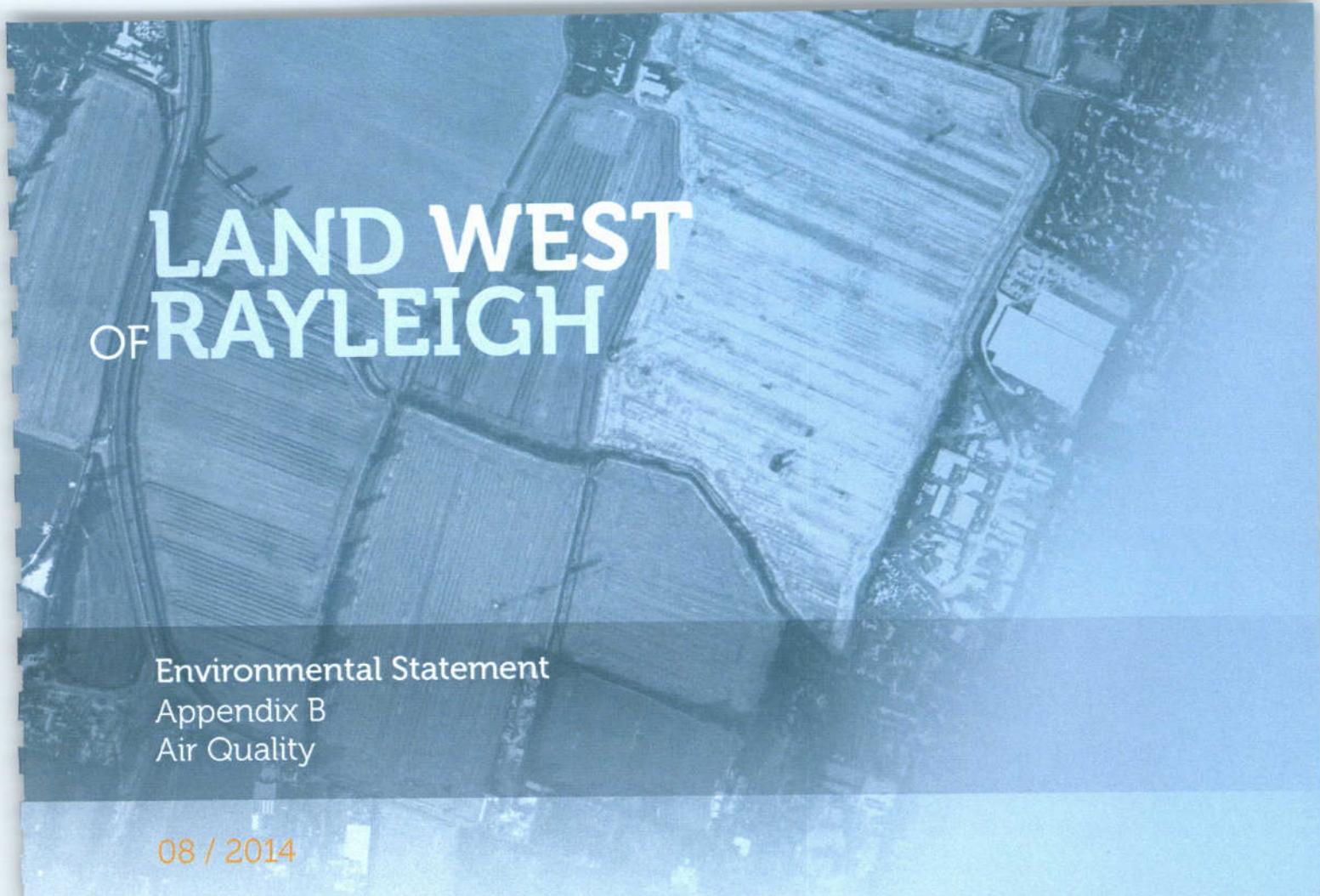

LAND WEST OF RAYLEIGH

Environmental Statement
Appendix B
Air Quality

08 / 2014

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COUNTRYSIDE
Places People Love

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COUNTRYSIDE PROPERTIES
WEST OF RAYLEIGH
RAYLEIGH

AIR QUALITY ASSESSMENT

AUGUST 2014

the journey is the reward

COUNTRYSIDE PROPERTIES
WEST OF RAYLEIGH
RAYLEIGH

AIR QUALITY ASSESSMENT

AUGUST 2014

Project Code:	**CPRAYLEIGH.9**
Prepared by:	**DS**
Approved by:	**SA**
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Countryside Properties
West of Rayleigh
Rayleigh

Air Quality Assessment

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1 Executive Summary

1.1 An air quality impact assessment was conducted for a proposed mixed-use development off Rawreth Lane, Rayleigh and is intended to present a reasonable worst case scenario. The analysis included conservative assumptions of vehicular traffic generation in relation to onsite and offsite impacts. Background air quality levels from local authority monitoring sites and DEFRA background maps have been utilised within the assessment and to verify the modelled results.

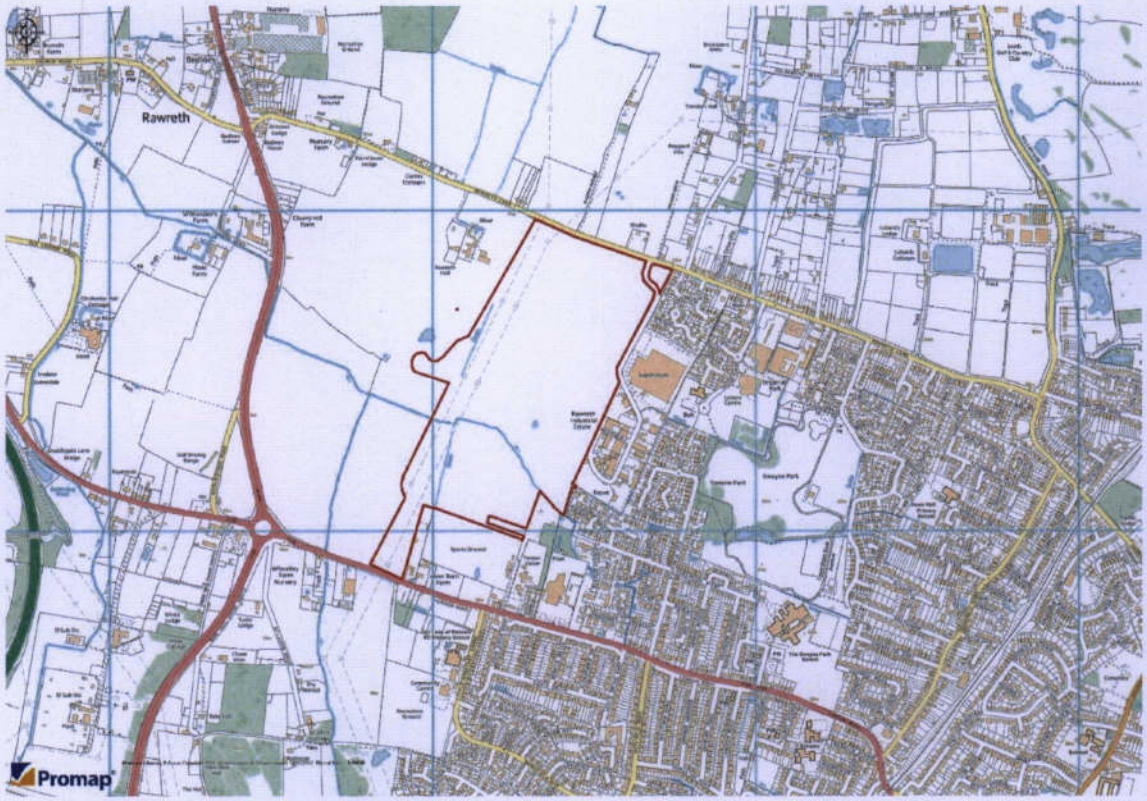
1.2 In general, the predominant change in air quality levels generated from the proposed development and corresponding impacts will be due to the increasing number of vehicles on the local highway network associated with the development.

