Air Quality Assessment

Proposed Lidl Foodstore - Mitchells Way Wombwell, Barnsley

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Version History

Version	Date	Amendments
Draft	28th July 2015	Initial Report
Submission Draft	29th July 2015	Reviewed and approved for client issue.
1st Issue	30th July 2015	Re-issue following client approval

Executive Summary

ADAS UK Ltd was commissioned by Lidl UK GmbH to undertake an Air Quality Assessment in support of a proposed foodstore on land off Mitchells Way, Wombwell, Barnsley.

The scheme has the potential to cause air quality impacts at sensitive locations during the construction and operational phases. These may include fugitive dust emissions associated with construction works and road vehicle exhaust emissions from traffic generated by the development during the operational phase. An Air Quality Assessment was therefore undertaken to consider potential impacts at sensitive locations in the vicinity of the site as a result of the scheme.

Potential construction phase air quality impacts from fugitive dust emissions were assessed as a result of earthworks, construction and trackout activities. Standard good practice dust control measures as described in this report will be sufficient to ensure that adverse effects are not caused.

Dispersion modelling was undertaken in order to predict operational air quality impacts as a result of road vehicle exhaust emissions associated with traffic generated by the development. Results were subsequently verified using monitoring results obtained from Barnsley Metropolitan Borough Council. This indicated that impacts were not predicted to be significant at any sensitive location in the vicinity of the site.

Proposed mitigation measures for the development were identified in accordance with the Barnsley Metropolitan Borough Council Air Quality and Emissions Good Practice Planning Guidance. These are detailed within the Framework Travel Plan for the scheme.

Based on the assessment results, air quality issues are not considered a constraint to planning consent for the development.

1 Introduction

1.1 Background

This Air Quality Assessment has been prepared by ADAS UK Ltd under instruction from Lidl UK GmbH in support of a proposed foodstore on land off Mitchells Way, Wombwell, Barnsley.

The proposals have the potential to cause air quality impacts during the construction and operational phases. An Air Quality Assessment was therefore undertaken to consider potential impacts at sensitive locations in the vicinity of the site.

1.2 Site Location and Context

The scheme includes the construction of a 2,470m^2 foodstore with associated car parking area and infrastructure on a 1.3ha site off Mitchells Way, Wombwell, Barnsley, at approximate National Grid Reference (NGR): 439300, 403850. Reference should be made to Appendix I Figure 1 for a location plan.

The site is located to the north of Wombwell, in close proximity to residential dwellings with direct access to the local road network and as such, there are concerns from the local planning authority that the proposals could cause impacts in this area. An Air Quality Assessment was therefore required to consider any effects associated with the development. This is detailed in the following report.

2 Legislation and Policy

2.1 European Legislation

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for NO_2, oxides of nitrogen (NO_x), sulphur dioxide, lead and PM_{10};
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQLVs for benzene and carbon monoxide; and,
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- Directive 2004/107/EC - sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

2.2 UK Legislation

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 5 pollutants.

Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) (and its devolved counter-parts in Scotland, Wales and Northern Ireland) and published in July 2007[1]. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

Table 1 presents the AQOs for the pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m³)	Averaging Period
NO_2	40	Annual Mean
	200	1-hour mean; not to be exceeded more than 18 times a year
PM_{10}	40	Annual Mean
	50	24-hour mean; not to be exceeded more than 35 times a year

Table 2 summarises the advice provided in DEFRA guidance LAQM.TG(09)[2] on where the AQOs for pollutants considered within this report apply.

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.
[2] Local Air Quality Management Technical Guidance LAQM.TG(09), DEFRA, 2009.

Table 2 Examples of Where the Air Quality Objectives Apply

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

2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that pollutant levels at locations of relevant exposure (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 National Planning Policy

The National Planning Policy Framework[3] (NPPF) was published on 27th March 2012 and sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment:

> *"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"*
>
> *"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."*

The implications of the NPPF have been considered throughout this assessment.

[3] National Planning Policy Framework, Department for Communities and Local Government, 2012.

2.5 National Planning Practice Guidance

The National Planning Practice Guidance[4] (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. Why should planning be concerned about air quality?
2. What is the role of Local Plans with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality be relevant to a planning decision?
6. Where to start if bringing forward a proposal where air quality could be a concern?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?
9. How do considerations about air quality fit into the development management process?

These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

2.6 Local Planning Policy

Barnsley Metropolitan Borough Council (BMBC) adopted the Local Development Framework (LDF) Core Strategy on 8th September 2011. The Core Strategy sets out the council's policies and proposals for the use and development of land and buildings.

A review of the BMBC Core Strategy indicated the following policies in relation to air quality that are relevant to this assessment:

"***CSP 40 Pollution Control and Protection***

Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people.

We will not allow development of new housing or other environmentally sensitive development where existing air pollution, noise, smell, dust, vibration, light or other pollution levels are unacceptable and there is no reasonable prospect that these can be mitigated against.

Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate."

CSP 41 Development in Air Quality Management Areas

Development which impact on areas sensitive to air pollution[(a)] will be expected to demonstrate that it will not have a harmful effect on the health or living conditions of any future users of the development in terms of air quality (including residents, employees, visitors and customers), taking into account any suitable and proportionate mitigation required for the development.

We will only allow residential development which impact on areas sensitive to air pollution where the developer provides an assessment that shows living conditions will be acceptable for future residents, subject to any required mitigation.

[4] http://planningguidance.planningportal.gov.uk.

We will only allow development which impact on areas sensitive to air pollution which could cause more air pollution, where the developer provides an assessment that shows there will not be significantly harmful effect on air quality, again subject to any required mitigation.

Furthermore, development which impact on areas sensitive to air pollution due to traffic emissions will be expected to demonstrate suitable and proportionate mitigation relative to the increased traffic emissions generated by the development. Such areas sensitive to traffic emissions are defined within Map 1 of the Barnsley MBC Air Quality and Emissions Good Practice Planning Guidance

(a) Areas sensitive to air pollution include (but are not limited to) the Borough's air quality management areas; "exceedence" areas within the Borough derived from the national assessment of air pollution by defra and reported to the European Commission; and housing within 20 metres of roads > 10k AADT (as defined within the Barnsley MBC Air Quality and Emissions Good Practice Planning Guidance)"

These policies have been considered throughout this report in determining baseline conditions and assessing the effects the proposed development is forecast to have on local air quality.

The Barnsley MBC Air Quality and Emissions Good Practice Planning Guidance[5] was prepared to provide guidance to developers and their consultants on the air quality assessment process and mitigation measures. This document has also been taken into consideration within this assessment.

[5] Barnsley MBC Air Quality and Emissions Good Practice Planning Guidance, BMBC, 2014.

3 Assessment Methodology

The proposed development has the potential to cause air quality impacts during the construction and operational phases. These have been assessed in accordance with the following methodology, as agreed with Chris Shields, Technical Officer at BMBC, on 15th July 2015.

3.1 Construction Phase Assessment

There is the potential for fugitive dust emissions to occur as a result of construction phase activities. These have been assessed in accordance with the methodology outlined within the Institute of Air Quality Management (IAQM) document 'Guidance on the assessment of dust from demolition and construction'[6].

Activities on the proposed construction site have been divided into three types to reflect their different potential impacts. These were:

- Earthworks;
- Construction; and,
- Trackout.

The potential for dust emissions was assessed for each activity that is likely to take place and considered three separate dust effects:

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

The assessment steps are detailed below.

3.1.1 Step 1

Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 350m from the site boundary or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should proceed to Step 2. Additionally, should ecological receptors be identified within 50m of the boundary site or 50m from the construction vehicle route up to 500m from the site entrance, then the assessment should also proceed to Step 2.

Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

3.1.2 Step 2

Step 2 assessed the risk of potential dust impacts. The site was allocated a risk category based on two factors:

- The scale and nature of the works, which determines the magnitude of dust arising as: small, medium or large (Step 2A); and,
- The sensitivity of the area to dust impacts, which can defined as low, medium or high sensitivity (Step 2B).

The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.

Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 3.

[6] Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, Institute of Air Quality Management, 2014.

Table 3 Construction Dust - Magnitude of Emission

Magnitude	Activity	Criteria
Large	Earthworks	Total site area greater than 10,000m^2 Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) More than 10 heavy earth moving vehicles active at any one time Formation of bunds greater than 8m in height More than 100,000 tonnes of material moved
	Construction	Total building volume greater than 100,000m^3 On site concrete batching Sandblasting
	Trackout	More than 50 Heavy Duty Vehicle (HDV) trips per day Potentially dusty surface material (e.g. high clay content) Unpaved road length greater than 100m
Medium	Earthworks	Total site area 2,500m^2 to 10,000m^2 Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time Formation of bunds 4m to 8m in height Total material moved 20,000 tonnes to 100,000 tonnes
	Construction	Total building volume 25,000m^3 to 100,000m^3 Potentially dusty construction material (e.g. concrete) On site concrete batching
	Trackout	10 to 50 HDV trips per day Moderately dusty surface material (e.g. high clay content) Unpaved road length 50m to 100m
Small	Earthworks	Total site area less than 2,500m^2 Soil type with large grain size (e.g. sand) Less than 5 heavy earth moving vehicles active at any one time Formation of bunds less than 4m in height Total material moved less than 20,000 tonnes Earthworks during wetter months
	Construction	Total building volume less than 25,000m^3 Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	Less than 10 HDV trips per day Surface material with low potential for dust release Unpaved road length less than 50m

Step 2B defines the sensitivity of the area around the development site for construction, earthworks and trackout. The factors influencing the sensitivity of the area are shown in Table 4.

