8 Local Air Quality

8.1 INTRODUCTION

8.1.1 This chapter of the ES assesses the likely significant effects of the Proposed Development in terms of air quality. Where appropriate, measures to prevent, minimise or control negative impacts are presented and residual effects following the adoption of those measures are assessed.

8.1.2 This chapter (and its associated figures and appendices) is not intended to be read as a stand alone assessment and reference should be made to **Chapters 1 – 4**, as well as **Chapter 16 Cumulative Effects** of this *report.*

8.2 LEGISLATION, POLICY AND GUIDANCE

Legislative Framework

8.2.1 The applicable legislative framework is summarised as follows:

- *The European Directive on Ambient Air Quality and Cleaner Air for Europe* (Directive 2008/50/EC) and associated Daughter Directive (**Ref. 8.1**);
- *The Air Quality (England) Regulations 2000* - Statutory Instrument 2000 No.928 (**Ref. 8.2**);
- *The Air Quality (England) (Amendment) Regulations 2002* - Statutory Instrument 2002 No.3043 (**Ref. 8.3**);
- *The Air Quality Standards Regulations 2010*- Statutory Instrument 2010 No. 1001 (**Ref. 8.4**);
- *The Environmental Protection Act 1990* (**Ref. 8.5**); and
- *The Environment Act 1995* (**Ref. 8.6**).

8.2.2 The Air Quality Strategy (AQS) sets out the Government's policy on air quality, pursuant to the requirements of Part IV of the Environment Act 1995. It establishes a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS sets standards and objectives for nine main air pollutants to protect health, vegetation and ecosystems. These are C_6H_6, 1,3 butadiene (C_4H_6), CO, Pb, NO_2, particulate matter (PM_{10} and $PM_{2.5}$), SO_2, O_3, and PAHs.

8.2.3 Many of the objectives in the AQS were made statutory in England with the *Air Quality (England) Regulations 2000* (**Ref. 8.7**) and the *Air Quality (England) (Amendment) Regulations 2002* (**Ref. 8.8**) for the purpose of Local Air Quality Management (LAQM). These regulations were subsequently replaced by the *Air Quality Standards Regulation 2010* (Ref. 10.4). The standards and objectives for each pollutant in the AQS and the Regulations are given in **Appendix 8.1**.

8.2.4 Under Part IV of the Environment Act 1995, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives by the years defined in the Air Quality Regulations (2002). Where the objectives of the Air Quality Regulations (2002) are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

8.2.5 The Environmental Protection Act 1990 refers to the control of dust and particulates associated with construction. Section 80 of the act states that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses. There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is subjective and its perception is highly dependent upon existing conditions and the change which has occurred. In the context of the Proposed Development, the main potential for nuisance of this nature will arise during the construction phase, potential sources being clearance, earthworks, construction and landscaping activities.

Planning Policy

8.2.6 Planning policy at the national, county and local level is discussed in **Chapter 5 - Relevant Policy**. A summary of the scheme's compliance with relevant legislation and planning policy is included in Section 8.6 of this Chapter.

National Planning Policy

National Planning Policy Framework

8.2.7 The National Planning Policy Framework (**Ref. 8.9**) sets out the Government's planning policies for England and how these are expected to be applied. It promotes sustainable development and opportunities for local communities to engage in plan making at a neighbourhood level. The core underpinning principle of the framework is the presumption in favour of sustainable development, defined as: *'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'* One of the 12 core planning principles in the NPPF is that planning should *'contribute to conserving and enhancing the natural environment and reducing pollution.'*

8.2.8 In relation to air quality, the document states 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';
- '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 soils, air, water, or noise pollution..';
- 'In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity values, where consistent with other policies in this Framework.'
- '..local planning authorities should focus on whether the development itself is an acceptable use of the land, and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should to be revisited through the permitting regimes operated by pollution control authorities'; and
- 'Local Planning authorities should consider where otherwise unacceptable development could be made acceptable though the use of conditions or planning obligations. Planning Obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.'

Local Planning Policy

Barnsley Local Development Framework: Core Strategy (September 2010) (**Ref. 8.10**)

8.2.9 Barnsley Metropolitan Borough Council (BMBC) Policy CSP 40 Pollution Control and Protection states:

- 'Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and ground water, noise, smell, dust, vibration, light or other pollution which would unacceptable 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.; and
- 'Developers will be expected to minimise the effects of any possible pollution and provide mitigation measures where appropriate.'

8.2.10 Policy CSP 41 Development in Air Quality Management Areas states:

- 'Development in air quality management areas 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), or that any such harmful effects can be mitigated against.'
- 'We will only allow residential development in air quality management areas, where the development provides an assessment that shows living conditions will be acceptable for future residents'; and
- 'We will only allow development in air quality management areas which could cause more air pollution, where the developer provides an assessment that shows there will not be a significant harmful effect on air quality.'

Guidance

12.1.1 The Department for Environment, Food and Rural affairs (Defra) has published technical guidance (**Ref. 8.11**) for use by local authorities in their review and assessment work. This guidance, referred to in this chapter as LAQM.TG(09), has been used where appropriate, in the assessment presented herein.

8.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Scope of the Assessment

8.3.1 The chapter considers the impact of dust and PM_{10} generated during the construction phase on nearby sensitive receptors and emissions from traffic associated with the development on pollutant concentrations at a number sensitive receptors around the Site.

Extent of the Study Area

8.3.2 The key effect on air quality as a result of the Proposed Development is likely to be due to emissions from road vehicles generated by the Proposed Development once it is operational.

8.3.3 The study area for the air quality assessment includes the Site and the immediate surrounding area. Sensitive receptors located in the immediate vicinity of the Site and adjacent to each of the road links considered have also been included in this assessment.

Consultation

8.3.4 The Environmental Health Department of BMBC was consulted in February 2011 to discuss the availability of monitoring data, and to agree the assessment methodology being applied.

Method of Baseline Data Collation

Desk Study

8.3.5 The desk top study incorporated the following:

- A review air quality data for the area surrounding the Site, including data from the Defra and the Environment Agency websites;
- A review of traffic data provided by WSP Property and Development (WSPP&D), which has been used as an input to the air quality assessment; and
- A study of maps of the Site and surrounding area to confirm the location of nearby areas that may be sensitive to changes in local air quality.

Assessment Modelling

Dust and PM_{10} Emissions from Construction Activities

8.3.6 During the construction phase, activities undertaken on the application site may cause dust and particulate matter to be emitted to the atmosphere.

8.3.7 Dust comprises particles typically in the size range 1-75 micrometres (µm) in aerodynamic diameter and is created through the action of crushing and abrasive forces on materials. The larger dust particles fall out of the atmosphere quickly after initial release and therefore tend to be deposited in close proximity to the source of emission. Dust therefore, is unlikely to cause long-term or widespread changes to local air quality; however, its deposition on

property and cars can cause 'soiling' and discolouration. This may result in complaints of nuisance through amenity loss or perceived damage caused, which is usually temporary.

8.3.8 The smaller particles of dust (typically less than 10μm in aerodynamic diameter) are known as particulate matter (PM_{10}) and represent only a small proportion of total dust released. As these particles are at the smaller end of the size range of dust particles they remain suspended in the atmosphere for a longer period of time than the larger dust particles, and can therefore be transported by wind over a wider area. PM_{10} is small enough to be drawn into the lungs during breathing, which in sensitive members of the public could cause an adverse reaction. As a result of this potential impact on health, standards and objectives for PM_{10} are defined in the AQS and Regulations.

8.3.9 A qualitative assessment of the potential impacts due to the generation and dispersion of dust and PM_{10} during the construction phase has been undertaken using information in guidance documents produced by the following organisations:

- Building Research Establishment (BRE) (**Ref. 8.12**);
- Quality of Urban Air Review Group (QUARG) (**Ref. 8.13**); and
- Department of the Environment (DoE) (**Ref. 8.14**).

8.3.10 As there are no formal assessment criteria for dust and PM_{10} generation and dispersion during construction, the significance of impacts associated with this phase of the proposed redevelopment has been determined qualitatively by:

- identifying the construction activities associated with the proposed redevelopment that could generate dust and PM_{10} and their likely duration;
- identifying sensitive receptors (e.g. schools, residential properties) within 200m of the construction site boundary; and
- the prevailing wind direction.

Exhaust Emissions from Construction Vehicles

8.3.11 Exhaust emissions from construction vehicles will have an impact on local air quality both on-site and adjacent to the routes used by these vehicles to access the site. As information on the number of vehicles associated with the construction phase is not available, a qualitative assessment of their impact on local air quality has been undertaken by considering:

- the level of construction traffic likely to be generated by this phase of the redevelopment;
- the number and distance of sensitive receptors in the vicinity of the site and along the likely routes to be used by construction vehicles; and
- the likely duration of the construction phase and the nature of the construction activities undertaken.

Emissions Arising from the Road Traffic Generated by the Operation of the Proposed Development

8.3.12 Once construction has been completed the traffic generated by the redevelopment will have an effect on local pollution concentrations, both within and around the proposed redevelopment site. The main pollutants of concern for road traffic are generally considered to be NO_2, PM_{10}, CO and C_6H_6. Of these pollutants, emissions of NO_2 and PM_{10} are most likely to result in exceedences of the relevant air quality standards or objectives in urban areas. Indeed, BMBC has declared six areas within the Borough as AQMAs due to exceedences of the annual mean objective for NO_2 concentrations. This air quality assessment will therefore only consider these two pollutants.

8.3.13 For the prediction of impacts due to emissions arising from road traffic during operation, the air pollutant dispersion model Breeze Roads has been used. This model uses detailed information regarding traffic flows on the local road network and local meteorological conditions to predict pollution concentrations at specific locations selected by the user.

8.3.14 Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data used in the model was obtained from the Met

Office observing station at Church Fenton. This station is considered to provide data representative of the conditions at the proposed redevelopment site. The meteorological data used for this assessment was from 2010.

8.3.15 For the assessment, four scenarios were modelled. These scenarios are as follows:

- 2010 "model verification";
- 2011 "baseline";
- 2016 "without development"; and
- 2016 "with development".

8.3.16 2010 was chosen as the model verification year as this was the most recent year for which monitoring data, meteorological data, traffic data and emissions factors were all available. 2011 was used as the baseline year (i.e. the current situation) and 2016 is the proposed opening year of the redevelopment.