1.3 Results of the air quality assessment conclude that the change in air quality from the proposed development will have no perceivable effect on nearby sensitive receptors. This conclusion is based on conservative modelling assumptions, as well as consideration of air pollution levels currently experienced by receptors due to existing air quality conditions. The criteria utilised in this assessment to reach this conclusion are based upon the Institute of Air Quality Managers and Environmental Protection UK guidance.

1.4 It should be noted that this assessment is based on worst case assumptions/scenarios and, therefore, a robust assessment has been undertaken.

2 Introduction

2.1 Mayer Brown Ltd has been appointed by Countryside Properties plc to undertake this air quality impact assessment in support of an outline planning application for a proposed development of land, off Rawreth Lane, Rayleigh. The location of the proposed development area is illustrated in **Figure 2.1**: Site Location in Relation to the Local Highway Network.



(Source: Ordnance Survey, Licence: AL100002189)

Figure 2.1: Site in Relation to the Local Highway Network

2.2 The application site is bounded to the south by London Road, West by the A1245 Chelmsford Road, north by Rawreth Lane and to the east by a Macro superstore and Rawreth Industrial estate. This is illustrated in **Figure 2.2**: Existing Site Layout.

(Source: Ordnance Survey, Licence: AL100002189)

Figure 2.2: Existing Site Layout

2.3 The proposal to which this Air Quality Assessment relates is for a residential led development. The proposal is for the construction of approximately 500 residential dwellings. Traffic separation from the non-residential uses proposed is likely to be relatively small-scale given the limited extent of non-residential development proposed, and in some cases trips will be linked with existing network trips or by non-car modes. Traffic for the non-residential uses does not therefore materially affect the assessment process. For the purpose of understanding the overall implications of the development area, the following scenarios have been tested:

- 500 dwellings at Land West of Rayleigh + sensitivity = 520 dwellings
- The total developable area within the SER1 allocation including the Application Site (550 dwellings, plus 10% for sensitivity testing purposes = 605 dwellings)
- SER1 + 10% (605 dwellings) with the development at Hullbridge (500 dwellings)
- SER1 + 10% (605 dwellings) with the development at Hullbridge (500 dwellings) and with the development at Rawreth Industrial Estate (220 dwellings)

2.4 The Land Use Plan is shown in **Figure 2.3**.

Figure 2.3: Proposed Land Use Plan

2.5 The main issue in terms of air quality for a development of this nature will be from vehicular emissions of Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10} and $PM_{2.5}$). Emissions from road traffic are most likely to affect receptors within 200m of a road which is subject to a traffic change. These receptors may include new residents as part of the new development and existing residential receptors in the surrounding area.

2.6 A quantitative assessment of the potential traffic related air quality impacts, both as a result of the development and for the location itself has also be undertaken.

2.7 At this outline application stage it is not possible to fully quantify the potential impact upon sensitive receptors as the routing of any construction vehicles would be considered within a routing plan built into the CEMP. Therefore, a qualitative assessment of the air quality impacts of construction upon local residents is provided based upon the scale of the development and appropriate referenced guidance.

2.8 This assessment has been undertaken using the guidance and parameters set out in Section 3 and the scope of works undertaken has been discussed with Rochford District Council (RDC).

3 National and Local Policies and Principles

National Legislation

3.1 Part IV of the Environment Act 1995[1] requires local authorities to review and assess the air quality within their boundaries. As a result, the Air Quality Strategy was adopted in 1997, with national health based standards and objectives set out for all seven key air pollutants.

3.2 The purpose of this is to identify areas where air quality is unlikely to meet the objectives prescribed in the regulations. The strategy was reviewed in 2000 and the amended Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2000) was published. This was followed by an Addendum in February 2003 and, in July 2007, an updated Air Quality Strategy was published. The current pollutant standards as they apply to this assessment are described below.

3.3 The UK Air Quality Strategy for England, Scotland, Wales and Northern Ireland sets national health-based standards and objectives for the seven key air pollutants. Pollutant standards relate to ambient pollutant concentrations in air, set on the basis of medical and scientific evidence based on how each pollutant affects human health. Pollutant objectives are the future dates by which each standard is to be achieved, taking into account economic considerations, practical and technical feasibility.

3.4 The updated 2007 strategy does not remove any of the objectives set out in the previous strategy and its addendum, apart from replacing the provisional 2010 PM_{10} objective in England, Wales and Northern Ireland with an exposure reduction approach. The exposure reduction approach will generally be more beneficial to public health and potentially more cost-effective.

3.5 The percentage reduction objective is a relative measure of improvement (in this case, 15% reduction in average concentrations in urban background areas across the UK between 2010 and 2020), the air quality objectives/limit values, are designed to deliver a minimum level of protection applicable to all areas in a country (25 $\mu g/m^3$).

3.6 The new objectives are set out in **Table 3.1**:

[1] Department for Environment, Food and Rural Affairs (1995) The Environment Act. HMSO, London.

Pollutant	Air Quality Objective		Date to be Achieved by
	Concentration	Measured As	
Nitrogen Dioxide (NO_2)	40 µg/m^3	Annual Mean	01.01.10
Particular Matter (PM_{10})	Indicative 2010 objectives for PM_{10} (from the 2000 Strategy and 2003 Addendum) have been replaced by an exposure reduction approach for $PM_{2.5}$		
Particles ($PM_{2.5}$) Exposure Reduction UK	25 µg/m3	Annual Mean	2020
Particles ($PM_{2.5}$) Exposure Reduction UK urban areas	Target of 15% Reduction in concentrations at urban background	Annual Mean	Between 2010 & 2020

Table 3.1: Air Quality Strategy for England, Scotland, Wales and Northern Ireland – New Particles Objectives

Air Quality Standards Regulations, 2010

3.7 The air quality limit values set out in EU Directive (2008/50/EC, 2008) are transposed in English law by the Air Quality Standards Regulations (2010). This imposes duties on the Secretary of State relating to achieving the limit values.

3.8 With regards to dust, it is recognised that major construction works may give rise to dust emissions within the PM_{10} size fraction and it is noted within section 79 of the Environmental Protection Act 1990 that a statutory nuisance is defined as:

'Any dust or effluvia arising from an industrial, trade or business premises and being prejudicial to health or a nuisance'

3.9 There are currently no statutory UK standards in relation to deposited dust and its propensity to cause nuisance. However, the Local Air Quality Management Technical Guidance Note (09)[2] advises that this source of PM_{10} emission is only relevant in terms of public exposure where:

- There are relevant locations for public exposure within 400 to 1000 metres of the dust emission source and the 2004 PM_{10} background is 27µg/m^3 or more.
- There are relevant locations for public exposure within 200 to 400 metres of the dust emission source and the 2004 PM_{10} background is 26 µg/m^3 or more.
- There are locations for public exposure within 200 metres of the dust emission source and the 2004 PM_{10} background is 26µg/m^3 or more, dust fall may become an issue and may be reported as a nuisance.