Table 4 Examples of Factors Defining Sensitivity of an Area

Sensitivity	Examples	
	Human receptors	Ecological Receptors
High	Users expect of high levels of amenity High aesthetic or value property People expected to be present continuously for extended periods of time Locations where members of the public are exposed over a time period relevant to the AQO for PM_{10}. e.g. residential properties, hospitals, schools and residential care homes	Internationally or nationally designated site e.g. Special Area of Conservation (SAC)

Sensitivity	Examples	
	Human receptors	Ecological Receptors
Medium	Users would expect to enjoy a reasonable level of amenity Aesthetics or value of their property could be diminished by soiling People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work	Nationally designated site e.g. Sites of Special Scientific Interest (SSSI)
Low	Enjoyment of amenity would not reasonably be expected Property would not be expected to be diminished in appearance Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads	Internationally or nationally designated site e.g. Special Area of Conservation (SAC)

The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts during the construction phase:

- Any history of dust generating activities in the area;
- The likelihood of concurrent dust generating activity on nearby sites;
- Any pre-existing screening between the source and the receptors;
- Any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which works will take place;
- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and,
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

These factors were considered in the undertaking of this assessment.

The sensitivity of the area to dust soiling effects on people and property is shown in Table 5.

Table 5 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 350
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

Table 6 outlines the sensitivity of the area to human health impacts.

Table 6 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
High	Greater than 32µg/m^3	More than 100	High	High	High	Medium	Low
		10 - 100	High	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	28 - 32µg/m^3	More than 100	High	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number of Receptors	Distance from the Source (m)				
			Less than 20	Less than 50	Less than 100	Less than 200	Less than 350
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	High	Medium	Low	Low	Low
	24 - 28µg/m³	More than 100	High	Medium	Low	Low	Low
		10 - 100	High	Medium	Low	Low	Low
		1 - 10	Medium	Low	Low	Low	Low
	Less than 24µg/m³	More than 100	Medium	Low	Low	Low	Low
		10 - 100	Low	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low	Low
Medium	-	More than 10	High	Medium	Low	Low	Low
	-	1 - 10	Medium	Low	Low	Low	Low
Low	-	More than 1	Low	Low	Low	Low	Low

Table 7 outlines the sensitivity of the area to ecological impacts.

Table 7 Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	Less than 20	Less than 50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts. Table 8 outlines the risk category from earthworks and construction activities.

Table 8 Dust Risk Category from Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Table 9 outlines the risk category from trackout.

Table 9 Dust Risk Category from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Low	Negligible
Low	Low	Low	Negligible

3.1.3 Step 3

Step 3 requires the identification of site specific mitigation measures within the IAQM guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

3.1.4 Step 4

Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'. It should be noted that these impacts have been described as **negligible** throughout this report to provide continuity between assessment terminologies.

The determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

3.2 Operational Phase Assessment

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site once it is developed.

3.2.1 Assessment Criteria

The sensitivity of each receptor was defined based on air quality conditions should the development proceed and the criteria contained within Table 10. These are based upon the guidance provided within the 'Land-Use Planning & Development Control: Planning for Air Quality' Guidance[7] prepared by the Environmental Protection UK (EPUK) and the IAQM.

Table 10 Receptor Sensitivity

Receptor Sensitivity	Description
Very High	Long term average concentration at receptor in assessment year is 110% or more of AQAL
High	Long term average concentration at receptor in assessment year is 103-109% of AQAL
Medium	Long term average concentration at receptor in assessment year is 95-102% of AQAL
Low	Long term average concentration at receptor in assessment year is 76-94% of AQAL
Very Low	Long term average concentration at receptor in assessment year is 75% or less of AQAL

The magnitude of change in pollutant concentrations was defined based on the criteria outlined in Table 11.

Table 11 Magnitude of Change

Magnitude of Change	Change in Pollutant Level as Proportion of AQAL (%)
Large	Greater than 10
Medium	6-10
Small	2-5
Imperceptible	1

[7] Land-Use Planning & Development Control: Planning For Air Quality, EPUK and IAQM, 2015.

Note: Changes of 0%, i.e. .less than 0.5% will be described as Negligible.

Impact significance was defined based on the interaction between the sensitivity of the affected receptor and the magnitude of change, as outlined in Table 12.

Table 12 Significance of Impact

Receptor Sensitivity	Magnitude of Change			
	Imperceptible	Small	Medium	Large
Very Low	Negligible	Negligible	Slight	Moderate
Low	Negligible	Slight	Moderate	Moderate
Medium	Slight	Moderate	Moderate	Substantial
High	Moderate	Moderate	Substantial	Substantial
Very High	Moderate	Substantial	Substantial	Substantial

It should be noted that the criteria shown in Table 10 and Table 11 and the matrix shown in Table 12 are adapted from the guidance document[7] prepared by the EPUK and the IAQM with sensitivity descriptors included to allow comparisons of various air quality impacts.

Following the prediction of impacts at discrete receptor locations the EPUK and IAQM document[7] provides guidance on determining the overall air quality impact significance of the operation of a development. The following factors are identified for consideration by the assessor:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts; and,
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

These factors were considered and an overall significance determined for the impact of operational phase road traffic emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

3.3 Air Quality and Emissions Good Practice Planning Guidance

The development has the potential to impact on existing air quality as a result of road traffic exhaust emissions, such as NO_2 and PM_{10}, associated with vehicles travelling to and from the site. The assessment therefore considered the methodology contained within the BMBC guidance[5] to determine the potential for the development to affect local air quality.

The approach to an air quality assessment recommended by the BMBC guidance follows a three stage process:

- Stage 1: Determining the classification of the development proposal;
- Stage 2: Assessing and quantifying the impact on local air quality; and,
- Stage 3: Determining the level of a mitigation required by the proposal to meet Local Development Plan requirements.

3.3.1 Stage 1 - Development Type Classification

The three levels of development classification are determined using the Department for Transport (DfT) criteria[8]. These are outlined in Table 13.

[8] http://webarchive.nationalarchives.gov.uk/20100409053417/http://www.dft.gov.uk/adobepdf/165237/202657/guidanceontaappendixb

Table 13 Criteria for Development Classification

Land Use	Description	Criteria
Food Retail (A1)	Retail sale of food goods to the public – supermarkets, superstore, convenience food store	>800m² (GFA)
Non-Food Retail (A1)	Retail sale of non-food goods to the public; but includes sandwich bars or other cold food purchased and consumed off site	>1500m² (GFA)
Financial and professional services (A2)	Banks, building societies and bureaux de change, professional services, estate agents, employment agencies, betting shops	>2500m² (GFA)
Restaurants and Cafes (A3)	Use for the sale of food for consumption on the premises	>2500m² (GFA)
Drinking Establishments (A4)	Use as a public house, wine-bar for consumption on or off the premises	>600m² (GFA)
Hot Food Takeaway (A5)	Use for the sale of hot food for consumption on or off the premises	>500m² (GFA)
Financial and professional services (A2)	Banks, building societies and bureaux de change, professional services, estate agents, employment agencies, betting shops	>2500m² (GFA)
Restaurants and Cafes (A3)	Use for the sale of food for consumption on the premises	>2500m² (GFA)
Drinking Establishments (A4)	Use as a public house, wine-bar for consumption on or off the premises	>600m² (GFA)
Hot Food Takeaway (A5)	Use for the sale of hot food for consumption on or off the premises	>500m² (GFA)
Business (B1)	(a) Offices other than in use within Class A2 (financial and professional) (b) Research and development – laboratories, studios (c) Light industry	>2500m² (GFA)
General industrial (B2)	General industry (other than B1).	>4000m² (GFA)
Storage or Distribution (B8)	Storage or distribution centres – wholesale warehouses, distribution centres and repositories	>5000m² (GFA)
Hotels (C1)	Hotels, boarding houses and guest houses	>100 bedrooms
Residential Institutions (C2)	Hospitals, nursing homes used for residential accommodation and care	>50 beds
Residential Institutions (C2)	Boarding schools and training centres	>150 students
Residential Institutions (C2)	Institutional hostels, homeless centres	>400 residents
Dwelling Houses (C3)	Dwellings for individuals, families or not more than six people in a single household	>50 units
Non-Residential Institutions (D1)	Medical and health services, museums, public libraries, art galleries, non-residential education, places of worship and church halls	>1000m² (GFA)
Assembly and Leisure (D2)	Cinemas, dance and concert halls, sports halls, swimming, skating, gym, bingo, and other facilities not involving motorised vehicles or firearms	>1500m² (GFA)
Other: 1. Any development generating 30 or more two-way vehicle movements in any hour 2. Any developments generating 100 or more two-way vehicle movements per day 3. Any development proposing 100 or more parking spaces 4. Any relevant development proposed in a location where the local transport infrastructure is inadequate 5. Any relevant development proposed in a location adjacent to an Air Quality Management Area (AQMA)		

Additional Trigger Criteria for Major Developments

- Where the proposed development falls within the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 and includes air quality and/or transport as a specific likely impact;
- Proposals located within the area identified in Map1 of the BMBC guidance[5]; and,
- Proposals that include additional Heavy Goods Vehicle (HGV) movements by more than 10% of total trips.

The three levels of development classification are outlined in Table 14.