8.3.17 A summary of the traffic data and pollutant emission factors used in the assessment can be found in **Appendix 8.2**. It includes details of Annual Average Hourly Traffic flows (AAHTs), average vehicle speeds and the percentage of Heavy Goods Vehicles (HGVs) for the local road network in all assessment years considered. It also includes details of the emission factors that were used for each road link considered.

8.3.18 The traffic flows for the "without development" scenarios include flows for committed developments in the locality of the proposed redevelopment site but do not include any contribution to road traffic from the proposed redevelopment itself. The traffic flows for the "with development" scenario includes flows for committed developments and contributions to road traffic from the proposed redevelopment.

8.3.19 Modelled annual mean oxides of nitrogen (NO_x) concentrations were converted to annual mean NO_2 concentrations using the methodology given in LAQM.TG(09) and the NO_x:NO_2 calculator available from DEFRA's website. The calculator provides a method of calculating NO_2 from NO_x wherever NO_x emissions from road traffic are predicted using dispersion modelling.

8.3.20 For PM_{10}, the modelled annual mean concentrations were used to calculate the number of exceedences of the 24-hour mean objective for direct comparison with the relevant AQS objective, following the methodology given in LAQM.TG(09).

8.3.21 LAQM.TG(09) does not provide a method for the conversion of annual mean NO_2 concentrations to 1 hour mean NO_2 concentrations. However, research carried out in 2003 (**Ref. 8.15**), determined that exceedences of the 1 hour mean objective were unlikely to occur where annual mean concentrations were below 60µg/m^3. Further research carried out in 2008 (**Ref. 8.16**) generally supported this relationship and as a result this criterion has been adopted for the purposes of local air quality review and assessment.

8.3.22 Quantitative assessment of the impacts on local air quality from road traffic emissions associated with the operation of the redevelopment have been completed against the current statutory standards and objectives for NO_2 and PM_{10} set out in **Appendix 8.1**.

8.3.23 The Breeze Roads dispersion model has been widely validated for this type of assessment and is considered to be fit for purpose. The model is also listed in Government guidance document LAQM.TG3(00) – Review and Assessment: Selection and Use of Dispersion Models (**Ref. 8.17**).

8.3.24 Model validation undertaken by the software developer will not have included validation in the vicinity of the development considered in this assessment. To determine the performance of the model at a local level it is therefore advisable to perform a comparison of modelled results with local monitoring data at one or more relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

8.3.25 Suitable local monitoring data for the purpose of model verification is available for concentrations of NO_2 at the locations shown in **Table 8.1**.

Table 8.1: Local monitoring data sources suitable for model verification

Location & Site Classification			O.S. Grid Reference	Distance to Site	2010 Monitored NO_2 Concentrations (µg/m^3)
103	113 Harborough Hills	Roadside	435047, 407033	0.1	45.8
102	Harborough Hills Road / Redfearn Street	Roadside	434951, 407003	0.2	39.6
45	Canal Street	Roadside	434885, 407072	0.2	27.7
101	Harborough Hills Road / Meadow Street	Roadside	434979, 406918	0.2	38.1
47	Burton Road	Roadside	435290, 407382	0.3	39.1
46	Burton Road	Kerbside	435211, 407443	0.3	49.2
44	Old Mill Lane / Eldon Street	Kerbside	434778, 406988	0.4	37.7
43	Old Mill Lane / Honeywell Street	Kerbside	434757, 406995	0.4	45.7
39	Wakefield Road - Burton Rd Junction	Roadside	435172, 407506	0.4	50.1
38	Wakefield Rd, approach Burton Road	Kerbside	435146, 407568	0.5	40.2
99	Mottram Street / Eldon Street	Roadside	434727, 406753	0.5	37.4
37	Wakefield Road, approach Burton Road	Kerbside	435108, 407676	0.6	38.7
94	Slip Road / Harborough Hills Road	Kerbside	434876, 406491	0.7	37.3
93	Pontefract Road / Queens Road	Roadside	434879, 406413	0.7	39.5
42	Victoria Rd / Huddersfield Road	Roadside	434346, 406846	0.8	37.3
92	Pontefract Road / Clyde Street	Kerbside	434920, 406277	0.9	39
41	Victoria Rd / Huddersfield Road	Kerbside	434274, 406887	0.9	44
48	Burton Road - Rotherham Road Junction	Kerbside	436072, 407320	1.0	48
35	Wakefield Rd / Smithies Lane	Roadside	435027, 408104	1.0	47.7
100	Harborough Hills Road, adj. ex-bakery	Roadside	434955, 406769	0.4	67.3
95	49 Harborough Hill Road	Roadside	434933, 406695	0.5	66.5

8.3.26 Model verification has been undertaken following the methodology specified in Annex 3 of LAQM.TG(09) using the NO_x:NO_2 calculator available from DEFRA's website to calculate the roadside NO_x component of the annual mean NO_2 concentrations measured at the diffusion tube sites. Verification factors have been calculated for roadside and kerbside receptors. Details of the verification calculations are presented in **Appendix 8.3**.

8.3.27 A factor of **7.78** was obtained for the roadside monitoring sites during the verification process and this factor has been applied to the modelled NO_x roads component before addition of the relevant background NO_x concentrations and conversion to annual mean NO_2 concentrations at all modelled roadside receptor locations. A factor of **8.12** was obtained for the kerbside monitoring site during the verification process and this factor has been applied to all modelled kerbside receptor locations.

8.3.28 BMBC has indicated that concentrations along part of the A61 Harborough Hill Road where there is a steep uphill section of carriageway, local air quality was affected by vehicles continually accelerating to climb the uphill gradient and therefore an AQMA had been declared. Therefore, a separate verification exercise was undertaken for the diffusion tubes located within this AQMA (Diffusion Tubes 100 and 95) and the calculated verification factor of **19.4** has been applied to the assessment receptors adjacent to the uphill section of the carriageway.

8.3.29 Local monitoring data is not available for concentrations of PM_{10}; as such final modelling results for this pollutant have been verified using the factors calculated for adjusting the modelled NO_x roads concentrations. This approach is considered to be appropriate according to guidance given in LAQM.TG(09).

Sensitive Receptors

8.3.30 Sensitive locations are those where the public may be exposed to pollutants from the Site. These will include locations sensitive to an increase in dust deposition as a result of on-site construction activities, or exposure to

gaseous pollutants from exhaust emissions from construction site traffic and traffic associated with the proposed redevelopment, once it becomes operational.

8.3.31 Locations with a high sensitivity to dust generated by construction activities include hospitals and clinics, hi-tech industries, painting and furnishing and food processing. Locations classed as being moderately sensitive to dust include schools, residential areas and food retailers.

8.3.32 In terms of locations that are sensitive to gaseous pollutants emitted from engine exhausts, these will include places where members of the public will be exposed to pollution over the period of time that they are present, and therefore the most suitable AQS averaging period of the pollutant needs to be used for assessment purposes.

8.3.33 For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15 minute mean or 1 hour mean) may be relevant. In a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24 hour mean or annual mean) may be more appropriate. In general terms, long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

12.1.2 To complete the assessment of operational phase impacts, a number of 'receptors' were identified at which pollution concentrations were predicted. The locations of the assessment receptors are shown on **Figure 8.1** and in **Appendix 8.4**. They include locations adjacent or near to the routes that are likely to experience the greatest change in traffic volume as a result of the proposed redevelopment.

Significance Criteria

8.3.34 The assessment of potential effects on local air quality as a result of the Proposed Development has taken into account effects during both the construction and operational phases.

8.3.35 The following terms have been used to define the significance of the effects identified:

- **Major effect**: where the proposed redevelopment could be expected to have a very significant effect (either positive or negative) on ground and groundwater conditions and on associated sensitive receptors;
- **Moderate effect**: where the proposed redevelopment could be expected to have a noticeable effect (either positive or negative) on ground and groundwater conditions and on associated sensitive receptors;
- **Minor effect**: where the proposed redevelopment could be expected to result in a small, barely noticeable effect (either positive or negative) on ground and groundwater conditions and on associated sensitive receptors; and
- **Negligible**: where no discernible effect is expected as a result of the proposed redevelopment on ground and groundwater conditions and on associated sensitive receptors.

8.3.36 The effects of the proposed redevelopment on local air quality once operational have been evaluated against the significance criteria published by Environmental Protection UK (**Ref. 8.18**) and presented in **Appendix 8.5.**

8.3.37 In addition to these quantitative criteria, the Environmental Protection UK report outlines a method that uses textual descriptors to identify the differing levels of relative priority that should be afforded to the air quality considerations of a development proposal in the planning process. A summary of the method is given in **Table 8.2.**

Table 8.2: Summary of method for assessing the significance of air quality in the planning process

Effect of Development	Outcome
Development would lead to a breach or significant[1] worsening of a breach of an EU limit value; cause a new breach to occur, or introduce of new exposure into an exceedence area.	Air Quality an overriding consideration.
Lead to a breach or significant [1] worsening of a breach of an AQ Objective, or cause a new AQMA to be declared, or introduce new exposure into an area of exceedence [2].	Air Quality a high priority consideration.
Development would interfere significantly with or prevent the implementation of actions within an AQ action plan	Air Quality a high priority consideration.

Development would interfere significantly with the implementation of a local AQ strategy.	Air Quality a medium priority consideration.
Development would lead to a significant increase in emissions, degradation in air quality or increase in exposure, below the level of a breach of an objective.	Air Quality a medium priority consideration.
None of the above.	Air Quality a low priority consideration.

(1) Where the term significant is used, it will be based on the professional judgement of the Local Authority officer.

(2) This could include the expansion of an existing AQMA or introduction of new exposure to cause a new AQMA to be declared. Where new exposures is introduced this should be with reference to the exceedence area, and not the AQMA boundary.

8.4 BASELINE CONDITIONS

Local Emissions Sources

8.4.1 The proposed redevelopment site is located in an area where air quality is mainly influenced by emissions from road transport. A number of roads (such A61 Old Mill Lane and Burton Road) pass close to the site and these sources will have a significant influence on pollutant concentrations at the proposed redevelopment site.

