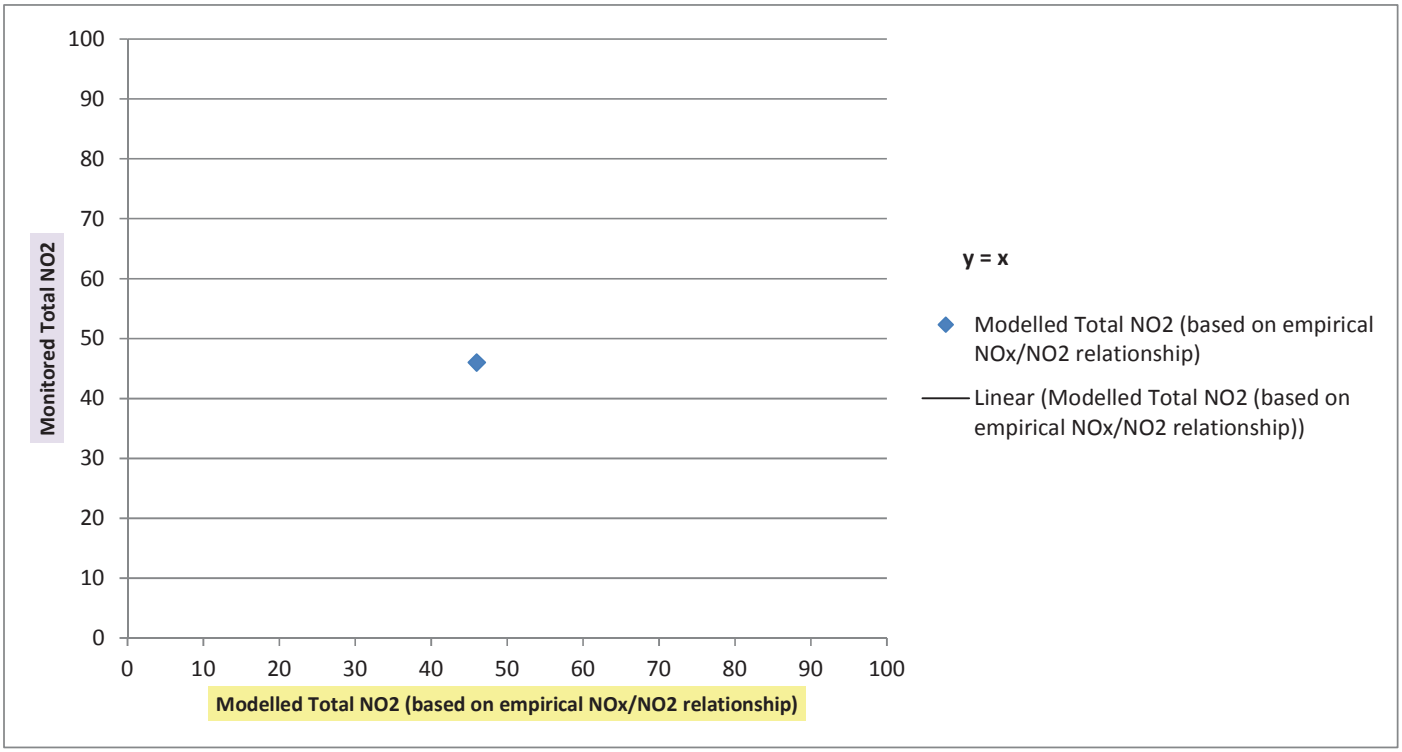
Address	2015 Monitored Total NO2	2015 Monitored Total NOx	2015 Background NO2	2015 Background NOx	Monitored Road Contribution NO2 (total - background)	Monitored Road Contribution NOx (excludes background)	Modelled Road Contribution NOx (excludes background)
A12 Hatfield Peverel	46.00	88.84	16.42	23.26	29.58	65.58	68.07



Address	Ratio of Monitored Road Contribution NOx / Modelled Road Contribution NOx	Adjustment Factor for Modelled Road Contribution	Adjusted Modelled Road Contribution NOx	Adjusted Modelled Total NOx (including background NOx)	Modelled Total NO2 (based on empirical NOx / NO2 relationship)	Monitored Total NO2	% Difference [(modelled - monitored) / monitored] x 100
A12 Hatfield Peverel	0.96		65.58	88.84	46.00	46.00	0.00
		0.9634					