Table 14 Development Type Classification

Development Type	Classification Criteria
1. Minor	Development proposals that fall below the criteria detailed within Table 13
2. Medium	Development proposals that meet the requirements detailed within Table 13
3. Major	Development proposals that meet the requirements detailed within Table 13 and the additional trigger criteria for major developments

3.3.2 Stage 2 - Air Quality Impact Assessment

Minor and Medium Developments

The BMBC guidance[5] requires an assessment of the likelihood of introducing additional exposure. The outcome of the exposure assessment will determine the level of mitigation required to make the development acceptable. This is determined by using the following criteria:

The proposal is one of the Land Use types:

- C1 to C3 in Table 13;
- C4 (Homes of Multiple Occupation); and,
- D1 in Table 13.

The proposal is within the area identified on Map 1 BMBC guidance[5] (this includes the area within or adjacent to an AQMA; applicable roads; and includes roads at or above the relevant national objective highlighted on the Defra GIS modelled maps[9]).

Major Developments

A detailed air quality assessment will be required to determine the impact on public health and the local environment. The following are required as part of the assessment:

- The identification of the level of exposure through the change in pollutant concentrations including cumulative impacts arising from the proposal, during both demolition/construction operations and operational phases based on the requirements of the DEFRA guidance[2] and the air quality assessment protocol detailed within Appendix 2 of the BMBC guidance[5];
- Mitigation measures should be identified and modelled where practicable; and,
- The calculation of pollutant emissions costs from the development by utilising the most recent DEFRA Emissions Factor Toolkit[10] and the latest DEFRA IGCB Air Quality Damage Costs[11].

9 http://uk-air.defra.gov.uk/data/gis-mapping).
10 http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#eft.
11 https://www.gov.uk/air-quality-economic-analysis.

3.3.3 Stage 3 - Mitigation

Minor Proposal - Type 1

If the proposal meets the exposure criteria in Stage 2, further mitigation is required to reduce the level of exposure. This will be in the form of:

- Possible short term screening monitoring or utilising the DEFRA distance calculation[12] at the proposed location to identify the level of exposure;
- Redesigning the proposal to reduce the ingress of pollution; and,
- Including a stand-off distance and/or vegetation boundary from the development.

Suggested Mitigation Options are:

Residential Developments:

- 1 charging point per unit (dwelling with dedicated parking) or 1 charging point per 10 spaces (unallocated parking).
- The use of such mitigation measures as designing the layout of the site taking into account air quality; and the use of green infrastructure or contributing to the funding of green infrastructure at schools etc.
- Provision of secure cycle storage
- Provision of incentives for the use of public transport

Medium Proposal - Type 2

The default mitigation measures for Medium Proposal - Type 2 include the measures detailed for Minor Proposals in addition to the following:

Commercial/Retail:

- 10% of parking spaces which may be phased with 5% initial provision and the remainder at an agreed trigger level

Industrial:

- 10% of parking spaces which may be phased with 5% initial provision and the remainder at an agreed trigger level

All Proposals:

- Travel Plan including agreed strategy for discouraging high emission vehicle use and encouraging modal shift (i.e. public transport, cycling and walking) as well as the uptake of low emission fuels and technologies;
- Improved pedestrian links to public transport;
- Provision of new bus stop infrastructure and provision of ticketing; and,
- Site layout designed to encourage walking; Cycle paths to link to local cycle network.

Commercial Specific mitigation measures:

- All commercial vehicles should comply with current or the most recent European Emission Standards from scheme opening, to be progressively maintained for the lifetime of the development;
- Fleet operations should provide a strategy for reducing emissions, including the uptake of low emission fuels and technologies such as ultra-low emission service vehicles; and,
- Fleet operators should consider joining schemes such as the South Yorkshire ECO Stars scheme.

[12] http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html.

Major Proposal - Type 3

In order to negate the impact of a development, the required level of mitigation compensation will be determined by the pollution damage costs attributed to the proposal emission changes.

The type specific suggested mitigation measures are detailed in Table 15.

Table 15 Type 3 - Major Proposal Suggested Mitigation Options

Aim of Mitigation	Mitigation
To reduce the need to travel	Local sourcing of staff, products and raw materials Development and use of hub distribution centres employing low emission deliveries Explore alternative working practices - flexitime, teleworking, homeworking, videoconferencing, compressed work periods
To reduce private use	Development of car clubs and car sharing with financial incentives and promotion Use workplace car clubs and car sharing with financial incentives and promotion Use of workplace pooled low emission vehicles - cars, vans, taxis, bicycles. Provision of dedicated low emission shuttle bus including managed pick-up and drop-off Contribution to the emerging low emission vehicle infrastructure Contribution to site low emission waste collection services Incentives for the take-up of low emission vehicle technologies and fuels Support driver training schemes
To support improved public transport	Provision of new or enhanced public transport services to the site Shuttle services to public transport interchange, rail station or park and ride facilities Support improving information services for public transport Promoting low emission bus service provision Support air quality monitoring programmes
To promote cycling and walking	Improvements to district walking and cycling networks including lighting, shelters, and information points and timetables Bike/e-bike hiring schemes Guaranteed ride home in emergencies Provision of secure and safe cycle parking facilities Support cycle training Supporting community / local organisation groups to promote sustainable travel.

4 Baseline

Existing air quality conditions in the vicinity of the site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

4.1 Local Air Quality Management

As required by the Environment Act (1995), BMBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean concentrations of NO_2 are above the AQO at some locations within the borough. As such, seven AQMAs have been declared. The closest of the declared AQMAs to the proposed site is the 'A61 Harborough Hill Road' AQMA.

This AQMA is located approximately 5.3km north-west of the development. Due to the distance between the sites, potential impacts on NO_2 concentrations within the AQMA are not anticipated to be significant and they have not been considered further in the context of this assessment.

BMBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated for any pollutant other than NO_2.

4.2 Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by BMBC using continuous and periodic methods throughout their area of jurisdiction. A review of the most recent LAQM report[13] indicated that no continuous monitoring is undertaken in the vicinity of the site.

BMBC utilises passive diffusion tubes to monitor NO_2 concentrations throughout the borough. There are two sites located in the vicinity of the proposed development and recent monitoring results are shown in Table 16.

Table 16 Diffusion Tube Monitoring Results

Site ID	Location	Type	NGR (m)		Annual Mean NO_2 Concentrations ($\mu g/m^3$)		
			X	Y	2012	2013	2014
DT55	Barnsley Road, Wombwell	Roadside	439100	404019	- [1]	- [1]	35.3
DT56	Billington Steel, Wombwell Lane	Roadside	439174	403934	34.1	30.5	35.3

Note: [1] Monitoring results were not available

As indicated in Table 16, there have been no exceedences of the annual mean AQO for NO_2 at the closest diffusion tubes during recent years. Reference should be made to Figure 1 for BMBC's non-automatic monitoring locations in the vicinity of the site.

4.3 Background Pollutant Concentrations

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The site is located in grid square NGR: 439500, 403500. The most recent data for this location, released in June 2014, was downloaded from the DEFRA website[14] for the purpose of this assessment and is summarised in Table 17.

[13] 2015 Updating and Screening Assessment for Barnsley Metropolitan Borough Council, 2015.
[14] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011.

Table 17 Predicted Background Pollutant Concentrations

NGR: X, Y (m)	Predicted 2015 Annual mean Background Pollutant Concentrations (µg/m³)		
	NO_2	NO_x	PM_{10}
439500, 403500	15.86	21.73	15.63

As indicated in Table 17, background concentrations in the vicinity of the site are predicted to be below the relevant AQOs although it should be acknowledged that the DEFRA interpolated datasets are known to in some cases under-predict background pollution levels within or close to large urban areas.

4.4 Sensitive receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development, with reference to the criteria recommended by the DEFRA guidance LAQM.TG(09)[2] summarised in Table 2. These have been defined for dust and road vehicle exhaust emission impacts in the following Sections.

4.4.1 Construction Phase Sensitive Receptors

Receptors sensitive to potential dust impacts during earthworks and construction were identified from a desk-top study of the area up to 350m from the development boundary. These are summarised in Table 18.

Table 18 Earthworks and Construction Dust Sensitive Receptors

Distance from Site Boundary (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	1 - 10	0
20 - 50	10 - 100	0
50 - 100	More than 100	-
100 -350	More than 100	-

Reference should be made to Figure 2 for a graphical representation of earthworks and construction dust buffer zones. The site is located within a mainly residential area with business and light industrial units to the north and woodlands to the east. The closest residential receptors to the proposed development are located to the west and to the south.

Receptors sensitive to potential dust impacts from trackout were identified from a desk-top study of the area up to 50m from the road network within 500m of the site access. These are summarised in Table 19. The exact construction vehicle access routes were not available for the purpose of this assessment as they will depend on sourcing of materials and development phasing. At this early stage of the proposals these details are not currently finalised. As such, to provide a conservative approach, each main road in the vicinity of the site was considered to be an access route for the development. This ensured the maximum potential trackout distance was considered.

Table 19 Trackout Dust Sensitive Receptors

Distance from Site Access Route (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	10 - 100	0
20 - 50	10 - 100	0

Reference should be made to Figure 2 for a graphical representation of trackout buffer zones.

There are no ecological receptors within 50m of the site boundary or access route, as such these have not been considered further within this report.

A number of additional factors have been considered when determining the sensitivity of the surrounding area. These are summarised in Table 20.