8.4.2 There are no industrial pollution sources in the immediate vicinity of the site that will influence the local air quality.

Background Air Quality Data

8.4.3 Background concentrations for the assessment have been taken from the urban background automatic monitoring station operated by BMBC located in Gawber approximately 2.6km to the west of the proposed development. The monitoring results from 2010 have been factored forward to 2011 and 2016 using the methodology and factors provided in LAQM.TG(09). The concentrations measured at this monitoring station will include a contribution from vehicles using the roads modelled in this assessment and therefore their use will provide a worst case assessment. The monitoring location does not measure PM_{10} concentrations and therefore background concentrations for this pollutant have been taken from the estimated background maps available on DEFRA's website.

8.4.4 **Table 8.3** shows the background concentrations of NO_2 and PM_{10} that were used in the assessment.

Table 8.3: Background concentrations used in the assessment (µg/m^3)

Pollutant	2010	2011	2016
NO_2	25.0	24.0	19.1
PM_{10}	n/a	14.0	13.4

8.4.5 The table above shows that for all years background concentrations of NO_2 are below the objective limit of 40µg/m^3 to be achieved by 2005 and thereafter. Background concentrations of PM_{10} meet the objective limit of 40µg/m^3 to be achieved by 2004 and thereafter.

Local Air Quality Monitoring Data

8.4.6 BMBC undertook monitoring at 81 locations within the Borough during 2009 and 2010. Concentrations of NO_2 measured within 1km of the proposed redevelopment site are provided in **Table 8.4.** The data shows that in 2009 the objective for annual mean concentrations of NO_2 is exceeded at three of the roadside sites along Harborough Hills Road. The objective is met at all kerbside sites and all other roadside locations in this year.

8.4.7 In 2010, the objective is exceeded at five roadside sites and five kerbside sites, and of these exceedences five occur within existing AQMAs designated by BMBC.

Table 8.4: BMBC Monitoring Data

Site ID	Location	Grid Reference	Distance to site	2009	2010

			(km)	(µg/m³)	(µg/m³)
103	113 Harborough Hills (roadside)	435047, 407033	0.11	46.9	45.8
102	Harborough Hills Rd / Redfearn St (roadside)	434951, 407003	0.20	29.7	39.6
45	Canal Street (roadside)	434885, 407072	0.23	30.5	27.7
101	Harborough Hills Rd / Meadow St (roadside)	434979, 406918	0.24	35.5	38.1
47	Burton Road (roadside)	435290, 407382	0.32	29.5	39.1
46	Burton Road (kerbside)	435211, 407443	0.34	33.4	49.2
44	Old Mill Lane / Eldon Street (kerbside)	434778, 406988	0.36	30	37.7
43	Old Mill Lane / Honeywell St (kerbside)	434757, 406995	0.37	35.8	45.7
100	Harborough Hills Rd, adj. ex-bakery (roadside)	434955, 406769	0.38	53.5	67.3
39	Wakefield Road - Burton Rd Junc. (roadside)	435172, 407506	0.39	36.9	50.1
38	Wakefield Rd, approach Burton Rd (kerbside)	435146, 407568	0.45	28.5	40.2
95	49 Harborough Hill Road (roadside)	434933, 406695	0.46	50.2	66.5
99	Mottram Street / Eldon Street (roadside)	434727, 406753	0.53	36.9	37.4
37	Wakefield Rd, approach Burton Rd (kerbside)	435108, 407676	0.56	26.5	38.7
94	Slip Road / Harborough Hills Rd (kerbside)	434876, 406491	0.67	27.9	37.3
93	Pontefract Road / Queens Road (roadside)	434879, 406413	0.74	28.8	39.5
42	Victoria Rd / Huddersfield Rd (roadside)	434346, 406846	0.81	32.6	37.3
92	Pontefract Road / Clyde Street (kerbside)	434920, 406277	0.86	24.5	39
41	Victoria Rd / Huddersfield Rd (kerbside)	434274, 406887	0.87	28.6	44
48	Burton Road - Rotherham Rd Junc. (kerbside)	436072, 407320	0.98	38.2	48.
35	Wakefield Rd / Smithies Lane (roadside)	435027, 408104	0.99	36.7	47.7

Future Baseline

8.4.8 If no development were to take place at the Site, pollution concentrations would be expected to decrease very gradually over time due to an expected future improvement in fuel and vehicle technology reducing the pollutant concentrations in vehicle emissions.

8.5 ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

Construction

Construction Sources of Dust and PM_{10}

8.5.1 The main sources of dust and PM_{10} during construction activities include:

- haulage routes, vehicles and construction traffic;
- materials handling, storage, stockpiling, spillage and disposal;
- exhaust emissions from site plant, especially when used at the extremes of their capacity and during mechanical breakdown;
- site preparation and restoration after completion;
- demolition;
- construction and fabrication processes; and
- internal and external finishing and refurbishment.

8.5.2 The majority of the releases are likely to occur during the 'working-week'. However, for some potential release sources, e.g. exposed soil produced from significant earthwork activities, in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.

8.5.3 Depending on wind speed and turbulence it is likely that the majority of dust generated by construction activities will be deposited in the area immediately surrounding the source (up to 200 metres away).

8.5.4 By consideration of the factors described above the overall impact of dust deposition would therefore be temporary, short-medium term, local in effect and of a **moderate** to **slight adverse** significance. Any adverse impacts resulting from the generation and dispersion of PM_{10} during construction are likely to be temporary, short-term and of **slight adverse** significance.

Mitigation

8.5.5 A number of mitigation methods should be implemented, as appropriate including:

- vehicles carrying loose aggregate and workings should be sheeted at all times;
- implementation of design controls for construction equipment and vehicles and use of appropriately designed vehicles for materials handling;
- completed earthworks should be covered or vegetated as soon as is practicable;
- regular inspection and, if necessary, cleaning of local highways and site boundaries to check for dust deposits (and removal if necessary);
- minimise surface areas of stockpiles (subject to health and safety and visual constraints regarding slope gradients and visual intrusion) to reduce area of surfaces exposed to wind pick-up;
- where appropriate, windbreak netting/screening should be positioned around material stockpiles and vehicle loading/unloading areas, as well as exposed excavation and material handling operations, to provide a physical barrier between the Site and the surroundings;
- where practicable, stockpiles of soils and materials should be located as far as possible from sensitive properties, taking account of prevailing wind directions and seasonal variations in the prevailing wind;
- during dry or windy weather, material stockpiles and exposed surfaces should be dampened down using a water spray to minimise the potential for wind pick-up;
- use of dust-suppressed tools for all operations;
- ensuring that all construction plant and equipment is maintained in good working order and not left running when not in use;
- Restrict on-site movements to well within site and not near the perimeter, if possible; and
- no unauthorised burning of any material anywhere on site.

Residual Effects

8.5.6 The greatest potential for an increase in dust deposition to occur will be within 200 metres of the construction site perimeter. There may be limited incidences of increased dust deposited on property beyond this distance. With appropriate use of mitigation measures and good site management the residual effects of dust generation and deposition would be **slight adverse** to **negligible**.

8.5.7 The potential for short-term releases of PM_{10} from materials handling and site plant will remain following mitigation. However, reducing the use of site plant and equipment near sensitive receptors and implementing the mitigation measures outlined above would result in **negligible** residual effects.

Release of emissions to air from construction traffic

8.5.8 The impact on air quality from traffic associated with this phase of the proposed redevelopment will be in the areas immediately adjacent to the principal means of site access for construction traffic. Based on the current local air

quality in these areas and the likely volume of construction traffic, the impacts are therefore considered to be temporary, short-medium term, local and of **slight adverse** significance.

Mitigation

8.5.9 Detailed mitigation measures to control construction traffic should be discussed with BMBC to establish the most suitable access and haul routes for the site traffic. The most effective mitigation will be achieved by ensuring that construction traffic does not pass along sensitive roads (residential roads, congested roads, via unsuitable junctions, etc.) where possible, and that vehicles are kept clean (through the use of wheel washers, etc.) and sheeted when on public highways. Timing of large-scale vehicle movements to avoid peak hours on the local road network will also be beneficial.

Residual Effects

8.5.10 The residual effects of emissions from construction vehicles will be **negligible**.

Operation

8.5.11 Full results of the dispersion modelling are presented in **Appendix 8.6**, and a summary is provided below.

Annual mean NO_2 concentrations

8.5.12 The objective for annual mean NO_2 concentrations is 40µg/m^3 to be achieved by the end of 2005 and thereafter. The results of the assessment show that in the 2011 baseline case concentrations exceed the annual mean objective at 16 receptor locations. The highest predicted concentration is 65.81µg/m^3 at one of the diffusion tube monitoring sites located at Harborough Hills Road (BMBC tube number 100, receptor number 9).

8.5.13 These results agree with the conclusions of the review and assessment work undertaken by BMBC, which concluded that exceedences of the objective for this pollutant may occur in this area.

8.5.14 By 2016, the opening year of the proposed redevelopment, predicted concentrations at all of the receptors both with and without the development are reduced from the 2011 baseline case. The highest concentrations are predicted at one of the diffusion tube monitoring sites Harborough Hills Road where the predicted concentrations are 50.57µg/m^3 in the without redevelopment scenario and 53.41µg/m^3 in the with redevelopment scenario. The greatest increase in concentrations as a result of the proposed redevelopment is 2.84µg/m^3, predicted at the same location.

8.5.15 In the 2016 with development case, concentrations exceed the standard of 40µg/m^3 at three receptors. However, two of these exceedences occur at roadside receptors where the standards would not apply, as members of the public would not be present at these locations for long periods of time.

8.5.16 Increases in concentrations due to the redevelopment at locations where concentrations already exceed the objective lead to the impact of the redevelopment being classed as **moderate adverse** at three receptor locations, although only one of these is located at the façade of a residential property where the objective would apply. The impact of the redevelopment is classified as **slight adverse** at one receptor and **negligible** at the remaining forty-one receptor locations.

Hourly mean NO_2 concentrations

8.5.17 In 2011 the annual mean NO_2 concentrations predicted by the model are above 60µg/m^3 at two receptor locations and therefore exceedences of the hourly mean NO_2 concentration objective may occur at these locations, however both of these locations are roadside diffusion tubes where there is likely to be no relevant exposure.