100
90
80
70
60
50
40
30
20
10
0
Monitored Total NO2
0
10
20
30
40
50
60
70
80
90
100
Modelled Total NO2 (based on empirical NOx/NO2 relationship)
y = x
Modelled Total NO2 (based on empirical NOx/NO2 relationship)
Linear (Modelled Total NO2 (based on empirical NOx/NO2 relationship))

Appendix D:
Air Quality Assessment Results

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Annual Mean NO_X, NO_2, PM_{10} and $PM_{2.5}$ Concentrations in µg/m³

Receptor	Scenario 1: 2015 Verification and Base Year				Scenario 2: 2018 Opening Year, Without Development				Scenario 3: 2018 Opening Year, With Development				Scenario 4: 2023 Future Year, Without Development				Scenario 5: 2023 Future Year, With Development			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	28.97	19.38	18.78	12.89	23.69	16.23	18.32	12.45	24.09	16.45	18.36	12.48	18.34	12.92	17.88	12.03	18.63	13.08	17.93	12.06
ESR 2	29.94	19.88	18.85	12.93	24.34	16.58	18.38	12.49	24.72	16.78	18.42	12.51	18.68	13.10	17.95	12.07	18.96	13.25	17.99	12.09
ESR 3	60.30	34.25	20.82	14.14	45.08	26.97	20.22	13.55	45.76	27.29	20.29	13.59	30.57	19.27	19.75	13.04	31.07	19.52	19.82	13.08
ESR 4	59.84	34.05	20.95	14.22	44.71	26.79	20.34	13.62	44.92	26.89	20.37	13.63	30.41	19.19	19.88	13.11	30.57	19.27	19.91	13.13
PR 1									24.63	16.73	18.40	12.50					18.95	13.25	17.96	12.08

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Appendix E:
Sensitivity Analysis Results

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Annual Mean NO_X, NO_2, PM_{10} and $PM_{2.5}$ Concentrations in µg/m³

Receptor	Scenario 2: 2018 Opening Year, Without Development				Scenario 3: 2018 Opening Year, With Development				Scenario 4: 2023 Future Year, Without Development				Scenario 5: 2023 Future Year, With Development			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$	NO_x	NO_2	PM_{10}	$PM_{2.5}$
ESR 1	29.22	19.51	18.80	12.90	29.73	19.77	18.85	12.93	29.63	19.72	18.83	12.92	30.15	19.98	18.89	12.95
ESR 2	30.25	20.03	18.87	12.94	30.73	20.28	18.92	12.97	30.70	20.26	18.91	12.96	31.20	20.52	18.95	12.99
ESR 3	61.91	34.95	20.93	14.21	62.75	35.32	21.00	14.25	64.37	36.02	21.10	14.31	65.25	36.40	21.17	14.35
ESR 4	61.40	34.73	21.06	14.28	61.64	34.84	21.08	14.30	63.97	35.85	21.24	14.39	64.24	35.96	21.27	14.41
PR 1					30.49	20.15	18.89	12.95					30.92	20.37	18.92	12.97