[2] Department for Environment, Food and Rural Affairs (2009) Local Air Quality Management Technical Guidance LAQM, TG (09). DEFRA London.

3.10 The London Best Practice Guidance - The control of dust and emissions from construction and demolition [3] has the overarching aim of protecting public health and ensuring proper management of demolition and construction sites. It builds on other guidance and establishes best practice that is relevant and achievable.

3.11 Under the site evaluation guidelines within this document, the site falls in the small to negligible/imperceptible risk category. The guidance offers best practice mitigation measures for medium risk sites which are applicable; it will be recommended that they are used to help reduce any construction activities to low risk.

3.12 The guidance also offers advice on dust and emission control measures stating that:

"Developers will need to ensure that all on-site contractors follow best practicable means (BPM) to minimise dust and emissions."

3.13 Where there is a potential for nuisance to occur, the Quality Urban Air Review Group advises that an appropriate criterion for nuisance is a deposition rate of 2 to 3 times the existing background rate. Therefore, for this criterion to be applied, existing background emission rates must be established prior to construction.

3.14 Part IV of the Environment Act [4] requires Local Authorities to undertake a review and assessment of the air quality within their boundaries, in relation to the seven key air pollutants of Benzene, 1,3 Butadiene, Lead, Sulphur Dioxide, Carbon Monoxide, Nitrogen Dioxide and Particulate Matter. These review and assessments are discussed further in Section 4.

National Policy

National Planning Policy Framework, March 2012

3.15 In March 2012, the current Planning Policy Guidance documents were superseded by the National Planning Policy Framework (NPPF). The aim of this document is to set out the Government's requirements for the planning system, only to the extent that it is relevant, proportionate and necessary to do so. It also aims to enable local people and councils to produce their own distinctive local and neighbourhood plans.

3.16 The NPPF is based upon 12 Core planning principles, two of which have relevance to the proposals:

3.17 Number 4 states that planning should:

[3] Greater London Authority, London Boroughs and Association of London Government (2006) London Best Practice Guidance - The control of dust and emissions from construction and demolition. London

[4] Department for Environment, Food and Rural Affairs (1995) The Environment Act. HMSO, London.

"...contribute to conserving and enhancing the natural environment and reducing pollution..."

3.18 Policy 11 Conserving and Enhancing the Natural Environment also 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;

3.19 The core principle and Policy 11 are reflected in the provision of this assessment which seeks to provide evidence that there will be no adverse effects upon air quality.

3.20 The NPPF states that the effects of pollution on health and the sensitivity of the area and the development should be taken into account.

3.21 More specifically the NPPF makes clear that: "Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.".

3.22 The NPPF also sets out the National planning policy on biodiversity and conservation. This emphasises that the planning system should seek to minimise effects on biodiversity and provide net gains in biodiversity wherever possible as part of the Government's commitment to halting declines in biodiversity and establishing coherent and resilient ecological networks.

National Planning Practice Guidance (NPPG, 2014)

3.23 The NPPF is now supported by Planning Practice Guidance (NPPG) (DCLG, 2014), which includes guiding principles on how planning can take account of the impacts of new development on air quality. The NPPG states that "Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values." and "It is important that the potential impact of new development on air quality is taken into account ... where the national assessment indicates that relevant limits have been exceeded or are near the limit". The role of the local authorities is covered by the LAQM regime, with the NPPG stating that local authority Air Quality Action Plans "identify measures that will be introduced in pursuit of

the objectives". The NPPG makes clear that "Air quality can also affect biodiversity and may therefore impact on our international obligation under the Habitats Directive". In addition, the NPPG makes clear that "Odour and dust can also be a planning concern, for example, because of the effect on local amenity".

3.24 The NPPG 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 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)".

3.25 The NPPG sets out the information that may be required in an air quality assessment, making clear that "Assessments should be proportional to the nature and scale of development proposed and the level of concern about air quality". It also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear that "Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact".

Local Planning Policy

3.26 The Core Strategy was adopted in December 2011. Policy ENV5 – Air Quality states:

"New residential development will be restricted in Air Quality Management Areas in order to reduce public exposure to poor air quality.

In areas where poor air quality threatens to undermine public health and quality of life, the Council will seek to reduce the impact of poor air quality on receptors in that area and to address the cause of the poor air quality. Proposed development will be required to include measures to ensure it does not have an adverse impact on air quality."

Local Air Quality Management - Air Quality Review and Assessment

3.27 No Air Quality Management Areas have been currently declared within the District. The review and assessment process for the Rochford area has been summarised and described below.

Phase I

3.28 The first round of Review & Assessment concluded that all Air Quality Objectives were expected to be met.

Phase II

3.29 The second round of Review & Assessment involved a Detailed Assessment (2005) of the 24-hour PM_{10} mean objective at Rawreth Industrial Estate, which indicated further monitoring should be undertaken.

Phase III

3.30 The third round of Review & Assessment resulted in two Detailed Assessment's, one for Rayleigh High Street for NO_2 and Rawreth Industrial Estate for PM_{10}. The industrial estate detailed assessment led to the declaration of an AQMA for the hourly mean objective for PM_{10}.

Phase IV

3.31 The 2009 Updating and Screening Assessment as part of the fourth round of Review & Assessment concluded that a Detailed Assessment should be undertaken for Eastwood Road and High Street, Rayleigh. The Detailed Assessment demonstrated exceedances of NO_2 annual mean objective at Rayleigh High Street and Crown Hill and Eastwood Road.

Phase V

3.32 The 2012 Updating and Screening Assessment as part of the fifth round of Review & Assessment identified continued exceedances of the annual mean objective of NO_2 at Eastwood Road, Rayleigh High Street and Sutton Road. Eastwood Road was part of the area which was earmarked for designation as an AQMA and Sutton Road did not show exceedance of the objective when projected to the nearest receptor. To note, in March 2013 the Rawreth Industrial Estate AQMA was undeclared.

4 Assessment Methodology and Criteria

4.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority. This covers both the study area and nearby sites, the latter being used to provide context for the assessment.

4.2 The assessment has been undertaken in consultation with RDC, using the parameters set out in the recognised standards and guidelines below.

4.3 The methodology comprises two main components: assessing the existing air quality situation to establish the baseline position and assessing the potential likely significant impacts of the proposed development on the surrounding existing air quality, both during the construction phase and the operational phase.

4.4 It is not anticipated that there will be any post construction air quality impacts related to Application Site activities, other than those associated with operational traffic movements.

Standards and Guidelines

4.5 Local Air Quality Management Technical Guidance LAQM. TG (09)[5]: Published by DEFRA in order to provide technical guidance to local authorities in the assessment of the seven key air pollutants of Nitrogen Dioxide, Particulate Matter, Lead, 1-3 butadiene, Benzene, Carbon Dioxide and Sulphur Dioxide.

4.6 Regional and Local Plans where applicable: These documents put the assessment of air quality into the context of the regional and local plans for the area.

4.7 Development Control: Planning for Air Quality[6]: This guidance has been produced to help ensure that air quality is properly accounted for in local development control processes. It states that, particular attention will inevitably be paid to development within or close to areas formally designated as air quality management areas (AQMAs). These guidelines have been followed, where appropriate, when preparing this air quality assessment.