8.5.18 By 2016 all concentrations are below 60µg/m^3 and therefore exceedences of the hourly mean NO_2 objective are unlikely to occur. These results again agree with the conclusions of the review and assessment work undertaken by BMBC, which concluded that no AQMAs needed to be designated for this pollutant.

Annual mean PM_{10} concentrations

8.5.19 The objective for annual mean PM_{10} concentrations is a concentration of 40µg/m^3 to be achieved by the end of 2004 and thereafter. The results of the assessment show that in the 2011 baseline case concentrations at all of the receptors considered are predicted to easily meet the objective. The highest predicted concentration is 25.53µg/m^3 at one of the diffusion tube monitoring sites in Harborough Hills Road (BMBC tube number 100, receptor number 9).

8.5.20 These results agree with the conclusions of the review and assessment work undertaken by BMBC, which concluded that no AQMAs needed to be designated for this pollutant.

8.5.21 By 2016, predicted concentrations at all of the receptors both with and without the redevelopment are reduced from the 2011 baseline case. The highest concentrations are predicted at one of the diffusion tube monitoring sites located in Harborough Hills Road where the predicted concentrations are 23.09µg/m^3 in the without redevelopment scenario and 24.36µg/m^3 in the with redevelopment case. The greatest increase in concentrations due to the redevelopment is 1.27µg/m^3 predicted at the same location. The impact of the proposed redevelopment is considered to be **negligible** at all receptor locations considered according to the EPUK significance criteria.

24 hour mean PM_{10} concentrations

8.5.22 The objective for 24 hourly mean PM_{10} concentrations is 50µg/m^3 to be exceeded no more than 35 times a year by the end of 2004 and thereafter. The results of the dispersion modelling show that in the 2011 baseline scenario the number of exceedences is a maximum of 14 days, which is below the objective.

8.5.23 The maximum number of days of exceedences decreases to 8 days in 2016 without the redevelopment and is 11 days with the redevelopment, which is also below the objective. The proposed redevelopment is predicted to cause a maximum increase of 3 days of exceedence. The impact of the proposed redevelopment is considered to be **negligible** at all receptor locations considered.

8.5.24 These results again agree with the conclusions of the review and assessment work undertaken by BMBC, which concluded that no AQMAs needed to be designated for this pollutant.

Mitigation

8.5.25 Sustainable modes of transport, (for example walking, cycling and public transport) will be encouraged through a Travel Plan produced for the site to reduce the number of car journeys associated with the redevelopment, which will be of benefit to local air quality. Furthermore, with the new link road and quality bus route to the north, the site is well served by bus routes.

Residual Effects

8.5.26 The proposed redevelopment is predicted to cause a medium to imperceptible increase in NO_2 concentrations and a small to imperceptible change in PM_{10} concentrations. These increases will be reduced by the implementation of the mitigation measures described above.

8.5.27 At the majority of locations concentrations are predicted to meet the statutory objectives both with and without the redevelopment.

8.5.28 The residual effects of the redevelopment on air quality are **moderate adverse** to **negligible** for NO_2 and **negligible** for PM_{10} according to the assessment criteria. For NO_2, **moderate adverse** effects are just predicted at three receptor locations, although only one of these is located at the façade of a residential property where the objective would apply, with **slight adverse** effects predicted at one receptor and **negligible** at the remaining forty-one receptor locations.

Monitoring and Follow Up

8.5.29 On-going air quality monitoring in the area beyond that already undertaken by BMBC is not proposed:

Limitations and Assumptions

8.5.30 Discrepancies can occur between the results predicted by the dispersion model (i.e. BREEZE Roads) and the results measured at local air quality monitoring stations. These discrepancies may be due to a number of reasons including:

- Traffic flow uncertainties, including estimates of speeds, total flows and proportions of vehicle types;
- Emissions estimates for vehicles;
- Estimates of background concentrations;

- Meteorological data uncertainties; and
- Overall model limitations.

8.5.31 Verification is the process by which uncertainties such as those above are investigated and minimised. Local monitoring data provided by BMBC for monitoring sites within 1km of the Site has been used to verify the dispersion modelling.

8.6 SUMMARY

8.6.1 A qualitative assessment of the potential impacts on local air quality from construction activities on the Proposed Development has been carried out. This showed that during construction activities releases of dust and PM_{10} were likely to occur. However, through good site practice and the implementation of suitable mitigation measures, the impact of dust and PM_{10} releases will be reduced and excessive releases prevented. The residual effects of the construction phase on air quality are considered to be **negligible**.

8.6.2 In addition, a quantitative assessment of the potential impacts during the operational phase was undertaken using Breeze Roads to predict the changes in NO_2 and PM_{10} concentrations that would occur due to traffic generated by the development.

8.6.3 The results show that the proposed redevelopment would cause a medium to imperceptible changes in pollutant concentrations but would not cause any exceedences of the statutory objectives.

8.6.4 According to the assessment significance criteria the impact of the proposed redevelopment is considered to range from **moderate adverse** to **negligible** for NO_2 and **negligible** for PM_{10}. For NO_2, **moderate adverse** effects are just predicted at one property where the objective would apply, with **slight adverse** effects predicted at another one receptor and **negligible** effects at the remaining forty-one receptor locations. Overall, it is therefore considered that the proposed redevelopment complies with local and national planning policies relevant to air quality.

8.6.5 A summary of the effects of the proposed redevelopment on air quality is provided below in **Table 8.5**.

Table 8.5: Summary of Effects Table for Air Quality

Description of Likely Significant Effects	Significance of Effects					Summary of Mitigation / Enhancement Measures	Significance of Residual Effects					Relevant Policy	Relevant Legislation
	(Major, Moderate, Minor, Negligible)	Positive / Negative	(P/T)	(D/I)	ST/MT/LT)		(Major, Moderate, Minor, Negligible)	Positive / Negative	(P/T)	(D/I)	ST/MT/LT)		
Construction Phase													
Generation of PM_{10} and dust during Site clearance and construction	Moderate to Slight	Negative	T	D	ST	▫ Employing good site practice. ▫ Ensuring Site plant and equipment is kept in good working order ▫ Restricting on-site movements to well within site and not near the perimeter, if possible ▫ Pro-active liaison with BMBC.	Slight	Negative	T	D	ST	N/A	Environmental Protection Act 1990
Emissions to air of PM_{10} and NO_2 from construction vehicles leaving or accessing the Site and site plant	Slight	Negative	T	D	ST	▫ Selection of access routes for site traffic should avoid major routes, links, junctions, sensitive locations etc. ▫ Timing of vehicle movements should avoid the peak hours on surrounding roads. ▫ Ensuring vehicles are regularly serviced and maintained, as much as practicable.	Negligible	Negative	T	D	ST	N/A	Controls of Asbestos Regulations 2006 Construction (Design & Management) Regulations 2007
Operational Phase													
Emissions from traffic generated by the Proposed	NO_2 – Moderate to Negligible	Negative	P	D	LT	▫ Travel Plan; ▫ Design development to	NO_2 – Moderate to Negligible	Negative	P	D	LT	PPS23	Environment Act 1995 Air Quality

Description of Likely Significant Effects	Significance of Effects					Summary of Mitigation / Enhancement Measures	Significance of Residual Effects					Relevant Policy	Relevant Legislation
	(Major, Moderate, Minor, Negligible)	Positive / Negative	(P/T)	(D/I)	ST/MT/LT)		(Major, Moderate, Minor, Negligible)	Positive / Negative	(P/T)	(D/I)	ST/MT/LT)		
Development	PM_{10} – Negligible					encourage non car trips;	PM_{10} – Negligible						(England) Regulations 2000 Air Quality (England) (Amendment) Regulations 2002

Key to table:

P/T = Permanent or Temporary, D/I = Direct or Indirect, ST/MT/LT = Short Term, Medium Term or Long Term

N/A = Not Applicable

8.7 REFERENCES

8.1 The European Directive on Ambient Air Quality and Cleaner Air for Europe (Directive 2008/50/EC) and associated Daughter Directive

8.2 The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

8.3 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043

8.4 The Air Quality Standards Regulations 2010- Statutory Instrument 2010 No. 1001

8.5 The Environmental Protection Act 1990

8.6 The Environment Act 1995

8.7 Air Quality (England) Regulations 2000

8.8 Air Quality (England) (Amendment) Regulations 2002

8.9 Communities and Local Government (March 2012): *National Planning Policy Framework*

8.10 Barnsley Metropolitan Borough Council. (2010) Barnsley Local Development Framework: Core Strategy (September 2010)

8. 11 Defra. (2009) Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(09)

8.12 Kukadia, V., Upton, S. L. and Hall, D. J. (2003) Control of dust from Construction and Demolition Activities. Building Research Establishment (BRE).

8.13 Quality of Urban Air Review Group (QUARG) (1996) Airborne Particulate Matter in the United Kingdom Third Report of the Quality of Urban Air Review Group. Department of the Environment.

8.14 Arup Environmental and Ove Arup and Partners. (1995) *The Environmental Effects of dust from Surface Mineral Workings Volume 2.* Prepared for Department of the Environment Minerals Division

8.15 Laxen, D. & Marner, B. (2003) Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites.

8.16 Cook, A. (2008) Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective.

8.17 DEFRA (2000) Review and Assessment: Selection and Use of Dispersion Models; Part IV The Environment Act 1995 Local Air Quality Management LAQM.TG(00).

8.18 Environmental Protection UK (2010) Development Control: Planning For Air Quality. Updated guidance from Environmental Protection UK on dealing with air quality concerns within the development control process

8 APPENDICES: Air Quality

APPENDIX 8.1 AIR QUALITY STANDARDS & OBJECTIVES

A summary of the current air quality objectives for the seven pollutants detailed in the *Air Quality Regulations 2000 and (Amendment) Regulations 2002* for the purpose of Local Air Quality Management is provided below.