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Drawing

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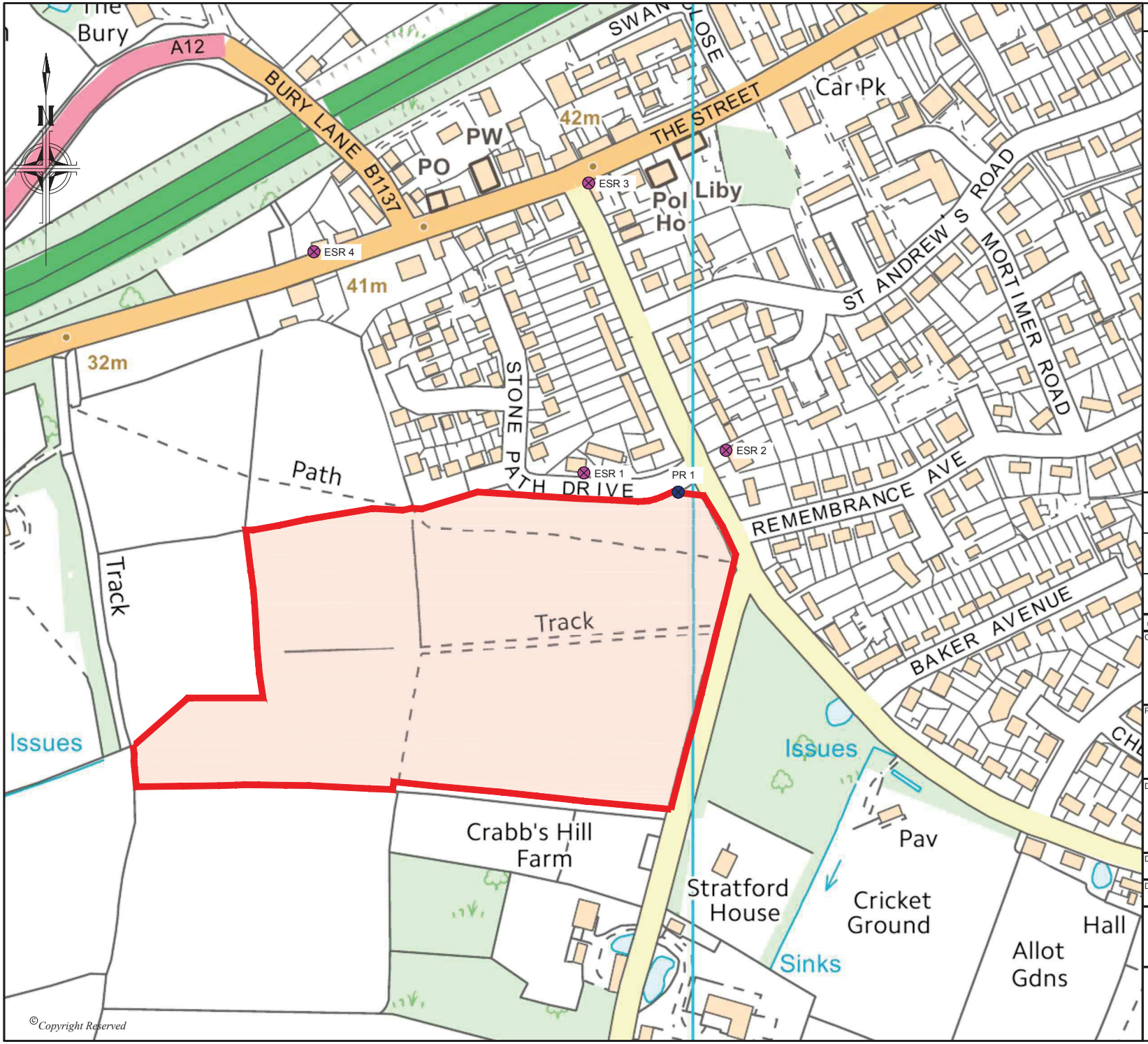

DO NOT SCALE FROM THIS DRAWING | A3

REFERENCE

- SITE BOUNDARY
- EXISTING SENSITIVE RECEPTOR LOCATION
- PROPOSED SENSITIVE RECEPTOR LOCATION

REVISION	DETAILS	DATE	DRAWN	CHK'D	APP'D
A	First Issue	26/09/16	SG	EZ	MTW

CLIENT
Gladman Developments Limited

PROJECT
The Street, Hatfield Peverel

DRAWING TITLE
Existing and Proposed Sensitive Receptor Locations

DRG No.	SCALE	DATE
LE13315-003	1:2500 @ A3	17/08/16

DRAWN BY	CHECKED BY	APPROVED BY
PG	EZ	MTW

STOKE-ON-TRENT (HEAD OFFICE)	TEL 0845 111 7777	CARDIFF	TEL 029 2072 9191
NEWCASTLE UPON TYNE	TEL 0191 232 0943	LEIGH	TEL 01942 260101
WEST BROMWICH	TEL 0121 580 0909	SHEFFIELD	TEL 0114 245 6244
LONDON	TEL 020 7287 2872	EDINBURGH	TEL 0131 555 3311
		TAUNTON	TEL 01823 703100

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