[5] Department for Environment, Food and Rural Affairs (2009) Local Air Quality Management Technical Guidance LAQM, TG (09). DEFRA. London

[6] Environmental Protection UK (2010) Development Control: Planning for Air Quality (2010 Update). Environmental Protection UK, Brighton

4.8 The National Atmospheric Emissions Inventory (NAEI)[7]: This is a website run by Ricardo AEA Technology where emission data can be obtained which relates the vehicle fleet composition for the year of study. The NAEI is the standard reference for air emissions in the UK and compiles annual estimates of emission for a wide range of important pollutants, including air quality pollutants and greenhouse gases to the atmosphere from UK sources such as cars, trucks, power stations and industrial plant.

4.9 The Local Air Quality Management Tools within the Department for Environment, Food & Rural Affairs website [8] contains information pertaining to monitoring networks across the UK and provides tools, which aid in the estimation of pollutant concentrations with reference to the year of study.

4.10 Urban Air Quality in the United Kingdom[9]: This report reviews knowledge of the sources, chemical composition and physical properties, and concentrations of airborne particles and examines the implications for control of particulate matter in the UK urban air. In particular, it is used in the study to provide an acceptable method for assessing nuisance dust deposition.

4.11 Air Quality and Planning Guidance[10]: This guidance is aimed at local authorities, developers and their consultants, and provides technical advice on how to deal with planning applications that could have an impact on air quality. Where developers and local authorities follow the procedures in this guidance, helps ensure consistency in the approach to dealing with air quality and planning.

Construction Related Air Quality

4.12 It is not anticipated that there will be any post construction air quality impacts related to Application Site activities, other than those associated with operational traffic movements.

4.13 Construction activity air quality effects cannot be easily quantified and therefore a more qualitative approach has been employed to predict potential effects from this phase. The emphasis of this approach is the minimisation of potential effects at source through appropriate site management and control practices and consideration has been made of relevant guidance.

[7] http://naei.defra.gov.uk

[8] http://laqm.defra.gov.uk/

[9] The Quality of Urban Air Review Group (QUARG) (1996) Airbourne Particulate Matter in the United Kingdom. DoE, London

[10] London Councils. (2007),Air Quality and Planning Guidance, The London Air Pollution Planning and the Local Environment (APPLE) working group, London

4.14 The potential air quality impacts of the proposed development have been assessed on the basis of a reasonable worst-case scenario, with the position post mitigation being considered later in the chapter.

4.15 **Table 4.1** below shows the potential sources of likely significant impact that have been identified:

Stage	Source of Impact
Construction	General construction activities
Post construction	Development traffic
	Post construction activities

Table 4.1: Sources of Air Quality Impacts

4.16 The construction dust assessment considers the potential for impacts within 350 m of the site boundary; or within 50 m of roads used by construction vehicles. The assessment methodology is that provided by the IAQM (Institute of Air Quality Management, 2014). This is based around a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts.

4.17 Guidance from the IAQM (Institute of Air Quality Management, 2014) is that, with appropriate mitigation in place, the impacts of construction dust will not be significant. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that impacts will normally be not significant.

4.18 The main air quality impacts associated with construction activities relate to the potential for the generation of particulate matter of both the $PM_{2.5}$ and PM_{10} size fractions. There is also the potential for the generation of other air quality pollutants. The sources of potential construction impacts specifically associated with the proposed development are set out below.

- Potential for generation of airborne dust from exposure and movement of soils and construction materials
- Generation of fumes on-site by construction plant and tools throughout the construction phase

- Increase in vehicle emissions (smoke/fumes) from vehicles (and potentially as a result of slow moving traffic, should local congestion ensue)

4.19 The migration distances of dust are largely dependent upon factors such as size, composition, source, wind speed and weather. There are currently no statutory UK standards in relation to deposited dust and its propensity to cause nuisance. However, the EPUK Development Control Air Quality (2010 update) notes that deposition rates are dependent in part upon metrological conditions and that these cannot be reliably predicted. The assessment should therefore focus on the distance and duration over which there is a risk that impacts may occur. Owing to the nature of the site and the works proposed, the following criteria have been derived, based upon advice contained within Institute of Air Quality Management guidance.

4.20 **Table 4.2** below details the Institute of Air Quality Managers guidance on significance of construction dust effects. The guidance also offers a scale for Demolition.

Dust Risk Category from Demolition, Earthworks, Construction, Activities				
Demolition				
Distance to Nearest Receptor		Dust Emission Class		
Dust Soiling and PM_{10}	Ecological	Large	Medium	Small
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 - 100	<20	High Risk Site	Medium Risk Site	Low Risk Site
100 - 200	20 - 40	Medium Risk Site	Low Risk Site	Low Risk Site
200 - 350	40 - 100	Medium Risk Site	Low Risk Site	Negligible
Construction Refurbishment				
Distance to Nearest Receptor		Dust Emission Class		
Dust Soiling and PM_{10}	Ecological	Large	Medium	Small
<20	-	High Risk Site	High Risk Site	Medium Risk Site
20 - 50	-	High Risk Site	Medium Risk Site	Low Risk Site
50 - 100	<20	Medium Risk Site	Medium Risk Site	Low Risk Site
100 - 200	20 - 40	Medium Risk Site	Low Risk Site	Negligible
200 - 350	40 - 100	Low Risk Site	Low Risk Site	Negligible

Table 4.2: Distance from Source

4.21 An assessment will normally be required where there are sensitive receptors (in this assessment, residential property) within 350 m of the boundary of the Application Site and/or within 100 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), which is relevant in this instance.

4.22 Where there is a potential for a nuisance to occur i.e. within these bands, the Quality Urban Air Review Group advises that an appropriate criterion for nuisance is a deposition rate of 2 to 3 times the existing background rate. Therefore, for this criterion to be applied, existing background emission rates must be established prior to construction.

4.23 The new NPPG document discusses ecological impacts. During the consultation with the Local Authority this was not raised as a concern and having reviewed the Natural England 'Magic' database there are no designated sited within 350 meters of the proposed site and therefore with reference to **Table 4.2**, it not considered that the application will have an impact on any sensitive site.

Traffic Related Air Quality

4.24 Currently there is no guidance on the absolute significance criteria for the assessment of air quality impacts. However, IAQM and Environmental Protection UK have published recommendations for describing the magnitude of impacts at individual receptors for changes in the annual mean objective **(Table 4.3)** and describing the significance **(Table 4.4)** of such impacts.

Magnitude of Change	Annual Mean Concentrations of NO_2 ($\mu g/m^3$)	Annual Mean Concentrations of PM_{10} ($\mu g/m^3$)	Annual Mean Concentrations of $PM_{2.5}$ ($\mu g/m^3$)
Large	Increase / Decrease > 4	Increase / Decrease > 4	Increase / Decrease > 2.5
Medium	Increase / Decrease 2 - 4	Increase / Decrease 2 - 4	Increase / Decrease 1.25 – 2
Small	Increase / Decrease 0.4 - 2	Increase / Decrease 0.4 - 2	Increase / Decrease 0.25 – 1.25
Imperceptible	Increase / Decrease < 0.4	Increase / Decrease < 0.4	Increase / Decrease < 0.25

Table 4.3: Magnitude of Changes in Ambient Pollutant Concentrations of NO_2, PM_{10} and $PM_{2.5}$

Absolute Concentration in Relation to Objective / Limit Value	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value with Scheme (>40$\mu g/m^3$)	Minor Adverse	Moderate Adverse	Major Adverse
Just Below Objective/Limit Value with Scheme (36 - 40$\mu g/m^3$)	Minor Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value with Scheme (30 - 36$\mu g/m^3$)	Negligible	Minor Adverse	Minor Adverse
Well Below Objective/Limit Value with Scheme (<30$\mu g/m^3$)	Negligible	Negligible	Minor Adverse
Decrease with Scheme			
Above Objective/Limit Value with Scheme (>40$\mu g/m^3$)	Minor Beneficial	Moderate Beneficial	Major Beneficial

Just Below Objective/Limit Value with Scheme (36 - 40µg/m^3)	Minor Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value with Scheme (30 - 36µg/m^3)	Negligible	Minor Beneficial	Minor Beneficial
Well Below Objective/Limit Value with Scheme (<30µg/m^3)	Negligible	Negligible	Minor Beneficial

Table 4.4: Air Quality Impact for Changes in Ambient Pollutant Concentrations of NO_2 and PM_{10}.