Air Quality Objectives currently included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)

Pollutant	Applies to	Standard		Objective		EU AQ Daughter Directive
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
Benzene (C_6H_6)	All UK	16.25µg/m^3	running annual mean		31.12.2003	
	England and Wales	5µg/m^3	annual mean		31.12.2010	As standard. target: 01.01.2010
	Scotland	3.25µg/m^3	running annual mean		31.12.2010	
1,3-Butadiene (C_4H_6)	All UK	2.25µg/m^3	running annual mean		31.12.2003	
Carbon monoxide (CO)	All UK	10mg/m^3	maximum daily running 8 hour mean		31.12.2003	As standard. target: 01.01.2005
Lead (Pb)	All UK	0.5µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005[8]
	All UK	0.25µg/m^3	annual mean		31.12.2008	
Nitrogen dioxide (NO_2)	All UK	200µg/m^3	1 hour mean	18	31.12.2005	As objective. target: 01.01.2010
	All UK	40µg/m^3	annual mean		31.12.2005	As standard. target: 01.01.2010
Particulate Matter (PM_{10}) (gravimetric)[1]	All UK	40µg/m^3	annual mean		31.12.2004	As standard. target: 01.01.2005
	All UK	50µg/m^3	24 hour mean	35	31.12.2004	As objective. target: 01.01.2005
	Scotland	50µg/m^3	24 hour mean	7	31.12.2010	As objective. target: 01.01.2010
	Scotland	18µg/m^3	annual mean		31.12.2010	
Sulphur dioxide (SO_2)	All UK	266µg/m^3	15 minute mean	35	31.12.2005	
	All UK	350µg/m^3	1 hour mean	24	31.12.2004	As objective. target: 01.01.2005
	All UK	125µg/m^3	24 hour mean	3	31.12.2004	As objective. target: 01.01.2005

Provisional Air Quality Objectives currently NOT included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management (LAQM)						
Pollutant	**Applies to**	**Standard**		**Objective**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
Polycyclic aromatic hydrocarbons (PAHs)[2]	All UK	0.25ng/m^3 B[a]P[3]	annual mean		31.12.2010	
Particulate Matter ($PM_{2.5}$) (gravimetric)[1,2]	UK (except Scotland)	25µg/m^3	annual mean	-	2020	As standard Target 2010
	Scotland	12µg/m^3	annual mean	-	2020	25µg/m^3 Target 2015
	UK urban areas	Target of 15% reduction in concentrations at urban background	annual mean	-	Between 2010 and 2020	Target 20% reduction in concentrations at urban background Target Between 2010 and 2020

Other Air Quality Strategy Objectives						
Pollutant	**Applies to**	**Standard**		**Objective**		**EU AQ Daughter Directive**
		Concentration	*Measured as*	*Annual exceedences allowed*	Target date	
For the protection of human health						
Ozone (O_3)[4]	All UK	100µg/m^3	maximum daily running 8 hour mean	10	31.12.2005	As objective; but 25 annual exceedences target: 01.01.2010
For the protection of vegetation and ecosystems[5]						
Nitrogen oxides (NO_x)[6]		30µg/m^3	annual mean		31.12.2000[7]	As standard. target: 19.07.2001
Sulphur dioxide (SO_2)		20µg/m^3	annual mean		31.12.2000[7]	As standard. target: 19.07.2001
		20µg/m^3	winter mean (1 October to 31 March)		31.12.2000[7]	As standard. target: 19.07.2001

Explanation:

ng/m^3 = nanogram per cubic metre;

$\mu g/m^3$ = microgram per cubic metre;

mg/m^3 = milligrams per cubic metre (i.e. microgram per cubic meter x 1,000);

1 Measured using the European gravimetric transfer sampler or equivalent.

2 Objective to be set in regulations in the future.

3 Concentration of Benzo[a]pyrene (B[a]P) to be measured as a marker for the total mixture of PAHs.

4 The objective for this pollutant is provisional and must be tackled at a national level due to its trans-boundary nature.

5 Only applies to those parts of the UK > 20km from an agglomeration; and > 5km from Part A processes, motorways and built up areas of > 5,000 people.

6 Assuming NO_X is taken as NO_2.

7 These objectives have successfully been achieved.

8 Also an EU AQ Directive Limit Value of $1\mu g/m^3$ to be achieved by 01.01.2010 in the immediate vicinity (1000 m) of certain named industrial sources situated on sites contaminated by decades of industrial activities.

The Air Quality Strategy states that further review and assessment and consultation in relation to air quality will be a rolling process, with additional revisions to the objectives for selected pollutants as appropriate, or where there is new evidence in relation to the effects of pollutants on health or ecosystems. New pollutants may be introduced through future reviews.

APPENDIX 8.2 SUMMARY OF TRAFFIC DATA USED IN THE ASSESSMENT

The tables below show the data that was used in the assessment of traffic impacts on local air quality. The emission factors were obtained from spreadsheet available on DEFRA's website.

2010 Verification

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	%HGV	Emission rate g/km/veh
				NO_x
1. Wakefield Road north	48	618	5.0	0.4329
2. Carlton Road	48	415	3.3	0.3624
3. Smithies Lane	48	316	4.3	0.4038
4. Wakefield Road south	48	746	4.2	0.4003
5. Burton Road	48	621	2.0	0.3112
6. Old Mill Lane north	48	1260	4.2	0.4001
7. Twibell Street	20	41	0.0	0.2982
8. Dryden Road	20	224	0.2	0.3173
9. Harborough Hill Road (south of gyratory)	48	1072	2.1	0.3126
10. Meadow Street	20	16	0.0	0.2730
11. Old Mill Lane south	48	862	4.0	0.3925
12. Canal Way	20	601	0.3	0.3193
13. Sheffield Road south	48	1374	4.3	0.4030
14. West Way	48	1375	1.9	0.3080
15. Sheffield Road north	20	289	1.5	0.3993
16. Burton Road Bypass (west of site access)	48	0	0.0	0.0000
17. Burton Road Bypass (east of site access)	48	0	0.0	0.0000
18. Burton Road East of Bypass	48	621	2.0	0.3112
19. Harborough Hill Road (south of gyratory) (Northbound)	48	561	1.6	0.2938
20. Harborough Hill Road (south of gyratory) (Northbound)	48	561	1.6	0.2938
21. Harborough Hill Road (south of gyratory) (Southbound)	20	511	2.6	0.4751
22. Huddersfield Road	48	548	3.1	0.3530

2011 Baseline

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	%HGV	Emission rate g/km/veh	
				NO_x	PM_{10}
1. Wakefield Road north	48	620	5.0	0.3885	0.0366
2. Carlton Road	48	299	3.8	0.3468	0.0355
3. Smithies Lane	48	316	4.3	0.3634	0.0358
4. Wakefield Road south	48	633	4.6	0.3757	0.0362
5. Burton Road	48	30	18.1	0.8797	0.0513
6. Old Mill Lane north	48	1264	4.2	0.3594	0.0357
7. Twibell Street	20	95	0.0	0.2738	0.0347
8. Dryden Road	20	224	0.2	0.2881	0.0351
9. Harborough Hill Road (south of gyratory)	48	1100	2.0	0.2787	0.0334
10. Meadow Street	20	16	0.0	0.2693	0.0341
11. Old Mill Lane south	48	869	4.0	0.3514	0.0355
12. Canal Way	20	601	0.3	0.2897	0.0351
13. Sheffield Road south	48	1388	4.2	0.3607	0.0358
14. West Way	48	1388	1.9	0.2759	0.0333
15. Sheffield Road north	20	290	1.4	0.3622	0.0371
16. Burton Road Bypass (west of site access)	48	755	1.2	0.2509	0.0326
17. Burton Road Bypass (east of site access)	48	716	1.3	0.2534	0.0327
18. Burton Road East of Bypass	48	746	2.0	0.2780	0.0334
19. Harborough Hill Road (south of gyratory) (Northbound)	48	570	1.6	0.2622	0.0329
20. Harborough Hill Road (south of gyratory) (Northbound)	48	570	1.6	0.2622	0.0329
21. Harborough Hill Road (south of gyratory) (Southbound)	20	530	2.5	0.4263	0.0389
22. Huddersfield Road	48	548	3.1	0.3173	0.0345

2016 Baseline

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	%HGV	Emission rate g/km/veh	
				NO_x	PM_{10}
1. Wakefield Road north	48	641	4.9	0.2144	0.0303
2. Carlton Road	48	308	3.7	0.1942	0.0294
3. Smithies Lane	48	327	4.2	0.2028	0.0298
4. Wakefield Road south	48	653	4.5	0.2080	0.0300
5. Burton Road	48	31	17.5	0.4415	0.0402
6. Old Mill Lane north	48	1305	4.1	0.2006	0.0297
7. Twibell Street	20	98	0.0	0.1773	0.0283
8. Dryden Road	20	231	0.2	0.1840	0.0285
9. Harborough Hill Road (south of gyratory)	48	1136	2.0	0.1633	0.0281
10. Meadow Street	20	17	0.0	0.1796	0.0287
11. Old Mill Lane south	48	898	3.9	0.1968	0.0295
12. Canal Way	20	621	0.3	0.1851	0.0286
13. Sheffield Road south	48	1434	4.1	0.2012	0.0297
14. West Way	48	1433	1.9	0.1620	0.0281
15. Sheffield Road north	20	300	1.4	0.2197	0.0298
16. Burton Road Bypass (west of site access)	48	780	1.2	0.1502	0.0276
17. Burton Road Bypass (east of site access)	48	739	1.3	0.1512	0.0276
18. Burton Road East of Bypass	48	770	1.9	0.1627	0.0281
19. Harborough Hill Road (south of gyratory) (Northbound)	48	589	1.5	0.1557	0.0278
20. Harborough Hill Road (south of gyratory) (Northbound)	48	589	1.5	0.1557	0.0278
21. Harborough Hill Road (south of gyratory) (Southbound)	20	547	2.4	0.2494	0.0308
22. Huddersfield Road	48	548	3.1	0.1825	0.0289