Table 20 Earthworks and Construction Dust Sensitive Receptors

Guidance	Comment
Whether there is any history of dust generating activities in the area	The site is located to the north of an ongoing Residential development of approximately 220 dwellings. There is likely to have been a history of dust generating activities in the area.
The likelihood of concurrent dust generating activity on nearby sites	Due to the site location, there is a very low possibility that dust generating activities may occur that could account for cumulative impacts
Pre-existing screening between the source and the receptors	There is no pre-existing screening between the source and the receptors
Conclusions drawn from analysing local meteorological data which accurately represent the area: and if relevant the season during which works will take place	The predominant wind direction is from the west, south-west of the development. Receptors to the east, north-east are therefore identified as particularly susceptible to impacts. Reference should be made to Figure 3 for a wind rose of data from Emley Moor
Conclusions drawn from local topography	The site is located within a mainly residential area with business and light industrial units to the north and woodlands to the east. The site and surrounding area appears relatively flat, as such there are no topographical constraints to dust dispersion
Duration of the potential impact, as a receptor may become more sensitive over time	Currently it is unclear as to the duration of the construction phase. However, it is unlikely that this will extend over 1-year
Any known specific receptor sensitivities which go beyond the classifications given in the document.	No specific receptor sensitivities have been identified during the baseline assessment

Based on the criteria shown in Table 4, the sensitivity of the receiving environment to potential dust impacts was considered to be high. This was because users would expect to enjoy a reasonable level of amenity and aesthetics or value of their property could be diminished by soiling and people would be expected to be present for extended periods of time e.g. residential properties.

The sensitivity of the receiving environment to specific potential dust impacts, based on the criteria shown in Section 3.1.2, is shown in Table 21.

Table 21 Sensitivity of the Surrounding Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	High
Human Health	Low	Low	Low

4.4.2 Operational Phase Sensitive Receptors

Receptors sensitive to potential operational phase impacts were identified from a desk-top study and are summarised in Table 22. These receptor locations were again selected with reference to the criteria outlined in LAQM TG09, summarised in Table 2 of this report.

Table 22 Existing Receptor Locations

Receptor		NGR (m)	
ID	Location	X	Y
R1	283 Barnsley Road	438848.9	404243.4
R2	247 Barnsley Road	438953.1	404164.8
R3	70 Barnsley Road	439066.7	404065.5
R4	227 Barnsley Road	439171.5	403890.6
R5	215 Barnsley Road	439182.2	403843.6
R6	201 Barnsley Road	439194.0	403795.0
R7	216 Barnsley Road	439226.3	403759.2
R8	174 Barnsley Road	439259.9	403657.6
R9	96 Bradberry Balk Lane	439750.0	404124.5
R10	Proposed Residential Dwelling	439301.7	403776.8
R11	Proposed Residential Dwelling	439399.9	403713.1
R12	Proposed Residential Dwelling	439379.6	403542.7

The sensitive receptors identified in Table 22 represent worst-case locations. However, this is not an exhaustive list and there may be other locations within the vicinity of the site that may experience air quality impacts as a result of the development that have not been individually identified above. Reference should be made to Figure 1 for a graphical representation of road vehicle exhaust emission sensitive receptor locations.

Receptor sensitivity was defined based upon the methodology outlined in Table 10 and predicted pollutant concentrations for 2016 with the proposal in place. These are detailed in Table 23.

Table 23 Road Vehicle Exhaust Emission Receptor Sensitivity

Receptor	NO_2		PM_{10}	
	Predicted Annual Mean Concentration (µg/m³)	Sensitivity	Predicted Annual Mean Concentration (µg/m³)	Sensitivity
R1	36.22	Low	16.16	Very Low
R2	36.41	Low	16.18	Very Low
R3	36.52	Low	16.20	Very Low
R4	35.99	Low	16.11	Very Low
R5	35.98	Low	16.11	Very Low
R6	36.76	Low	16.28	Very Low
R7	36.17	Low	16.08	Very Low
R8	36.15	Low	16.06	Very Low
R9	36.24	Low	16.08	Very Low
R10	36.30	Low	16.13	Very Low
R11	36.16	Low	16.11	Very Low
R12	35.35	Low	15.97	Very Low

As indicated in Table 23, existing receptor sensitivity was **low** to changes in annual mean NO_2 concentrations and **very low** to changes in annual mean PM_{10} concentrations.

5 Assessment

There is the potential for air quality impacts as a result of the construction and operation of the proposed development. These are assessed in the following Sections.

5.1 Construction Phase Assessment

A sensitive receptor is defined as any location which may be affected by changes in air quality as a result of a development. These have been defined for dust and road vehicle exhaust emission impacts as described in Section 4.

5.1.1 Step 1

The undertaking of activities such as excavation, ground works, cutting, construction, concrete batching and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from haul road and highway surfaces.

The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most significant effects likely to occur during dry and windy conditions.

The desk-study undertaken to inform the baseline identified a number of sensitive receptors within 350m of the site boundary. As such, a detailed assessment of potential dust impacts was required.

5.1.2 Step 2

Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling, as well as site levelling and landscaping. Information on soil type was not available for the purpose of this assessment. As such, the soil type was considered to be potentially dusty in order to provide a worst-case scenario.

The proposed development site is estimated to cover an area greater than 10,000m^2. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from earthworks is therefore **large**.

Table 21 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **medium** risk site for dust soiling as a result of earthworks activities.

Table 21 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for human health as a result of earthwork activities.

Construction

Due to the size of the development site the total building volume is likely to be less than 25,000m^3. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from construction is therefore **small**.

Table 21 indicates the sensitivity of the area to dust soiling effects on people and property is **medium**. In accordance with the criteria outlined in Table 8, the development is considered to be a **low** risk site for dust soiling as a result of construction activities.

Table 21 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 8, the development is considered to be a **negligible** risk site for human health as a result of construction activities.

Trackout

Information on the number of HDV trips to be generated during the construction phase of the development was not available at the time of assessment. Similarly, the surface material and unpaved road length was not known at this stage of the project.

Based on the site area, it is anticipated that the unpaved road length is likely to be greater than 100m. In accordance with the criteria outlined in Table 3, the magnitude of potential dust emissions from trackout is therefore **large**.

Table 21 indicates the sensitivity of the area to dust soiling effects on people and property is **high**. In accordance with the criteria outlined in Table 10, the development is considered to be a **high** risk site for dust soiling as a result of trackout activities.

Table 21 indicates the sensitivity of the area to human health is **low**. In accordance with the criteria outlined in Table 9, the development is considered to be a **low** risk site for human health as a result of trackout activities.

Summary of the Risk of Dust Effects

A summary of the risk from each dust generating activity is provided in Table 24.

Table 24 Summary of Potential Dust Risk to Define Site-Specific Mitigation

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	High
Human Health	Low	Negligible	Low

As indicated in Table 24, the potential risk of dust soiling is medium from earthworks, low from construction and high from trackout. The potential risk to human health impacts is low or negligible from all activities.

It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the site boundary closest to each sensitive area. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

5.1.3 Step 3

The IAQM guidance[6] provides a number of potential mitigation measures to reduce potential impacts from the construction phase. These have been adapted for the development site as summarised in Table 25. These may be reviewed prior to the commencement of construction works and incorporated into a Construction Environmental Management Plan if required by the Local Planning Authority.

Table 25 Fugitive Dust Mitigation Measures

Issues	Approximate Number of Human Receptors
Communications	Develop and implement a Stakeholder Communications Plan that includes community engagement Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary Display the head or regional office contact information Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the LA
Site Management	Record all dust and air quality complaints Make the complaints log available to the LA when asked Record any exceptional incidents that cause dust/or air emissions, and the action taken to resolve the situation Hold regular liaison meeting with other high risk construction sites within 500m of the site boundary to ensure plans are co-ordinated and dust and particulate matter emissions are minimised
Monitoring	Undertake daily on-site and off-site inspection to monitor dust. This should include regular dust soiling checks of surfaces within 100m of site boundary. Cleaning to be provided if necessary Carry out regular site inspections to monitor compliance with the DMP Increase frequency of site inspections when activities with a high potential to produce dust are being carried out
Preparing and Maintaining the Site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible Erect solid barriers to site boundary Fully enclose site or specific operations where there is a high potential for dust production and the site as actives for an extensive period Avoid site runoff of water or mud Keep site fencing, barriers and scaffolding clean using wet methods Remove materials that have a potential to produce dust from site as soon as possible Cover, seed or fence stockpiles to prevent wind whipping
Operating Vehicle/ Machinery and Sustainable Travel	All vehicles to switch of engines - no idling vehicles Avoid the use of diesel or petrol powered generators where practicable Impose a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas Produce a Construction Logistics Plan to manage deliveries Implement a Travel Plan that supports and encourages sustainable travel
Operations	Cutting equipment to use water as dust suppressant or suitable local extract ventilation Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation Use enclosed chutes and covered skips Minimise drop heights Ensure equipment is readily available on site to clean any spillages
Waste Management	No bonfires

Issues	Approximate Number of Human Receptors
Earthworks and Construction	Re-vegetate earthworks and exposed areas Use Hessian, mulches or trackifiers where it is not possible to re-vegetate Only remover the cover in small areas during work and not all at once Avoid scabbling Ensure sand and other aggregates are stored and not able to dry out Ensure bulk cement and other fine power materials are delivered and stored to prevent escape For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately
Trackout	Use water-assisted dust sweeper on the access and local roads Avoid dry sweeping of large areas Ensure vehicles entering and leaving site are covered to prevent escape of materials Inspect on-site routes for integrity, instigate necessary repairs and record in site log book Install hard surfaced haul routes which are regularly damped down Implement a wheel washing system at a suitable location near site exit Access gates 10m from receptors where possible

5.1.4 Step 4

Assuming the relevant mitigation measures outlined in Table 28 are implemented, the residual effect from all dust generating activities is predicted to be **negligible**.