4.25 Whilst the guidance within **Tables 4.3** and **4.4** attempt to provide some consistency for local authorities when interpreting assessment results, it is recognised that it is difficult to be prescriptive and that each case will need to be judged on its own merit. The above criteria relates to what could be considered significant and must not be regarded as thresholds above which developments should be refused.

Assessment Model

4.26 The modelling tool which has been used is the dispersion model ADMS Roads, which has been developed by the Cambridge Environmental Research Consultants. It is one of the screening models referred to within the Local Air Quality Management Technical Guidance document TG (09) Annex 2: Estimating Emissions.

4.27 This model uses the following input data:

- Hourly Average Traffic Speeds - derived from diurnal traffic counts and provided by Mayer Brown Ltd
- Latest relevant Emission Factor Toolkit
- Geo-referenced mapping data
- Hourly Sequential ADMS format MET data for the closest suitable site - Andrewsfield, for the year 2012

Study Scenarios

4.28 An assessment of specific construction impacts is dependent upon a number of construction details, and construction programmes which are not available at this stage.

4.29 It is not anticipated that there will be any post construction air quality impacts related to Application Site activities, other than those associated with operational traffic movements.

4.30 Traffic related air quality impacts associated with the operation of the proposed development have been assessed for the following scenarios:

- The baseline levels for NO_2, PM_{10} and $PM_{2.5}$

- The predicted levels for NO_2, PM_{10} and $PM_{2.5}$ for the development year without the development
- The predicted levels for NO_2, PM_{10} and $PM_{2.5}$ for the development year with the proposed development (i.e. West of Rayleigh – Scenario 1)
- The predicted levels for NO_2, PM_{10} and $PM_{2.5}$ for the development year with the proposed development (i.e. West of Rayleigh – Scenario 1) and the other developments considered for the cumulative assessment (Scenarios 2, 3 and 4)

4.31 The assessment of impacts has been undertaken by calculating whether the $NO_{2,}$, PM_{10} and $PM_{2.5}$ levels are expected to improve or deteriorate at specified locations as a result of the proposed development.

4.32 Supporting air quality data has been obtained from RDC.

Receptor Types and Locations

4.33 The receptors, which have been used to assess the potential likely significant impacts of the proposed development, relate to existing residential locations in the vicinity of the application site, which may potentially be affected by air quality impacts due to changes in road traffic associated with construction and post-construction activities.

4.34 Local residential receptors may potentially be affected by the proposed development, where changes in traffic flow as a result of the proposed development occur in proximity to them. As a result, receptor locations for modelling have primarily been identified as those locations where there is a potential site access within or adjacent to a residential area.

4.35 Proposed residents on the application site may also be affected by existing poor air quality as a result of proximity to a source of air pollution. All the receptor locations, which have been assessed, are listed in **Table 4.5** and are shown in **Figure 4.1**:Air Quality Modelling Locations.

Receptor No.	Receptor Name	Description
1	Sholto – Winchester Drive	Existing Receptor
2	No.4 Rawreth Hall Cottage	Existing Receptor
3	Lower Barn Farm – London Rd	Existing Receptor
4	Oak Cottage – London Rd	Existing Receptor

Table 4.5: Potential Sensitive Receptor Locations

(Source: Ordnance Survey, Licence: AL100002189)

Figure 4.1: Air Quality Modelling Locations

Emissions

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

4.37 The potential impacts have been modelled using the ADMS Roads atmospheric dispersion model using the Emission Factor Toolkit (version 5.2) which is built into the ADMS model.

NO_x: NO_2 Chemistry

4.38 Vehicles emit NO_x with different proportions of NO_2. In the atmosphere, chemical reactions take place between NO, NO_2 and Ozone. In this assessment the screening of NO_x emissions has taken place and the resulting NO_2 concentration has been calculated post modelling using the DEFRA NO_x to NO_2 Calculator[11].

[11] http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

Traffic Data

4.39 The traffic data used in this modelling exercise has been provided by Mayer Brown transport consultants for the following scenarios:

1) 500 dwellings at Land North of London Road + sensitivity = 520 dwellings
2) The total developable area within the SER1 allocation including the Application Site (550 dwellings, plus 10% for sensitivity testing purposes = 605 dwellings)
3) SER1 + 10% (605 dwellings) with the development at Hullbridge (500 dwellings)
4) SER1 + 10% (605 dwellings) with the development at Hullbridge (500 dwellings) and with the development at Rawreth Industrial Estate (220 dwellings)

4.40 To note, the proposed development is scenario one, and scenarios two to four include cumulative assessments. The traffic data is set out in **Appendix A**.

Background

4.41 Initial background levels for this study have been reviewed from the 2013 Air Quality Progress Report for RDC. However, it was noted that no background monitoring is undertaken by the district for NO_2, PM_{10} and $PM_{2.5}$. The nearest *urban background* site is the AURN (Chalkwell Park) in Southend-on-Sea (approximately 9.5 miles).

4.42 The most recent available annual data for this site is for 2012, as shown in **Table 4.6** below.

NO_2	$PM_{2.5}$
22.3 (71% data capture)	9.9 (below 75% data capture)

Table 4.6: NO_2 and $PM_{2.5}$ Background Data

4.43 Due to the poor data capture levels and no background monitoring for PM_{10} it was decided that estimated background levels for the study site are derived from the DEFRA UK-Air website, which gives estimates for the background pollutant concentrations at $1km^2$ locations across the UK would be reviewed. The background concentration for 2012 is given in **Table 4.7** represent the closest $1km^2$ to the proposed development site at (578500:192500).

Site Name	NO_2	PM_{10}	$PM_{2.5}$
DEFRA UK-AIR mapping estimate (site location)	16.0	17.53	11.58

Table 4.7: DEFRA NO_2 PM_{10} and $PM_{2.5}$ Background Data

4.44 To allow for a worst case assessment it was decided the highest pollution levels for each site would be utilised for each pollutant. Therefore the DEFRA backgrounds will be utilised for PM_{10} and $PM_{2.5}$ and the monitored NO_2 data for the AURN (Chalkwell Park) in Southend-on-Sea.

Metrological Data

4.45 The metrological data required for the ADMS model must be from a representative location to the site and include a full year of sequential readings. The MET office has advised that the closest suitable site with the most representative data is located at Andrewsfield, Essex. This data has been obtained for the ADMS model.

Calculation Methodology

4.46 Worst-case development traffic air quality impacts have been quantitatively assessed by modelling the effect of the development traffic flows along the proposed routes and comparing this to the baseline and proposed development scenarios. The resultant changes in air quality have then been assessed against the criteria given in **Tables 4.3** and **4.4.**

Model Uncertainty.