2016 with development

Road link	Speed (km/hour)	Annual Average Hourly Flows (AAHT)	%HGV	Emission rate g/km/veh	
				NO_x	PM_{10}
1. Wakefield Road north	48	856	3.6	0.1926	0.0294
2. Carlton Road	48	305	3.8	0.1954	0.0295
3. Smithies Lane	48	327	4.2	0.2028	0.0298
4. Wakefield Road south	48	865	3.4	0.1886	0.0292
5. Burton Road	48	31	17.5	0.4415	0.0402
6. Old Mill Lane north	48	1620	3.3	0.1867	0.0291
7. Twibell Street	20	12	0.0	0.1752	0.0280
8. Dryden Road	20	230	0.2	0.1842	0.0285
9. Harborough Hill Road (south of gyratory)	48	1307	1.7	0.1588	0.0280
10. Meadow Street	20	20	0.0	0.1771	0.0283
11. Old Mill Lane south	48	991	3.5	0.1904	0.0293
12. Canal Way	20	465	0.3	0.1876	0.0287
13. Sheffield Road south	48	1448	4.1	0.2006	0.0297
14. West Way	48	1364	2.0	0.1637	0.0282
15. Sheffield Road north	20	297	1.4	0.2203	0.0298
16. Burton Road Bypass (west of site access)	48	1533	0.6	0.1397	0.0271
17. Burton Road Bypass (east of site access)	48	840	1.1	0.1485	0.0275
18. Burton Road East of Bypass	48	871	1.7	0.1588	0.0279
19. Harborough Hill Road (south of gyratory) (Northbound)	48	680	1.3	0.1521	0.0277
20. Harborough Hill Road (south of gyratory) (Northbound)	48	680	1.3	0.1521	0.0277
21. Harborough Hill Road (south of gyratory) (Southbound)	20	627	2.1	0.2402	0.0305
22. Huddersfield Road	48	548	3.1	0.1825	0.0289

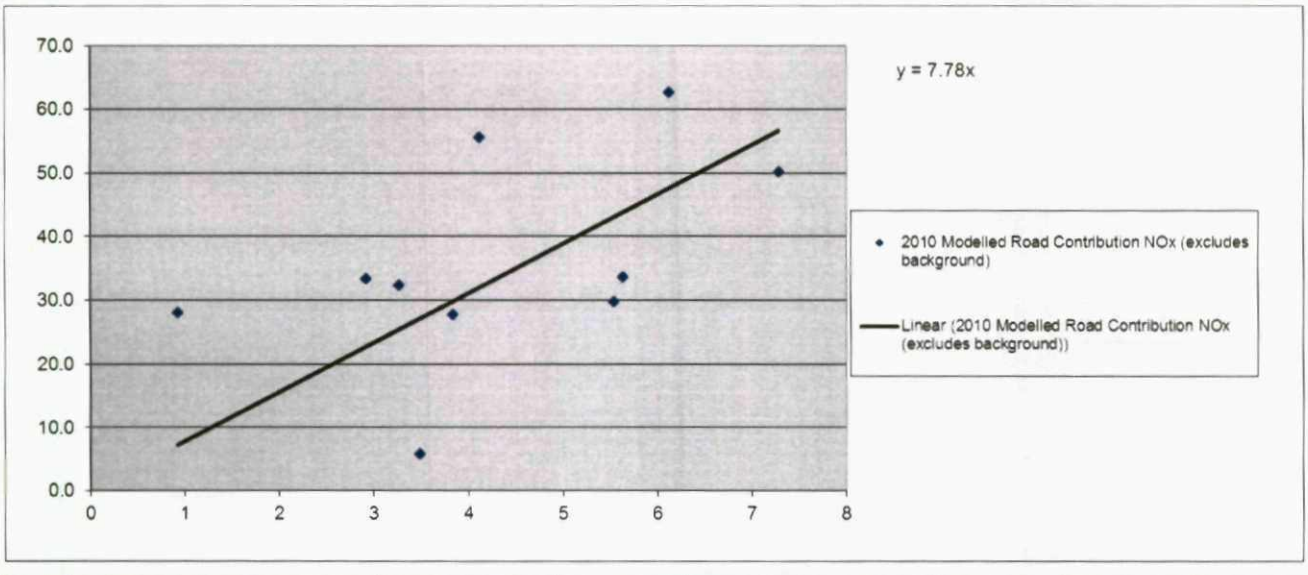
APPENDIX 8.3 MODEL VERIFICATION CALCULATIONS

Model Verification Calculations

NO_2

Model verification has been undertaken following the methodology specified in Annex 3 of the Technical Guidance LAQM.TG(09). The NO_x:NO_2 calculator available from DEFRA's website was used to calculate the roadside NO_x component of the annual mean NO_2 concentrations measured at the diffusion tube sites summarised in the table below.

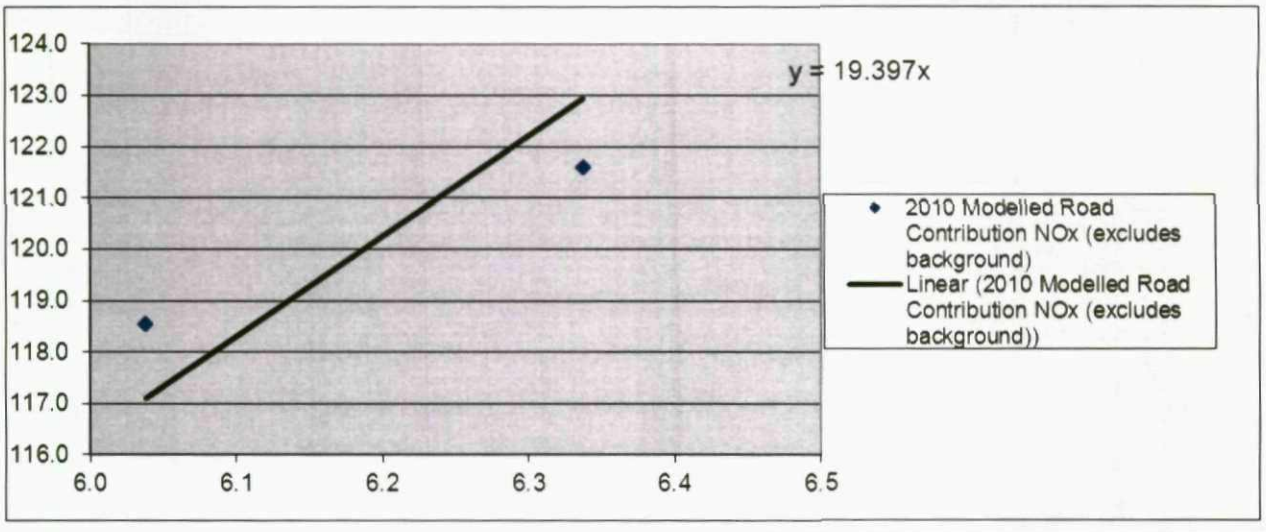
Site ID		2010 Monitored Total NO2	2010 Monitored Total NOx	2010 Monitored Background NO2	2010 Monitored Background NOx	2010 Monitored Road Contribution NO2 (total - background)	2010 Monitored Road Contribution NOx (total - background)	2010 Modelled Road Contributio n NOx (excludes background)
103	113 Harborough Hills	45.8	90.2	25.0	40.0	20.8	50.2	7.3
102	Harboro' Hills Rd / Redfearn St	39.6	73.5	25.0	40.0	14.6	33.5	5.6
45	Canal Street	27.7	45.7	25.0	40.0	2.7	5.7	3.5
101	Harboro' Hills Rd / Meadow St	38.1	69.8	25.0	40.0	13.1	29.8	5.5
47	Burton Road	39.1	72.3	25.0	40.0	14.1	32.3	3.3
39	Wakefield Road - Burton Rd Junc.	50.1	102.7	25.0	40.0	25.1	62.7	6.1
99	Mottram Street / Eldon Street	37.4	68.0	25.0	40.0	12.4	28.0	0.9
93	Pontefract Road / Queens Road	39.5	73.3	25.0	40.0	14.5	33.3	2.9
42	Victoria Rd / Huddersfield Rd	37.3	67.8	25.0	40.0	12.3	27.8	3.8
35	Wakefield Rd / Smithies Lane	47.70	79.5	25.0	40.0	22.7	55.6	4.1



Site ID	Monitor Location	Ratio of monitored road Contribution Nox/modelled road contribution Nox	Adjustment factor for modelled road contribution	Adjusted modelled road contribution Nox	Adjsuted modelled total Nox (incl background Nox)	Modelled total NO2 (based on empirical Nox/NO2 relationship)	Monitored Total NO2	% Difference [(modelled - monitoried) /monitored] x100
103	113 Harborough Hills	6.9		56.7	96.7	48.1	45.8	5
102	Harboro' Hills Rd / Redfearn St	6.0		43.8	83.8	43.5	39.6	10
45	Canal Street	1.6		27.1	67.1	37.0	27.7	34
101	Harboro' Hills Rd / Meadow St	5.4		43.0	83.0	43.2	38.1	13
47	Burton Road	9.9		25.4	65.4	36.3	39.1	-7
39	Wakefield Road - Burton Rd Junc.	10.2		47.7	87.7	44.9	50.1	-10
99	Mottram Street / Eldon Street	30.2		7.2	47.2	28.4	37.4	-24
93	Pontefract Road / Queens Road	11.4		22.7	62.7	35.2	39.5	-11
42	Victoria Rd / Huddersfield Rd	7.2		29.9	69.9	38.1	37.3	2
35	Wakefield Rd / Smithies Lane	13.5		32.0	72.0	39.0	47.7	-18
			7.78					

A correction factor of 7.78 was obtained during the verification process for the roadside diffusion tube locations. This factor has been applied to the modelled Road-NO_x contribution before addition of the appropriate background concentration to determine total predicted annual mean NO_2 concentrations of all roadside receptor locations. It should be noted that the diffusion tubes located in Harborough Hills Road and 49 Harborough Hill Road were also included in the early stages of the verification process however the ratio between modelled and monitored NOx concentrations was considerably higher than for the remaining monitoring sites; these tube was therefore removed from the verification process. Following consultation with BMBC it was highlighted that concentrations within the A61 southbound carriageway AQMA were being elevated due to the impact of the gradient, therefore a further verification was undertaken for the tubes located along the southbound carriageway and this factor was applied to the sensitive receptors located along this carriageway within the assessment. A correction factor of 19.4 was obtained for locations along the A61 southbound carriageway.