5.2 Operational Phase Assessment

5.2.1 Assessment Input

Traffic Data

Traffic flows and proportion of Heavy Duty Vehicles (HDVs) for the adjacent road network were obtained from EJS Associates, the Transport Consultants for the development.

Additional vehicle movements associated with the operation of the development will generate exhaust emissions on the local and regional road networks. An assessment was therefore undertaken using the DMRB Screening Tool in order to quantify potential changes in pollutant concentrations at sensitive locations. The assessment considered the following scenarios:

- 2014 Verification
- 2016 DM; and,
- 2016 DS.

The "DM" (i.e. without development) scenarios were representative of projected traffic data for 2016. The "DS" (i.e. with development) scenarios were representative of projected traffic data for 2016 in addition to vehicle trips associated with the proposal.

For the purpose of this assessment traffic data was supplied for 2016, the development opening year. Air quality is predicted to improve in the future. However, in order to provide a robust assessment, emission factors for 2014 were utilised within the dispersion model. The use of 2016 traffic data and 2014 emission factors is considered to provide a worst-case scenario and therefore a sufficient level of confidence can be placed within the predicted pollution concentrations. Reference should be made to Appendix II for full assessment input details.

5.2.2 Assessment results

Nitrogen Dioxide

Annual mean NO_2 concentrations were predicted across the development site for the 2016 DM and DS scenarios, as shown in Figures 4 and 5.

Annual mean NO_2 concentrations were predicted for each 2016 scenarios and are summarised in Table 26.

Table 26 Predicted Annual Mean NO_2 Concentrations - 2016

Receptor		Predicted Annual Mean NO_2 Concentration (µg/m^3)		
ID	Location	Do-minimum	Do-something	Change
R1	283 Barnsley Road	35.96	35.99	0.03
R2	247 Barnsley Road	35.95	35.98	0.03
R3	70 Barnsley Road	36.71	36.76	0.05
R4	227 Barnsley Road	36.12	36.17	0.05
R5	215 Barnsley Road	36.08	36.15	0.07
R6	201 Barnsley Road	36.15	36.24	0.09
R7	216 Barnsley Road	36.21	36.30	0.09
R8	174 Barnsley Road	36.07	36.16	0.09
R9	96 Bradberry Balk Lane	35.20	35.35	0.15
R10	Proposed Residential Dwelling	35.88	35.92	0.04
R11	Proposed Residential Dwelling	35.66	35.68	0.02
R12	Proposed Residential Dwelling	35.84	35.91	0.07

As indicated in Table 26, predicted annual mean NO_2 concentrations were below the relevant AQO at all existing receptor locations for both scenarios considered. The maximum predicted increase was 0.15µg/m^3 at 96 Bradberry Balk Lane (R9).

Predicted impacts on annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 27.

Table 27 Predicted Annual Mean NO_2 Impacts at Sensitive Receptors - 2016

Receptor		Change (% of AQO)	Magnitude of Change	Receptor Sensitivity	Significance of Impact
ID	Location				
R1	283 Barnsley Road	0.08	Imperceptible	Low	Negligible
R2	247 Barnsley Road	0.07	Imperceptible	Low	Negligible
R3	70 Barnsley Road	0.12	Imperceptible	Low	Negligible
R4	227 Barnsley Road	0.13	Imperceptible	Low	Negligible
R5	215 Barnsley Road	0.17	Imperceptible	Low	Negligible
R6	201 Barnsley Road	0.23	Imperceptible	Low	Negligible
R7	216 Barnsley Road	0.23	Imperceptible	Low	Negligible
R8	174 Barnsley Road	0.23	Imperceptible	Low	Negligible
R9	96 Bradberry Balk Lane	0.37	Imperceptible	Low	Negligible
R10	Proposed Residential Dwelling	0.10	Imperceptible	Low	Negligible
R11	Proposed Residential Dwelling	0.05	Imperceptible	Low	Negligible

Receptor		Change (% of AQO)	Magnitude of Change	Receptor Sensitivity	Significance of Impact
ID	Location				
R12	Proposed Residential Dwelling	0.18	Imperceptible	Low	Negligible

As indicated in Table 27, the significance of impacts on annual mean NO_2 concentrations as a result of the development was predicted to be **negligible** at all existing receptor locations in 2016.

Particulate Matter

Annual mean PM_{10} concentrations were predicted across the assessment extents for the 2016 DM and DS scenarios, as shown in Figures 6 and 7.

Annual mean PM_{10} concentrations were predicted for each 2016 scenarios and are summarised in Table 28.

Table 28 Predicted Annual Mean PM_{10} Concentrations - 2016

Receptor		Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)		
ID	Location	Do-minimum	Do-something	Change
R1	283 Barnsley Road	16.10	16.11	0.01
R2	247 Barnsley Road	16.10	16.11	0.01
R3	70 Barnsley Road	16.27	16.28	0.01
R4	227 Barnsley Road	16.07	16.08	0.01
R5	215 Barnsley Road	16.05	16.06	0.01
R6	201 Barnsley Road	16.06	16.08	0.02
R7	216 Barnsley Road	16.11	16.13	0.02
R8	174 Barnsley Road	16.09	16.11	0.02
R9	96 Bradberry Balk Lane	15.94	15.97	0.04
R10	Proposed Residential Dwelling	16.06	16.07	0.01
R11	Proposed Residential Dwelling	16.03	16.04	0.00
R12	Proposed Residential Dwelling	16.04	16.06	0.02

As indicated in Table 28, predicted annual mean PM_{10} concentrations were below the relevant AQO at all existing receptor locations for both scenarios considered. The maximum predicted increase was $0.04\mu g/m^3$ at 96 Bradberry Balk Lane (R9).

Predicted impacts on annual mean PM_{10} concentrations at the sensitive receptor locations are summarised in Table 29.

Table 29 Predicted Annual Mean PM_{10} Impacts at Sensitive Receptors - 2016

Receptor		Change (% of AQO)	Magnitude of Change	Receptor Sensitivity	Significance of Impact
ID	Location				
R1	283 Barnsley Road	0.02	Imperceptible	Very Low	Negligible
R2	247 Barnsley Road	0.02	Imperceptible	Very Low	Negligible
R3	70 Barnsley Road	0.03	Imperceptible	Very Low	Negligible
R4	227 Barnsley Road	0.03	Imperceptible	Very Low	Negligible
R5	215 Barnsley Road	0.03	Imperceptible	Very Low	Negligible

Receptor		Change (% of AQO)	Magnitude of Change	Receptor Sensitivity	Significance of Impact
ID	Location				
R6	201 Barnsley Road	0.04	Imperceptible	Very Low	Negligible
R7	216 Barnsley Road	0.05	Imperceptible	Very Low	Negligible
R8	174 Barnsley Road	0.05	Imperceptible	Very Low	Negligible
R9	96 Bradberry Balk Lane	0.09	Imperceptible	Very Low	Negligible
R10	Proposed Residential Dwelling	0.02	Imperceptible	Very Low	Negligible
R11	Proposed Residential Dwelling	0.01	Imperceptible	Very Low	Negligible
R12	Proposed Residential Dwelling	0.04	Imperceptible	Very Low	Negligible

As indicated in Table 29, the significance of impacts on annual mean PM_{10} concentrations as a result of the development was predicted to be **negligible** at all existing receptor locations in 2016.

5.2.3 Overall Impact Significance

The overall significance of operational phase road traffic emission impacts was determined as **negligible**. This was based on the most significant predicted impact at discrete receptor locations and the considerations outlined in Section 3.

5.3 Proposed Mitigation Measures

The assessment considered the methodology contained within the BMBC guidance[5] to determine the potential for the development to affect local air quality. Based on the methodology outlined in Section 3.3 the development is considered to be a Type 2 - Medium Proposal.

Reference should be made to the Framework Travel Plan (FTP) for the proposed mitigation measures for the development. The FTP effectively represents a combination of information, proposals and incentives designed to use most effectively the different means of travel available to customers and store workers. This document outlines management measures such as the provision of secure cycle parking, the promotion of car sharing and the appointment of a Travel Co-ordinator and Sustainable Travel Assistant. Such measures contribute to reduced vehicle trips and subsequently provide mitigation relating to increased pollutant concentrations. The implementation of these initiatives will be phased in order to reflect the on-going development of the Travel Plan.

6 Conclusions

ADAS UK Ltd was commissioned by Lidl UK GmbH to undertake an Air Quality Assessment in support of a proposed foodstore on land off Mitchells Way, Wombwell, Barnsley.

The scheme has the potential to cause air quality impacts at sensitive locations during the construction and operational phases. These may include fugitive dust emissions associated with construction works and road vehicle exhaust emissions from traffic generated by the development during the operational phase. An Air Quality Assessment was therefore undertaken to consider potential impacts at sensitive locations in the vicinity of the site as a result of the scheme.

An assessment of fugitive dust emissions during the construction phase was undertaken in accordance with the IAQM methodology. Assuming good practice dust control measures are implemented, the residual significance of potential air quality impacts from dust generated by earthworks, construction and trackout activities was predicted to be **negligible**.