4.47 This assessment focuses on modelling annual mean concentrations. This is because it is inherently more difficult to make satisfactory predictions for short-term behaviour of pollutants than it is to model an annual mean value.

4.48 It should also be noted that the modelling process is dependant in the first instance upon projected traffic data. Where this data is subject to change, this may affect the results of the modelling process.

4.49 The above limitations have been taken into consideration in the assessment.

4.50 Model uncertainty can result from:

- Data uncertainty – errors in input data emission estimates and background estimates;
- Assumptions in model formulations; and
- Variability – in traffic data.

4.51 Model uncertainty as a result of data uncertainty has been reduced where possible by close verification of the input data.

4.52 The main area of uncertainty in model assumptions is currently seen to be the assumption that background pollutant levels will reduce over time. In 2001, DEFRA

commissioned a study into the trends in NO_x and NO_2 emissions and measurements. The report examined the predicted trends compared to the available data and showed that the UK emissions factors assumed that the level of ambient NO_2 would decrease over time.

4.53 This reduction was predicted to be caused by improvements in vehicle engines and abatement technology. The report showed that the level of NO_x and NO_2 decreased between 1996 and 2004, but that the level since this time has been far more stable than previously predicted. The report also showed that the vehicle contribution to the total NO_2 actually increased during the same time frame. It is suggested that the lack of improvement in NO_2 emissions is, at least partly caused by, factors such as catalytic degradation and the slower take up of the newer euro 4/5 petrol cars than expected.

4.54 This area of uncertainty has been reduced by the use of the most recent background monitored data for the projected scenarios. In addition, the ADMS dispersion model applies the latest emission factors which take account of recently observed reduction rates. Both such applications provide for a robust assessment

Model Verification

4.55 Model verification is required to demonstrate that the model is performing within an acceptable margin of error. Therefore, it is necessary to undertake modelling at a location where air quality levels are known, and to compare the result with ratified monitored data for that location.

4.56 The 2013 Progress Report identifies the closest location of NO_2 roadside monitoring is by the site on the Rawreth Lane/A1245 junction. The results of the verification process are set out in **Table 4.8** below:

Location	Monitored Data	Modelled Data	% Difference
Bedloes Corner	39.34	34.80	-11.5

Table 4.8: Results of Verification Exercise

4.57 This exercise indicates that the model was underestimating at this location by up to 11.5% at *'Bedloes Corner'*. This type of discrepancy generally occurs for a number of possible reasons. These include anomalies in the monitored results obtained and also the fact that monitored results take account of all sources of pollution while modelling results only take into account traffic related emissions.

4.58 The Defra Technical Guidance (TG(09)), advises that where model results are within 25% of monitored data, then modelling results do not need to be further adjusted. The

model is, therefore, considered acceptable for the purpose of assessing the development traffic impacts.

5 Baseline Conditions

5.1 Under the Air Quality Strategy there is a duty on all Local Authorities to consider the air quality within their boundaries and to report annually to Defra. The air quality situation in Rochford has been assessed by the Local Authority through the national Review and Assessment process.

5.2 No Air Quality Management Areas have been currently declared within the District. The review and assessment process for the Rochford area has been summarised and described below.

5.3 The adjacent Rawreth Industrial Estate was declared an AQMA up until March 2013, but monitored data from the industrial estate from June 2011 to June 2012 gave an annual mean of 25.60 $\mu g/m^3$, which is 34% below the annual mean objective and this indicates the industrial estate is no longer a source of air quality concern in the vicinity of the Application Site.

Mayer Brown 2014 Baseline Modelling

5.4 Baseline air quality at the identified receptor sites has been modelled using the traffic flows provided by Mayer Brown transport consultations for 2014 and the background values identified in **Table 4.4** and **4.5**

Receptor	2014 Projected Annual Average NO_2 ($\mu g/m^3$)	2014 Projected Annual Average PM_{10} ($\mu g/m^3$)	2014 Projected Annual Average $PM_{2.5}$ ($\mu g/m^3$)
1	23.26	17.72	11.70
2	25.39	18.12	11.98
3	24.18	17.92	11.83
4	25.12	18.11	11.96

Table 5.1: Annual Mean of NO_2 PM_{10}, $PM_{2.5}$ Levels at Receptor Locations

5.5 The values in **Table 5.1** are, on average, 39% below the objective value for NO_2, and on average, 55% below the objective value for PM_{10} and on average, 53% below the objective value for $PM_{2.5}$. Therefore, this indicates air quality is not currently of concern for residents in the vicinity of the development site.

6 Potential Impacts

6.1 The potential air quality impacts of the proposed development have been assessed on the basis of a reasonable worst-case scenario.

Construction Impacts

6.2 As previously discussed, the main air quality impacts associated with construction activities relate to the potential for the evolution of particulate matter of both $PM_{2.5}$ and PM_{10} size fractions. There is also the potential for the evolution of other air quality pollutants. The sources of potential construction impacts specifically associated with the proposed development are set out below.

- Potential for generation of airborne dusts from exposure and movement of soils and construction materials;
- Generation of fumes on-site by construction plant and tools throughout the construction phase; and
- Increase in vehicle emissions (smoke/fumes) from vehicles (and potentially as a result of slow moving traffic, should local congestion ensue).

6.3 Owing to the nature of the works proposed, the distance criteria within **Table 4.2** have been applied to the assessment to identify those potential receptors most likely to be subject to dust nuisance. The nearest residential properties to the application site are within 20 metres to the north and south on Rawreth Lane and London Road, and to the east at Laburnum Way and Grosvenor Road. Based on the criteria in **Table 4.2** this would put them in the Medium potential for effects category (based on likely construction materials). Roads which are located within 100m of the outline application site boundaries may have the potential to be at risk from some degree of dust. The roads which are within 100m of the site include the following:

- Rowan Close;
- Laburnum Way;
- Trenders Avenue;
- Grosvenor Road;
- Rawreth Lane; and
- London Road.

6.4 **Table 6.1** below shows a summary of the dust risk analysis using the criteria set out in **Table 4.2** using the Institute of Air Quality Managers guidance.

Summary of Risk for Dust Emissions		
Source	Reasoning	Risk
Demolition Activities	Most of the demolition has already taken place on the site. During phases that bring works in close proximity to existing receptors within the development area or on the boundary of the Site, there is considered a High Risk of dust impact.	Low Risk (with some Medium Risk at the phases when in proximity of the Application Site boundary
Earth Works	Earthworks, such as excavation, haulage, tipping and stockpiling are considered to have a 'medium' potential for dust emission, due to the moderately dusty soil type and the average rainfall in the area . Taking into account the distance to the majority of receptors earthworks are considered to present a 'low risk' of dust impact. During phases that bring works in close proximity to existing receptors within the development area or on the boundary of the Site, there is considered a High Risk of dust impact and appropriate additional mitigation measures will be employed	Low Risk (with some Medium Risk at the phases when in proximity of the Application Site boundary
Construction Activities	Construction activities are considered to have a 'medium' potential for dust emission on account of the total build volume, but low dust potential building material (predominantly brick). Taking into account the distance to the majority of receptors, construction works are considered to present a 'low risk' of dust impact. During phases that bring construction works in close proximity to existing receptors within the development area and on the boundary there is considered a Medium Risk of dust impact and appropriate additional mitigation measures will be employed	Low risk (with some medium Risk at the phases when in proximity of the Site boundary
Overall Site		**Medium Risk**

Table 6.1: Summary of Dust Emission Risks

Post Construction Impacts

Application Site Post-Construction Traffic

6.5 The potentially likely significant impacts of traffic from the completed development on potentially affected receptors has been assessed, based upon the traffic flows anticipated for the Application Site (Scenario One). The predicted flows associated with the post construction phase of the proposed development have been compared to those associated with the baseline conditions in 2014 to allow for a worst-case scenario.