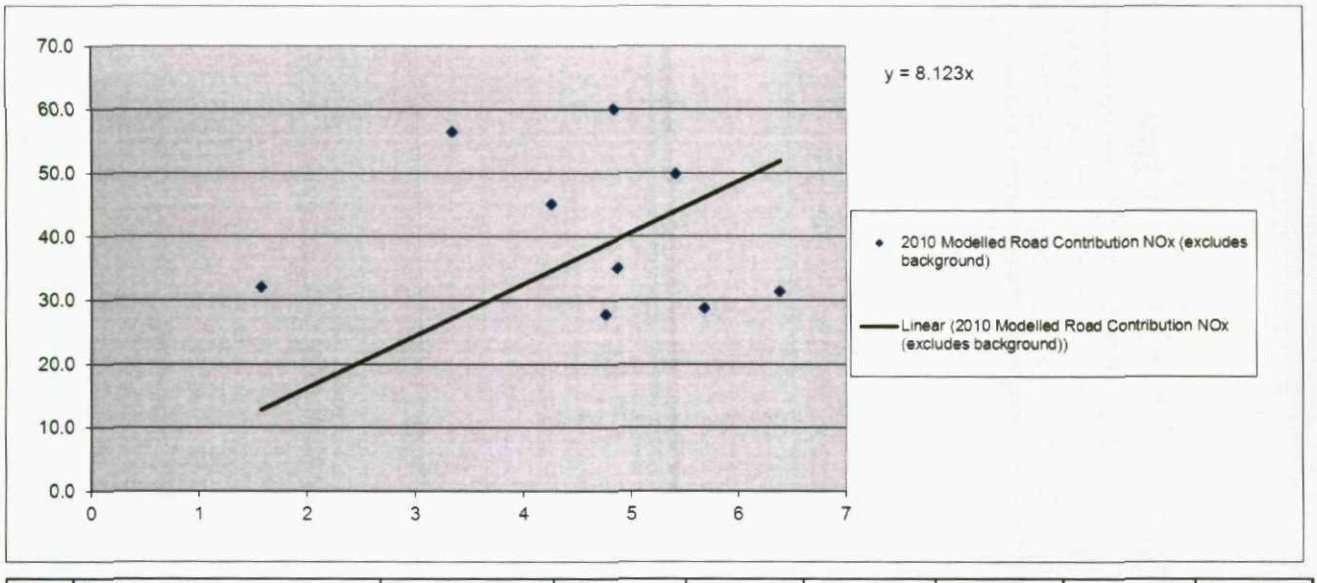
Site ID	Monitor Location	2010 Monitored Total NO2	2010 Monitored Total NOx	2010 Monitored Background NO2	2010 Monitored Background NOx	2010 Monitored Road Contribution NO2 (total - background)	2010 Monitored Road Contribution NOx (total - background)	2010 Modelled Road Contribution NOx (excludes background)
100	Harb'gh Hills Rd, adj ex-bakery	67.3	161.6	25.0	40.0	42.3	121.6	6.3
95	49 Harborough Hill Road	66.5	158.5	25.0	40.0	41.5	118.5	6.0



Site ID	Monitor Location	Ratio of monitored road Contribution Nox/modelled road contribution Nox	Adjustment factor for modelled road contribution	Adjusted modelled road contribution Nox	Adjsuted modelled total Nox (incl background Nox)	Modelled total NO2 (based on empirical Nox/NO2 relationship)	Monitored Total NO2	% Difference [(modelled - monitoried)/ monitored] x100
100	Harb'gh Hills Rd, adj ex-bakery	19.18		122.94	162.9	67.65	67.3	1
95	49 Harborough Hill Road	19.63		117.12	157.1	66.12	66.5	-1
			19.40					

A correction factor of 8.12 was obtained during the verification process using the kerbside diffusion tube locations. This factor has been applied to the modelled Road-NO_x contribution before addition of the appropriate background concentration to determine total predicted annual mean NO_2 concentrations of all kerbside receptor locations.

Site ID	Monitor Location	2010 Monitored Total NO2	2010 Monitored Total NOx	2010 Monitored Background NO2	2010 Monitored Background NOx	2010 Monitored Road Contribution NO2 (total - background)	2010 Monitored Road Contribution NOx (total - background)	2010 Modelled Road Contributio n NOx (excludes background)
46	Burton Road	49.2	100.0	25.0	40.0	24.2	60.0	4.8
44	Old Mill Lane / Eldon Street	37.7	68.8	25.0	40.0	12.7	28.8	5.7
43	Old Mill Lane / Honeywell St	45.7	89.9	25.0	40.0	20.7	49.9	5.4
38	W'field Rd, approach Burton Rd	40.2	75.1	25.0	40.0	15.2	35.1	4.9
37	W'field Rd, approach Burton Rd	38.7	71.3	25.0	40.0	13.7	31.3	6.4
94	Slip Road / Harborough Hills Rd	37.3	67.8	25.0	40.0	12.3	27.8	4.8
92	Pontefract Road / Clyde Street	39.0	72.0	25.0	40.0	14.0	32.0	1.6
41	Victoria Rd / Huddersfield Rd	44.0	85.2	25.0	40.0	19.0	45.2	4.3
48	B'ton Road - Rotherham Rd Junc.	48.0	96.4	25.0	40.0	23.0	56.4	3.3



Site ID	Monitor Location	Ratio of monitored road Contribution Nox/modelled road contribution Nox	Adjustment factor for modelled road contribution	Adjusted modelled road contribution Nox	Adjsuted modelled total Nox (incl background Nox)	Modelled total NO2 (based on empirical Nox/NO2 relationship)	Monitored Total NO2	% Difference [(modelled - monitoried) /monitored] x100
46	Burton Road	12.4		39.3	79.3	41.8	49.2	-15
44	Old Mill Lane / Eldon Street	5.1		46.2	86.2	44.4	37.7	18
43	Old Mill Lane / Honeywell St	9.2		44.0	84.0	43.6	45.7	-5
38	W'field Rd, approach Burton Rd	7.2		39.6	79.6	41.9	40.2	4
37	W'field Rd, approach Burton Rd	4.9		51.9	91.9	46.4	38.7	20
94	Slip Road / Harborough Hills Rd	5.8		38.7	78.7	41.6	37.3	12
92	Pontefract Road / Clyde Street	20.3		12.8	52.8	30.9	39.0	-21
41	Victoria Rd / Huddersfield Rd	10.6		34.6	74.6	40.0	44.0	-9
48	B'ton Road - Rotherham Rd Junc.	16.9		27.1	67.1	37.0	48.0	-23
			8.12					

APPENDIX 8.4 RECEPTOR LOCATIONS USED IN THE ASSESSMENT

Receptor No.	Receptor Name	Grid Reference	Height above ground level (m)
1	113 Harborough Hills	435047, 407033	1.8
2	Harborough Hills Road / Redfearn Street	434951, 407003	1.8
3	Canal Street	434885, 407072	1.8
4	Harborough Hills Road / Meadow Street	434979, 406918	1.8
5	Burton Road	435290, 407382	1.8
6	Burton Road	435211, 407443	1.8
7	Old Mill Lane / Eldon Street	434778, 406988	1.8
8	Old Mill Lane / Honeywell Street	434757, 406995	1.8
9	Harborough Hills Road, adj. ex-bakery	434955, 406769	1.8
10	Wakefield Road - Burton Rd Junction	435172, 407506	1.8
11	Wakefield Rd, approach Burton Road	435146, 407568	1.8
12	49 Harborough Hill Road	434933, 406695	1.8
13	Mottram Street / Eldon Street	434727, 406753	1.8
14	Wakefield Road, approach Burton Road	435108, 407676	1.8
15	Slip Road / Harborough Hills Road	434876, 406491	1.8
16	Pontefract Road / Queens Road	434879, 406413	1.8
17	Victoria Rd / Huddersfield Road	434346, 406846	1.8
18	Pontefract Road / Clyde Street	434920, 406277	1.8
19	Victoria Rd / Huddersfield Road	434274, 406887	1.8
20	Burton Road - Rotherham Road Junction	436072, 407320	1.8
21	Wakefield Rd / Smithies Lane	435027, 408104	1.8
22	135 Wakefield Road	435087, 407847	1.8
23	23 Twibell Road	435120, 407058	1.8
24	123 Old Mill Lane	435051, 407056	1.8
25	113 Old Mill Lane	435047, 407034	1.8
26	14 Burton Road	435211, 407463	1.8
27	1 Wakefield Road	435185, 407488	1.8
28	21 Wakefield Road	435168, 407524	1.8
29	42 Wakefield Road	435093, 407679	1.8
30	121 Wakefield Road	435093, 407807	1.8
31	1 to 11 Smithies Lane	435021, 408687	1.8
32	120 Smithies Lane	434848, 408160	1.8
33	7 Carlton Road	435055, 408232	1.8

34	20 Carlton Road	435119, 408263	1.8
35	167 Wakefield Road	435023, 408240	1.8
36	199 Wakefield Road	435014, 408404	1.8
37	6 Meadow Street	434972, 406906	1.8
38	1 Meadow Street	434974, 406918	1.8
39	107 Hillborough Hill	434976, 406820	1.8
40	134 Old Mill Lane	434807, 407022	1.8
41	47 Old Mill Lane	434742, 406972	1.8
42	74 Old Mill Lane	434671, 406959	1.8
43	23 Old Mill Lane	434658, 406934	1.8
44	92 Sheffield Road	434900, 405863	1.8
45	56 Sheffield Road	434844, 405984	1.8

APPENDIX 8.5 SINFICANCE CRITERIA USED IN THE ASSESSMENT

The following criteria relate to changes in annual mean NO_2/PM_{10} concentrations and 24-hour mean PM_{10} concentrations resulting from the redevelopment.