Dispersion modelling was undertaken in order to predict air quality impacts at sensitive receptors as a result of emissions associated with traffic generated by the development during the operational phase.

The results of the dispersion modelling assessment indicated that predicted annual mean NO_2 and PM_{10} concentrations did not exceed the relevant AQOs at modelled sensitive receptor locations for both scenarios considered. Predicted impacts on NO_2 and PM_{10} levels as a result of operational phase vehicle exhaust emissions were negligible at all sensitive receptor locations. The overall significance of potential impacts was determined to be **negligible**, in accordance with the EPUK and IAQM guidance.

Proposed mitigation measures for the development were identified in accordance with the BMBC guidance[5]. These are detailed within the accompanying Framework Travel Plan.

Based on the results of this assessment, air quality is not considered a constraint to planning consent for the proposed development.

Appendix I Figures

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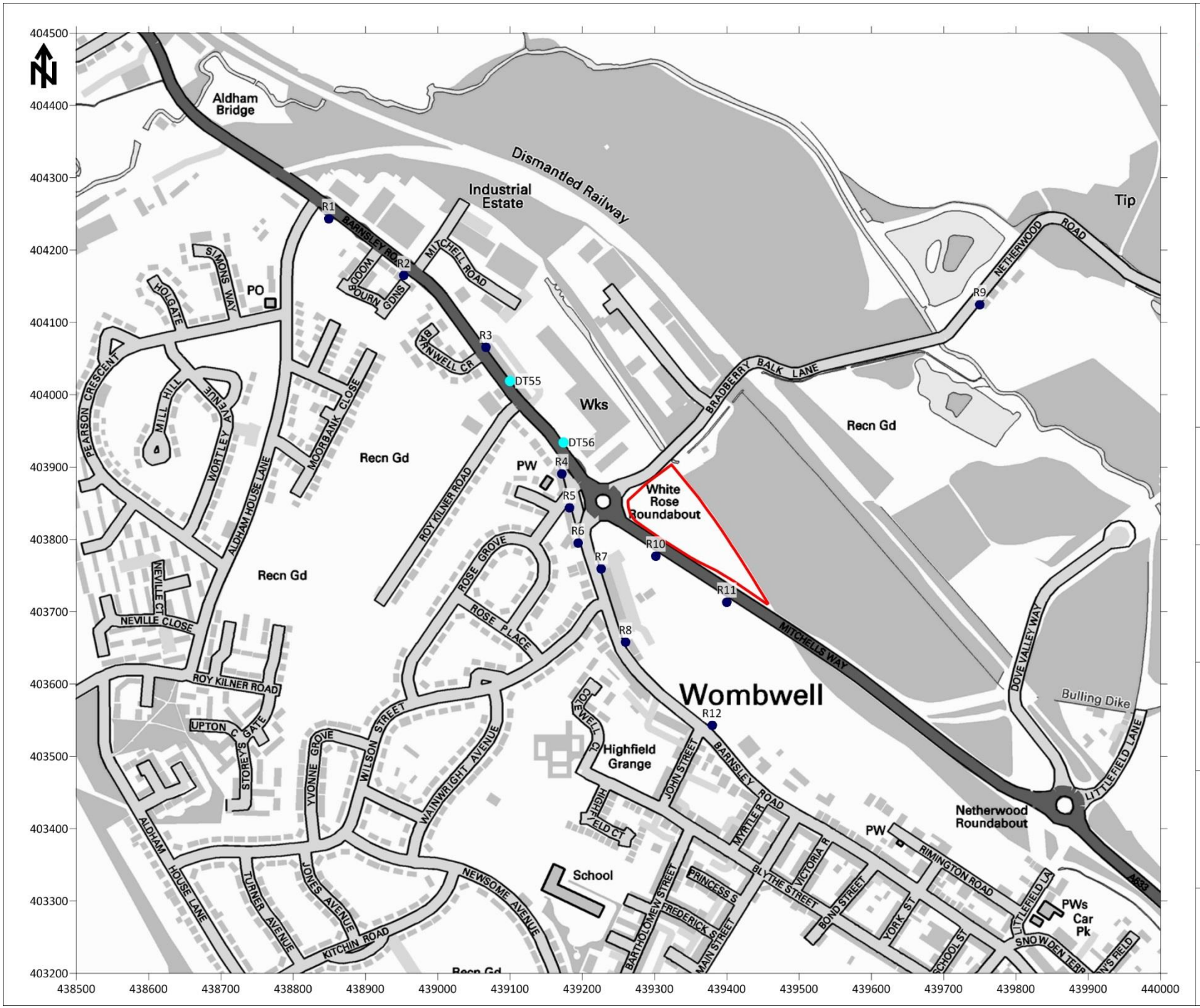

Legend

Site Location

Sensitive Receptor Location

Diffusion Tube Location

Title

Figure 1
Site Location

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

Client

Lidl UK GmbH

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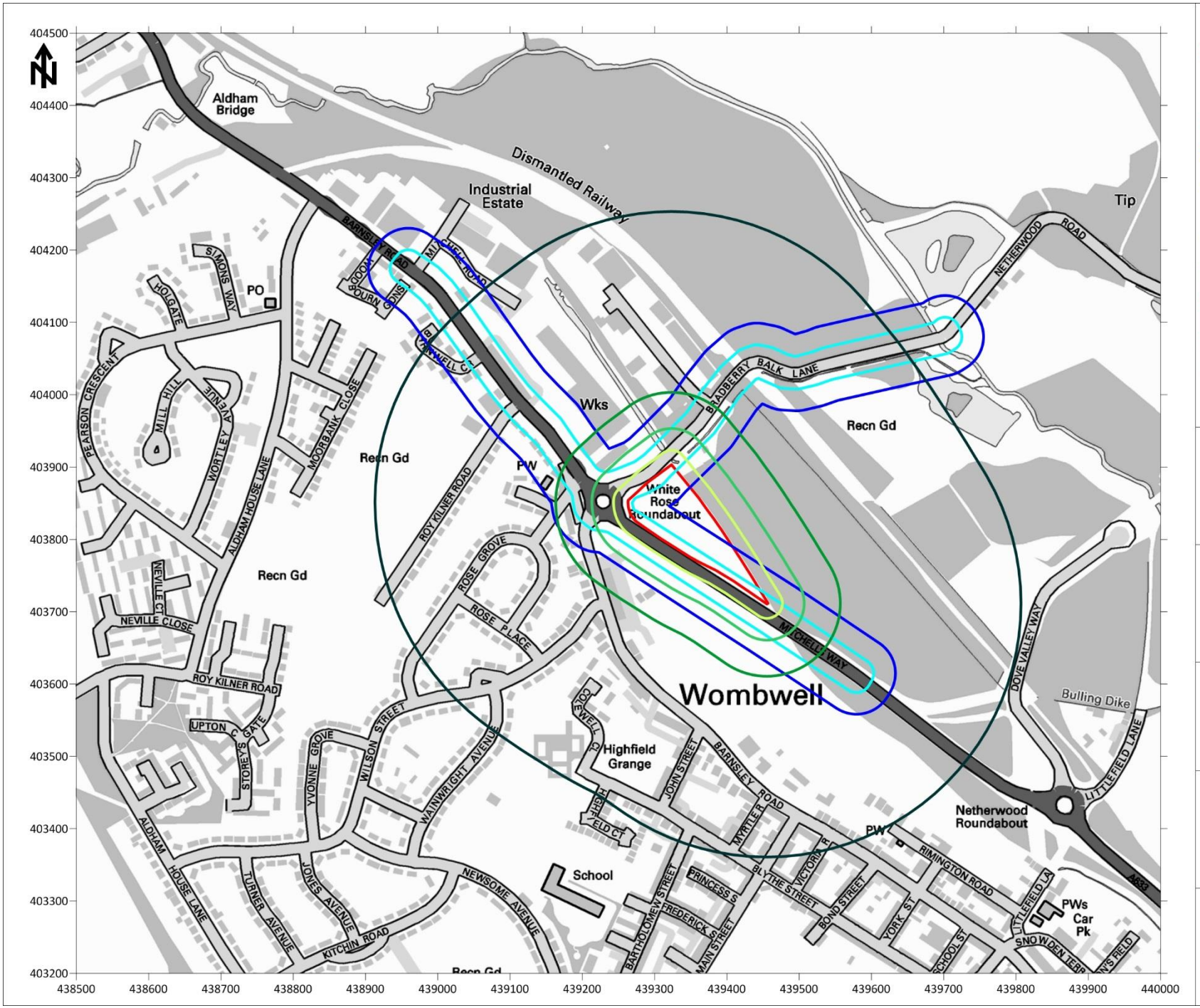

Legend

Site Location

Trackout Dust Buffer Zones:

20m From Site Access Route

50m From Site Access Route

Demolition, Earthworks and Construction Dust Buffer Zones:

20m From Site Boundary

50m From Site Boundary

100m From Site Boundary

350m From Site Boundary

Title

Figure 2
Construction Phase
Dust Buffer Zones

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

Client

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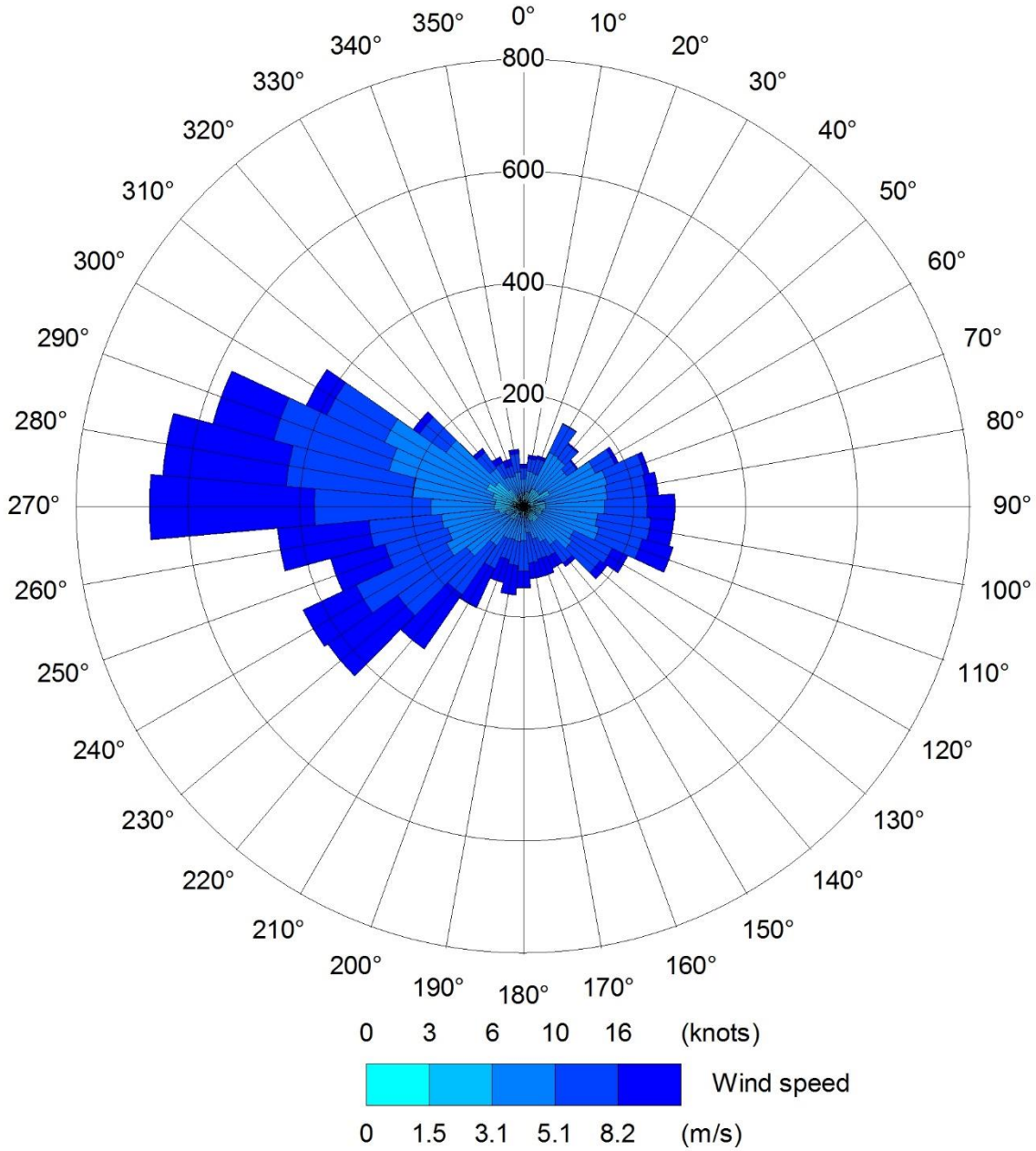

Title

Figure 3

Emley Moor Meteorological Data

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

Client

Lidl UK GmbH

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Site Location

Sensitive Receptor Location

Predicted Annual Mean NO_2 Concentration (µg/m³)

40
39
38
37
36
35

Title

Figure 4
Predicted Annual Mean NO_2 Concentrations (µg/m³) 2016 DM

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

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Legend

Site Location

Sensitive Receptor Location

Predicted Annual Mean NO_2 Concentration (µg/m³)

40
39
38
37
36
35

Title

Figure 5
Predicted Annual Mean NO_2 Concentrations (µg/m³) 2016 DS

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

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Legend

Site Location

Sensitive Receptor Location

Predicted Annual Mean PM_{10} Concentration (µg/m³)

17.2
17.1
17.0
16.9
16.8
16.7
16.6
16.5
16.4
16.3
16.2
16.1
16.0
15.9

Title

Figure 6
Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2016 DM

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

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Legend

Site Location

Sensitive Receptor Location

Predicted Annual Mean PM_{10} Concentration (µg/m³)

17.2
17.1
17.0
16.9
16.8
16.7
16.6
16.5
16.4
16.3
16.2
16.1
16.0
15.9

Title

Figure 7
Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2016 DS

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

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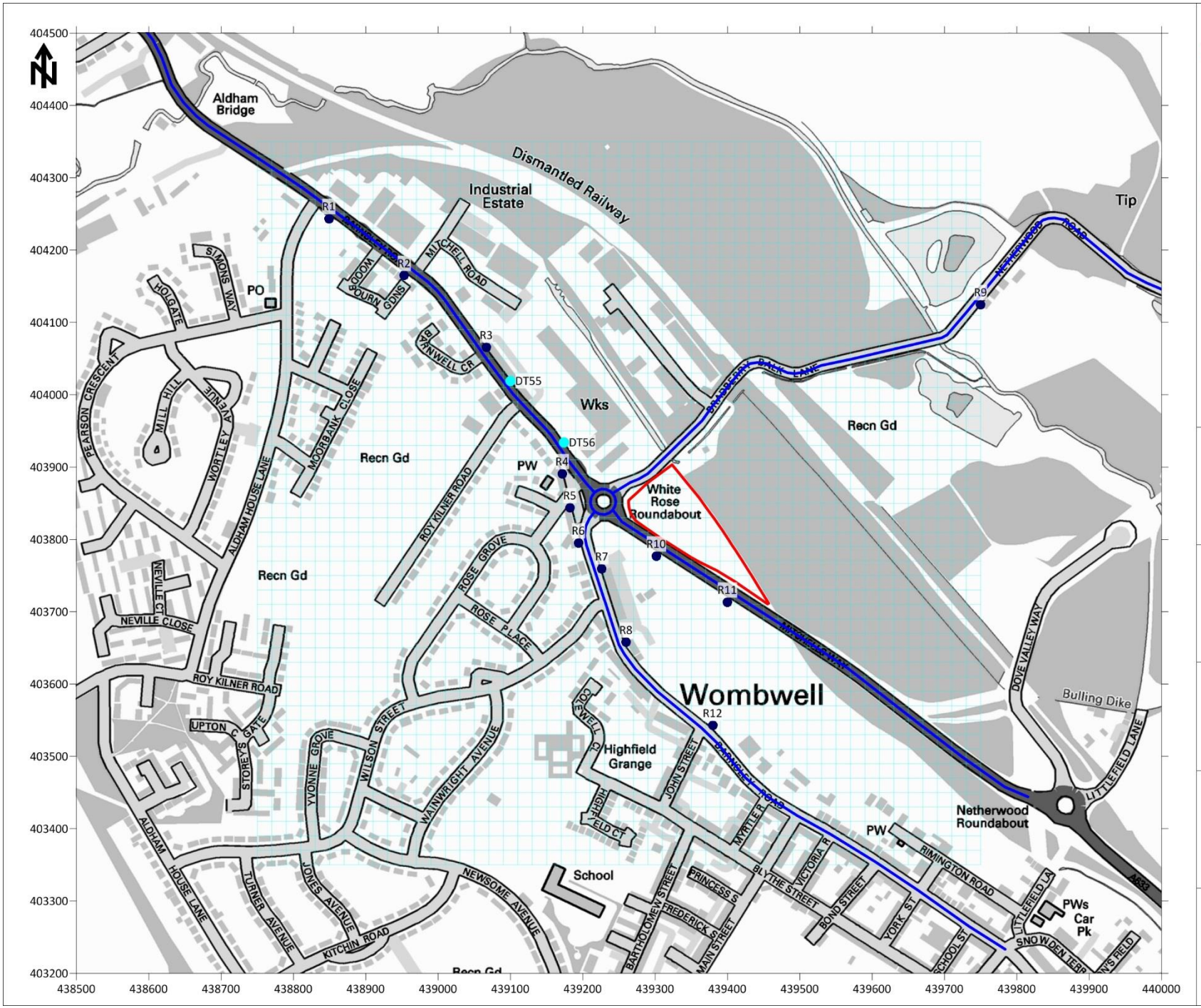

Legend

- Site Location
- Sensitive Receptor Location
- Diffusion Tube Location
- Cartesian Grid
- Modelled Road Layout

Title

Figure 8
ADMS Roads Model Input

Project

Proposed Lidl Foodstore
Mitchells Way Wombwell, Barnsley
Air Quality Assessment

Client

Lidl UK GmbH

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Appendix II ADMS Roads Input Data

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Assessment Inputs

Vehicle trips associated with the development have the potential to result in air quality impacts as a result of increased traffic exhaust emissions. Dispersion modelling using ADMS-Roads was therefore undertaken to predict NO_2 and PM_{10} concentrations at sensitive locations both with and without the development in order to consider potential changes as a result of the proposals.

The dispersion model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length; and,
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 3.4). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and DEFRA.