Receptor	Projected Annual Average NO_2 ($\mu g/m^3$)		
	Baseline	Baseline + Development Scenario One	Max Impact
1	23.29	23.31	0.02
2	25.49	25.53	0.04
3	24.28	24.36	0.08
4	25.27	25.41	0.14
	Projected Annual Average PM_{10} ($\mu g/m^3$)		
1	17.73	17.74	0.01
2	18.19	18.20	0.01
3	17.94	17.96	0.02
4	18.14	18.19	0.05
	Projected Annual Average $PM_{2.5}$ ($\mu g/m^3$)		
1	11.70	11.71	0.01
2	11.98	11.99	0.01
3	11.83	11.84	0.01
4	11.96	11.98	0.02

Table 6.2: Modelled NO_2 and PM_{10} and $PM_{2.5}$ Annual Average Development Traffic For the Application Site Concentrations at Specified Receptor Locations

6.6 **Table 6.2** show the results of the assessment for this Application Site of NO_2, PM_{10} $PM_{2.5}$ related air quality impacts associated with this Application Site. It is concluded that there is a potential for:

- NO_2 levels to increase by up to 0.14µg/m3 or 0.35% of the annual mean objective level;
- PM_{10} levels to increase by up to 0.05µg/m3 or 0.13% of the annual mean objective level; and
- $PM_{2.5}$ levels to increase by up to 0.02µg/m3 or 0.08% of the annual mean objective level;

6.7 Therefore, in accordance with the criteria set out in **Tables 4.1 and 4.2**, NO_2, PM_{10} and $PM_{2.5}$ impacts associated with the operation of the Application Site are considered to be imperceptible / negligible in terms of magnitude and of a negligible significance.

6.8 In reality with improving vehicle technology and the associated reduction of NO_2 levels over time, by the time the development comes forward the NO_2 levels/potential impacts at Bedloes Corner will be lower than what is currently experienced / modelled.

Cumulative Development Traffic

6.9 The potential unmitigated air quality impact of traffic from the post construction development on potentially affected receptors has been assessed, based upon the traffic flows anticipated for cumulative developments (Scenarios Two to Four). The predicted flows associated with the operation of the proposed development have been compared to those associated with the baseline conditions in 2014 to allow for a worst-case assessment

Receptor	Projected Annual Average NO_2 ($\mu g/m^3$)				
	Baseline	Baseline + Development Scenario Two	Baseline + Development Scenario Three	Baseline + Development Scenario Four	Max Impact
1	23.29	23.32	23.34	23.39	0.10
2	25.49	25.54	25.62	25.76	0.25
3	24.28	24.33	24.34	24.34	0.06
4	25.27	25.45	25.45	25.45	0.18
	Projected Annual Average PM_{10} ($\mu g/m^3$)				
1	17.73	17.74	17.75	17.76	0.03
2	18.19	18.20	18.22	18.26	0.07
3	17.94	17.96	17.96	17.96	0.02
4	18.14	18.20	18.20	18.20	0.06
	Projected Annual Average $PM_{2.5}$ ($\mu g/m^3$)				
1	11.70	11.71	11.71	11.72	0.02
2	11.98	11.99	12.00	12.03	0.05
3	11.83	11.84	11.84	11.84	0.01
4	11.96	11.99	11.99	11.99	0.03

Table 6.3: Modelled NO_2 and PM_{10} and $PM_{2.5}$ Annual Average Development Traffic For Cumulative Developments Concentrations at Specified Receptor Locations

6.1 **Table 6.3** show the results of the assessment of NO_2, PM_{10} $PM_{2.5}$ related air quality impacts associated with the proposed development and cumulative developments. It is concluded that there is a potential for:

- NO_2 levels to increase by up to 0.25$\mu g/m^3$ or 0.63% of the annual mean objective level;
- PM_{10} levels to increase by up to 0.07$\mu g/m^3$ or 0.18% of the annual mean objective level; and
- $PM_{2.5}$ levels to increase by up to 0.05$\mu g/m^3$ or 0.20% of the annual mean objective level;

6.2 Therefore, in accordance with the criteria set out in **Tables 4.3 and 4.4**, NO_2, PM_{10} and $PM_{2.5}$ impacts associated with the operation of the Application Site are still considered to be imperceptible / negligible in terms of magnitude and of a negligible significance.

Operational Activities

6.3 It is not anticipated that there will be any operational air quality impacts related to the proposed site activities, other than those associated with operational traffic movements.

7 Mitigation Measures and Residual Impacts

Construction

7.1 Potentially likely significant impacts are associated with air polluting activities in close proximity to potentially sensitive receptors. By employing appropriate site management practices, the potential for adverse air quality impacts from construction vehicles and plant during the works will be minimised. A range of measures are suggested, which will form part of a site specific Construction Environmental Management Plan (CEMP) within which all contractor activities will be undertaken.

7.2 The CEMP will also contain environmental risk assessments for all dust or pollution generating activities. Designers and contractors should liaise to identify the hazards and risks likely to occur for each activity taking place on the construction site and find ways of avoiding or reducing them within the design. A comprehensive method statement detailing the methods to be used should be drawn up and communicated to all relevant personnel.

7.3 The following measures may form part of CEMP to be agreed with RDC:

- Routine monitoring of dust at the site boundary;
- Use of water spraying, especially on access roads, in order to reduce dust generation, as and when conditions dictate;
- Effective wheel/body washing facilities to be provided and used as necessary;
- A road sweeper to be readily available whenever the need for road cleaning arises;
- Dampening of exposed soil and material stockpiles, where necessary;
- Consider wind speed and direction prior to conducting dust generating activities to determine the potential for dust nuisance to occur and avoid such activities during periods of high or gusty winds.
- Stockpiles of soil and materials should be located as far as possible from local receptors , taking account of prevailing wind directions;
- Windbreak netting should be positioned, where possible, around material stockpiles and vehicle loading /unloading areas;
- Completed earthworks should be covered or vegetated as soon as possible;
- Ensure that all construction plant and equipment is maintained in good working order;
- Vehicles carrying waste material off-site to be sheeted;

- The inclusion of the traffic route management plan.
- Under no circumstances should fires be allowed on site; and
- Special provisions will apply for any materials containing asbestos. The safety method statement should outline the control measures necessary to minimise the risks to an acceptable level, and all statutory notices will be placed with the Health and Safety Executive (HSE).

7.4 Subject to the implementation of good practice within a site specific CEMP, construction impacts are anticipated to be of temporary and slight to negligible significance.

7.5 The number of construction vehicle movements will vary depending on the stage of construction of the development. Countryside Properties (UK) Limited estimates that the peak HGV movement would not exceed 60 vehicles per day, and at its peak approximately 120 people will be employed on site.

Post Construction (Completed Development)

7.6 This assessment has demonstrated that the air quality impacts associated with the development traffic are considered negligible and, therefore, not likely to be significant. Therefore, it is not anticipated that mitigation measures will be required.

Residual Effects

7.7 No significant residual effects are expected to occur as a consequence of construction activities assuming that appropriate mitigation measures to prevent and control dust emissions are maintained by the construction contractor.

Cumulative Assessment

7.8 Assuming the same construction mitigation measures are required to be put in place for the other projects considered as part of the cumulative assessment, no significant adverse effects on air quality will arise during construction phases.

8 Conclusions

Demolition and Construction

8.1 Subject to the implementation of good practice within a site specific Construction Environmental Management Plan, which incorporates all of the measures proposed within the construction statement, the residual construction impacts are anticipated to be, local, temporary, adverse, of a medium risk.

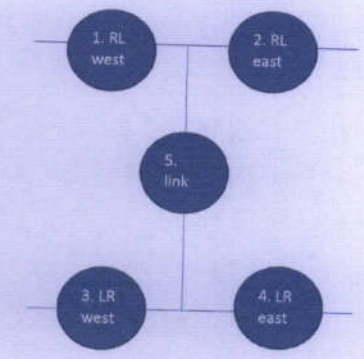
Completed Development

8.2 The traffic data examined here, has indicated that the additional traffic flows associated with the Application Site and cumulative developments have the potential to have impacts of negligible magnitude in terms of increases in levels of NO_2 PM_{10} and $PM_{2.5}$ over baseline levels.

8.3 However it should be noted that the NO_2, PM_{10} and $PM_{2.5}$ levels themselves are around 62%, 45% and 48% respectively of the objective levels even when assessing with cumulative developments. The objective values are statutory standards derived in adherence to advice from the Expert Panel on Air Quality Standards to protect human health. Given that the anticipated pollutant levels are considerably below objective levels, the implications of the operational traffic impacts are not considered to be significant.

8.4 Therefore, it is concluded that any air quality impacts associated with development of land at Rawreth Lane, Rayleigh are not considered to be significant. Therefore, the development should not be constrained on the basis of air quality.

APPENDIX A: Traffic Data



"dev4"

Tests and number of units			
Test	Countryside	Industrial	Hullbridge
1	520		
2	605		
3	605	220	
4	605	220	500

Location	Direction	Base			
		24hr AADT	18hr AAWT	% HGV AADT	% HGV AAWT
1	WB	8122	8389	4.3%	4.0%
	EB	7454	7729	4.5%	4.2%
	Total	15576	16118	4.4%	4.1%
2	WB	8122	8389	4.3%	4.0%
	EB	7454	7729	4.5%	4.2%
	Total	15576	16118	4.4%	4.1%
3	WB	8235	8506	4.3%	4.0%
	EB	8329	8637	4.5%	4.2%
	Total	16564	17142	4.4%	4.1%
4	WB	8235	8506	4.3%	4.0%
	EB	8329	8637	4.5%	4.2%
	Total	16564	17142	4.4%	4.1%
5	NB	0	0	0.0%	0.0%
	SB	0	0	0.0%	0.0%
	Total	0	0	0.0%	0.0%

Location	Direction	Opening year - base			
		24hr AADT	18hr AAWT	% HGV AADT	% HGV AAWT
1	WB	8528	8808	4.3%	4.0%
	EB	7827	8116	4.5%	4.2%
	Total	16355	16924	4.4%	4.1%
2	WB	8528	8808	4.3%	4.0%
	EB	7827	8116	4.5%	4.2%
	Total	16355	16924	4.4%	4.1%
3	WB	8646	8931	4.3%	4.0%
	EB	8746	9068	4.5%	4.2%
	Total	17392	17999	4.4%	4.1%
4	WB	8646	8931	4.3%	4.0%
	EB	8746	9068	4.5%	4.2%
	Total	17392	17999	4.4%	4.1%
5	NB	0	0	0.0%	0.0%
	SB	0	0	0.0%	0.0%
	Total	0	0	0.0%	0.0%

Location	Direction	Opening year - Test 1			
		24hr AADT	18hr AAWT	% HGV AADT	% HGV AAWT
1	WB	8676	8957	4.2%	3.9%
	EB	7957	8335	4.4%	4.1%
	Total	16633	17291	4.3%	4.0%
2	WB	8840	9130	4.1%	3.8%
	EB	8163	8465	4.3%	4.0%
	Total	17003	17595	4.2%	3.9%
3	WB	9571	9886	3.8%	3.5%
	EB	9507	9857	3.7%	3.4%
	Total	19077	19743	3.8%	3.5%
4	WB	9020	9316	4.1%	3.8%
	EB	9220	9560	3.8%	3.5%
	Total	18239	18876	3.9%	3.6%
5	NB	2697	2697	0.0%	0.0%
	SB	2697	2697	0.0%	0.0%
	Total	5395	5395	0.0%	0.0%

Location	Direction	Opening year - Test 2			
		24hr AADT	18hr AAWT	% HGV AADT	% HGV AAWT
1	WB	8700	8981	4.2%	3.9%
	EB	8027	8465	4.4%	4.0%
	Total	16728	17446	4.3%	3.9%
2	WB	8891	9183	4.1%	3.8%
	EB	8218	8522	4.3%	4.0%
	Total	17109	17705	4.2%	3.9%
3	WB	9722	10042	3.8%	3.5%
	EB	9631	9986	3.6%	3.4%
	Total	19353	20028	3.7%	3.4%
4	WB	9081	9379	4.0%	3.7%
	EB	9297	9640	3.8%	3.5%
	Total	18378	19020	3.9%	3.6%
5	NB	3138	3138	0.0%	0.0%
	SB	3138	3138	0.0%	0.0%
	Total	6276	6276	0.0%	0.0%

Location	Direction	Opening year - Test 3			
		24hr AADT	18hr AAWT	% HGV AADT	% HGV AAWT
1	WB	9046	9326	4.0%	3.8%
	EB	8270	8801	4.2%	3.8%
	Total	17316	18127	4.1%	3.8%
2	WB	9193	9496	4.0%	3.7%
	EB	8582	8899	4.1%	3.8%
	Total	17776	18395	4.0%	3.7%
3	WB	9745	10065	3.8%	3.5%
	EB	9671	10028	3.6%	3.4%
	Total	19416	20094	3.7%	3.4%
4	WB	9098	9397	4.0%	3.7%
	EB	9343	9688	3.8%	3.5%
	Total	18441	19085	3.9%	3.6%
5	NB	3138	3138	0.0%	0.0%
	SB	3138	3138	0.0%	0.0%
	Total	6276	6276	0.0%	0.0%

Location	Direction	Opening year - Test 4			
		24hr AADT	18hr AAWT	% HGV AADT	% HGV AAWT
1	WB	9544	9824	3.8%	3.6%
	EB	8837	9232	4.0%	3.7%
	Total	18380	19057	3.9%	3.6%
2	WB	9845	10169	3.7%	3.4%
	EB	9149	9487	3.8%	3.6%
	Total	18994	19655	3.8%	3.5%
3	WB	9745	10065	3.8%	3.5%
	EB	9671	10028	3.6%	3.4%
	Total	19416	20094	3.7%	3.4%
4	WB	9098	9397	4.0%	3.7%
	EB	9343	9688	3.8%	3.5%
	Total	18441	19085	3.9%	3.6%
5	NB	3138	3138	0.0%	0.0%
	SB	3138	3138	0.0%	0.0%
	Total	6276	6276	0.0%	0.0%