Assessment Area

Ambient concentrations were predicted over the area NGR: 438750, 403350 to 439750, 404350. A Cartesian grid with a height of 1.5m, to represent exposure at ground level, was used within the model to produce data suitable for contour plotting using the Surfer software package.

It should be noted that although the grid only covered the proposed site and surrounding area, road links were extended in order to ensure the impact of all relevant vehicle emissions in the vicinity of the development were considered.

Reference should be made to Figure 8 for a graphical representation of the assessment extents.

Traffic Flow Data

Traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and HDV proportion was provided by EJS Associates, the Transport Consultants for the project.

Traffic data for the wider area was not available from the Transport Consultants. As such, information for these links was obtained from the Department for Transport (DfT) matrix[15]. The website provides traffic counts for 'A' roads and motorways throughout Great Britain from the years 1999 to 2014. It should be noted that the DfT matrix is referenced in DEFRA guidance LAQM.TG(09)[2] as being a suitable source of data for air quality assessments and is therefore considered to provide a reasonable representation of traffic flows in the vicinity of the site.

Vehicle speeds were estimated based on the free flow potential of each link and local speed limits. Road widths were estimated from aerial photography and UK highway design standards.

The assessment input details are presented within Tables AII.1 and AII.2.

[15] http://www.dft.gov.uk/traffic-counts/index.php.

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Table AII.1 2014 Verification Traffic Data

Road Link		2014 Verification			
		AADT	Road Width (m)	HDV Proportion (%)	Speed (km/h)
01	Barnsley Road (A633)	16,288	7.3	2.39	55
01SD	Barnsley Road (A633) Junction Approach	16,288	7.8	2.39	25
02	White Rose Roundabout	19,556	7.3	2.61	20
03	Bradberry Balk Lane	3,031	7.3	1.4	55
03SD	Bradberry Balk Lane Junction Approach	3,031	7.8	1.4	25
04	Mitchells Way	11,104	7.3	1.7	55
04SD	Mitchells Way Junction Approach	11,104	7.8	1.7	25
05	Barnsley Road	8,690	7.3	4.6	45
05SD	Barnsley Road Junction Approach	8,690	8.2	4.6	25
06	Barnsley Road (A633) North	18,057	9.8	4.06	55

Table AII.2 2016 Traffic Data

Road Link		2016 Do-minimum		2016 Do-something	
		AADT	Road Width (m)	HDV Proportion (%)	Speed (km/h)
01	Barnsley Road (A633)	16,587	2.39	17,072	2.33
01SD	Barnsley Road (A633) Junction Approach	16,587	2.39	17,072	2.33
02	White Rose Roundabout	19,916	2.61	21,456	2.43
03	Bradberry Balk Lane	3,086	1.40	4,626	0.96
03SD	Bradberry Balk Lane Junction Approach	3,086	1.40	4,626	0.96
04	Mitchells Way	11,308	1.70	11,469	1.68
04SD	Mitchells Way Junction Approach	11,308	1.70	11,469	1.68
05	Barnsley Road	8,850	4.60	9,744	4.19
05SD	Barnsley Road Junction Approach	8,850	4.60	9,744	4.19
06	Barnsley Road (A633) North	18,389	4.06	18,874	3.96

Emission Factors

Emission rates for each road link were calculated from the information shown in Tables AII.1 and AII.2 utilising the Emission Factor Toolkit (version 6.0.2). This incorporates updated COPERT4v10 vehicle emission factors for NO_x and vehicle fleet information. There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2014 emission factors have been utilised in preference to the development opening year. However, it should be noted that 2016 traffic data was utilised in the assessment, which includes anticipated future growth. Therefore predicted concentrations are likely to be an overestimate of actual concentrations, resulting in a worst-case scenario.

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Meteorological Data

Meteorological data used in this assessment was taken from Emley Moor meteorological station. The Emley Moor observation station is located at NGR: 422233, 413007, which is approximately 19.4km north-west of the proposed development. DEFRA guidance LAQM.TG(09)[2] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling.

All meteorological data used in the assessment was provided by UK Met Office, which is an established distributor of meteorological data within the UK. Reference should be made to Figure 3 for a wind rose of utilised meteorological data.

Roughness Length

A roughness length (z_0) of 0.5m was used in the dispersion model. This value of z_0 is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'parkland, open suburbia'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and is suggested within ADMS-Roads as being suitable for 'cities and large towns'.

Background Concentrations

Annual mean concentrations of 16.33 and 15.85µg/m^3 for NO_2 and PM_{10} respectively, as predicted by DEFRA, were used to represent background levels in the vicinity of the site.

Similarly to emission factors, background concentrations for 2014 were utilised in preference to future assessment years. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of proposal.

NO_X to NO_2 Conversion

Predicted annual mean NO_X concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM.TG(09)[2].

Verification

The predicted results from a model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

For the purpose of this assessment model verification was undertaken for 2014 using traffic data and monitoring results from this year.

BMBC undertakes monitoring of NO_2 concentrations at two positions within the assessment extents. These diffusion tubes had sufficient data capture for 2014 for the purposes of the verification process.

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Monitoring results for these location was therefore obtained and the road contribution to total NO_X concentration calculated following the methodology contained within DEFRA guidance LAQM.TG(09)[2].

The monitored and modelled annual mean NO_2 concentrations are summarised Table AII.3.

Table AII.3 2014 Verification Results

Monitoring Location		Monitored NO_2 Concentration (µg/m³)	Calculated Roadside NO_X Concentration (µg/m³)
Site ID	Location		
DT55	Barnsley Road, Wombwell	35.30	45.32
DT56	Billington Steel, Wombwell Lane	35.30	40.73

The dispersion model was run with the traffic input data previously detailed for 2014 to predict the NO_X concentration at the monitoring location. The result is shown in Table AII.4.

Table AII.4 NO_X Verification Results

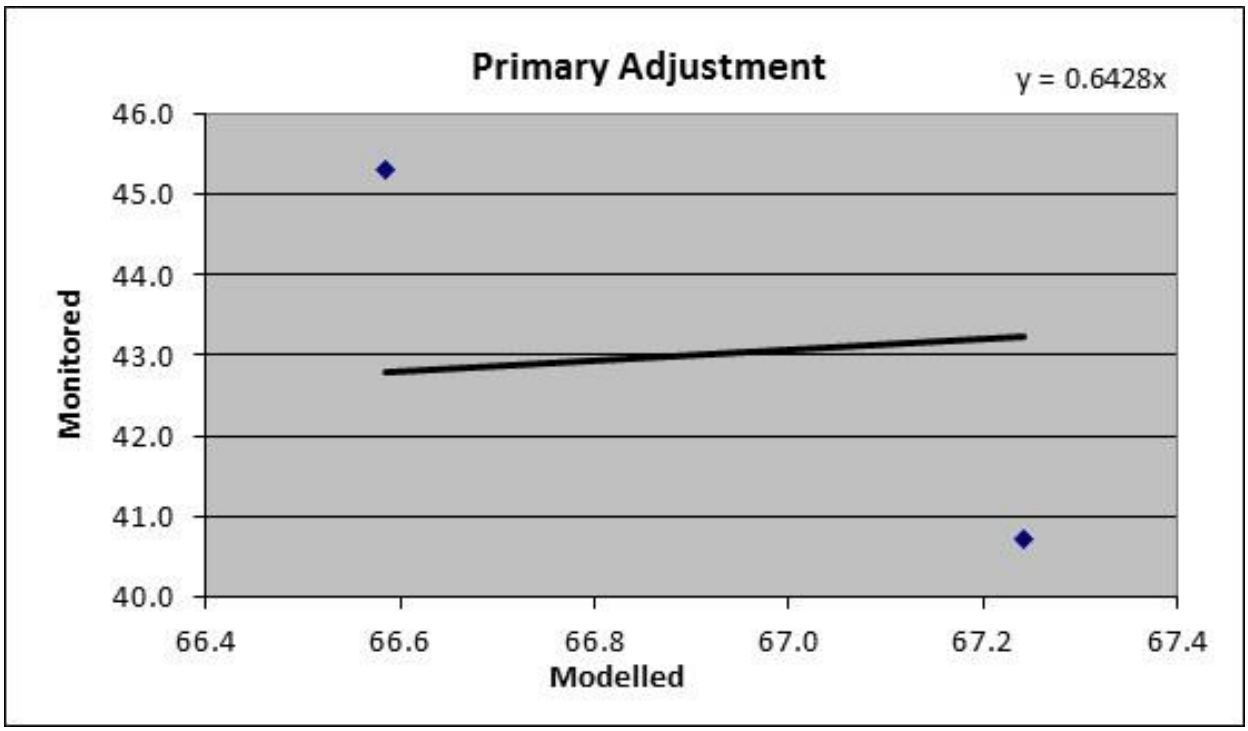
Monitoring Location		Modelled Roadside NO_X Concentration (µg/m³)
Site ID	Location	
DT55	Barnsley Road, Wombwell	66.59
DT56	Billington Steel, Wombwell Lane	67.24

The monitored and modelled NO_X concentrations were compared to calculate the associated ratio. This indicated a verification factor of **0.6428** was required to be applied to all modelling results.

As PM_{10} monitoring is not undertaken within the assessment extents, a verification factor of **0.6428** was also used to adjust model predictions of this pollutant in accordance with the guidance provided within LAQM.TG(09)[2].

Reference should be made to Graph 1 for a model correlation coefficient.

Graph 1 Model Correlation Coefficient



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