ANNUAL MEAN NO_2 AND PM_{10} CONCENTRATIONS

Significance criteria	**Definition**
NEUTRAL	The development causes no change in concentrations.
NEGLIGIBLE IMPACT	The development gives rise to a IMPERCEPTIBLE change in concentrations or; The development gives rise to a SMALL change in concentrations and predicted concentrations are below 36μg/m^3; or The development gives rise to a MEDIUM change in concentrations and predicted concentrations are below 30μg/m^3;
A SLIGHT ADVERSE IMPACT	The development gives rise to a SMALL increase in concentrations and predicted concentrations with the development in place are above 36μg/m^3; or The development gives rise to a MEDIUM increase in concentrations and predicted concentrations with the development in place are between 30-36μg/m^3; or The development gives rise to a LARGE increase in concentrations and predicted concentrations with the development in place are less than 36μg/m^3.
A MODERATE ADVERSE IMPACT	The development gives rise to a MEDIUM increase in concentrations and predicted concentrations with the development in place are above 36μg/m^3; or The development gives rise to a LARGE increase in concentrations and predicted concentrations with the development in place are between 36-40μg/m^3.
A SUBSTANTIAL ADVERSE IMPACT	The development gives rise to a LARGE increase in concentrations and predicted concentrations with the development in place exceed the objective level of 40μg/m^3.
A SLIGHT BENEFICIAL IMPACT	The development gives rise to a SMALL decrease in concentrations and predicted concentrations without the development in place are above 36μg/m^3; or The development gives rise to a MEDIUM decrease in concentrations and predicted concentrations without the development in place are between 30-36μg/m^3; or The development gives rise to a LARGE decrease in concentrations and predicted concentrations without the development in place are less than 36μg/m^3.
A MODERATE BENEFICIAL IMPACT	The development gives rise to a MEDIUM decrease in concentrations and predicted concentrations without the development in place are above 36μg/m^3; or The development gives rise to a LARGE decrease in concentrations and predicted concentrations without the development in place are between 36-40μg/m^3.
A SUBSTANTIAL BENEFICIAL IMPACT	The development gives rise to a LARGE decrease in concentrations and predicted concentrations without the development in place exceed the objective level of 40μg/m^3.

Where the magnitude of change in concentration **for annual mean NO_2** and **PM_{10}** has been defined as follows:

An IMPERCEPTIBLE change is a change of <0.4μg/m^3;

A SMALL change is a change of less than 0.4 – 2μg/m^3;

A MEDIUM change is a change of 2 - 4μg/m^3; and

A LARGE change is a change of > 4μg/m^3.

An EXCEEDENCE is defined as a concentration that is predicted to be above the standard (40μg/m^3) in, or after the objective achievement year (2005 for NO_2 and 2004 for PM_{10}) at a location where members of the public are likely to be exposed over the averaging period (1 year).

DAILY MEAN PM_{10} CONCENTRATIONS

Significance criteria	**Definition**

NEUTRAL	The development causes no change in the number of days of exceedence.
NEGLIGIBLE IMPACT	The development gives rise to a IMPERCEPTIBLE change in the number of days of exceedence; or The development gives rise to a SMALL change and the predicted number of days of exceedence is below 32 days; or The development gives rise to a MEDIUM change and the predicted number of days of exceedence is below 26 days.
A SLIGHT ADVERSE IMPACT	The development gives rise to a SMALL increase and the predicted number of days of exceedence is above 32 days; or The development gives rise to a MEDIUM increase and the predicted number of days of exceedence is between 26 and 32 days; or The development gives rise to a LARGE increase and the predicted number of days of exceedence is below 32 days.
A MODERATE ADVERSE IMPACT	The development gives rise to a MEDIUM increase and the predicted number of days of exceedence is above 32 days; or The development gives rise to a LARGE increase and the predicted number of days of exceedence is between 32 and 35 days.
A SUBSTANTIAL ADVERSE IMPACT	The development gives rise to a LARGE increase and the number of days of exceedence with the development in place is above 35 days.
A SLIGHT BENEFICIAL IMPACT	The development gives rise to a SMALL decrease and the predicted number of days of exceedence without the development is above 32 days; or The development gives rise to a MEDIUM decrease and the predicted number of days of exceedence without the development is between 26 and 32 days; or The development gives rise to a LARGE decrease and the predicted number of days of exceedence without the development is between 32 and 35 days.
A MODERATE BENEFICIAL IMPACT	The development gives rise to a MEDIUM decrease and the predicted number of days of exceedence without the development is above 32 days; or The development gives rise to a LARGE decrease and the predicted number of days of exceedence without the development is between 32 and 35 days.
A SUBSTANTIAL BENEFICIAL IMPACT	The development gives rise to a LARGE decrease and the number of days of exceedence without the development in place is above 35 days.

Where the magnitude of change is defined as the number of days of exceedence of a **daily mean PM_{10} concentration** of 50µg/m^3:

An IMPERCEPTIBLE change is a change of < 1 day;

A SMALL change is a change of 1- 2 days;

A MEDIUM change is a change of 2 - 4 days; and

A LARGE change is a change of > 4 days.

An EXCEEDENCE is defined as predicted 24-hour mean concentrations in excess of 50µg/m^3 for more than 35 days per year, in, or after the objective achievement year (2004) at a location where members of the public are likely to be exposed over the averaging period (24-hours).

APPENDIX 8.6 MODEL ASSESSMENT RESULTS

NO_2 Annual Mean	2005	Source
AQS Objective ($\mu g/m^3$)	40	UK Air Quality Strategy

Receptor Number	Receptor Name/Description	2010 baseline	2015 without development	2015 with development	Change
Existing Receptors					
1	113 Harborough Hills Road *(Roadside Diffusion Tube)*	45.99	34.09	35.87	1.78
2	Harborough Hills Road / Redfearn Street *(Roadside Diffusion Tube)*	41.64	31.28	32.42	1.14
3	Canal Street *(Roadside Diffusion Tube)*	35.34	26.67	27.04	0.37
4	Harborough Hills Road / Meadow Street *(Roadside Diffusion Tube)*	41.37	31.19	32.44	1.25
5	Burton Road *(Roadside Diffusion Tube)*	29.37	22.51	23.04	0.53
6	Burton Road *(Kerbside Diffusion Tube)*	32.09	24.24	24.98	0.74
7	Old Mill Lane / Eldon Street *(Diffusion Tube)*	42.32	31.40	32.15	0.75
8	Old Mill Lane / Honeywell Street *(Diffusion Tube)*	41.55	30.85	31.57	0.72
9	Harborough Hills Road, adj ex-bakery *(Roadside Diffusion Tube)*	65.81	50.57	53.41	2.84
10	Wakefield Road - Burton Road Junction *((Roadside Diffusion Tube)*	40.66	30.08	32.03	1.95
11	Wakefield Road, approach Burton Road *(Diffusion Tube)*	38.43	28.53	30.26	1.73
12	49 Harborough Hill Road *(Roadside Diffusion Tube)*	64.28	49.29	52.04	2.75
13	Mottram Street / Eldon Street *(Roadside Diffusion Tube)*	27.18	21.16	21.31	0.15
14	Wakefield Rd, approach Burton Road *(Diffusion Tube)*	42.32	31.22	33.44	2.22
15	Slip Road / Harborough Hills Road *(Diffusion Tube)*	39.92	30.10	31.20	1.10
16	Pontefract Road / Queens Road *(Roadside Diffusion Tube)*	33.70	25.66	26.30	0.64
17	Victoria Rd / Huddersfield Road *(Roadside Diffusion Tube)*	36.32	27.17	27.62	0.45
18	Pontefract Road / Clyde Street *(Diffusion Tube)*	29.61	22.82	23.12	0.30
19	Victoria Road / Huddersfield Road *(Diffusion Tube)*	38.07	28.33	28.39	0.06
20	Burton Road - Rotherham Road Junction *(Diffusion Tube)*	37.12	28.07	28.98	0.91
21	Wakefield Road / Smithies Lane *(Roadside Diffusion Tube)*	36.92	27.48	28.88	1.40
22	135 Wakefield Road	35.36	26.43	27.79	1.36
23	23 Twibell Road	31.86	24.34	24.14	-0.20
24	123 Old Mill Lane	43.94	32.64	33.83	1.19
25	113 Old Mill Lane	45.89	34.02	35.79	1.77
26	14 Burton Road	31.11	23.63	24.31	0.68
27	1 Wakefield Road	33.20	25.01	25.98	0.97
28	21 Wakefield Road	36.39	27.15	28.61	1.46
29	42 Wakefield Road	33.68	25.32	26.47	1.15
30	121 Wakefield Road	35.58	26.58	27.96	1.38
31	1 to 11 Smithies Lane	32.70	24.67	25.44	0.77
32	120 Smithies Lane	27.26	21.17	21.27	0.10
33	7 Carlton Road	34.03	25.58	26.05	0.47
34	20 Carlton Road	29.77	22.78	22.98	0.20
35	167 Wakefield Road	37.33	27.76	29.12	1.36
36	199 Wakefield Road	28.79	22.13	22.66	0.53
37	6 Meadow Street	36.91	27.93	28.81	0.88
38	1 Meadow Street	36.33	27.50	28.34	0.84
39	107 Harborough Hills Road	58.49	44.48	46.82	2.34
40	134 Old Mill Lane	37.45	28.00	28.54	0.54
41	47 Old Mill Lane	42.72	30.90	31.63	0.73
42	74 Old Mill Lane	37.23	27.81	28.36	0.55
43	23 Old Mill Lane	41.11	30.52	31.22	0.70
44	92 Sheffield Road	46.00	34.00	34.13	0.13
45	56 Sheffield Road	45.46	33.64	33.78	0.14

PM_{10} Annual Mean	2004	Source
AQS Objective ($\mu g/m^3$) 2004	40	UK Air Quality Strategy

Receptor Number	Receptor Name/Description	2010 baseline	2015 without development	2015 with development	Change
Existing Receptors					
1	113 Harborough Hills Road *(Roadside Diffusion Tube)*	19.20	17.91	18.73	0.82
2	Harborough Hills Road / Redfearn Street *(Roadside Diffusion Tube)*	18.55	17.30	17.83	0.52
3	Canal Street *(Roadside Diffusion Tube)*	16.61	15.63	15.82	0.19
4	Harborough Hills Road / Meadow Street *(Roadside Diffusion Tube)*	18.42	17.20	17.73	0.53
5	Burton Road *(Roadside Diffusion Tube)*	15.10	14.34	14.56	0.22
6	Burton Road *(Kerbside Diffusion Tube)*	15.61	14.78	15.09	0.31
7	Old Mill Lane / Eldon Street *(Diffusion Tube)*	18.25	17.02	17.39	0.37
8	Old Mill Lane / Honeywell Street *(Diffusion Tube)*	18.04	16.85	17.20	0.35
9	Harborough Hills Road, adj ex-bakery *(Roadside Diffusion Tube)*	25.53	23.09	24.36	1.27
10	Wakefield Road - Burton Road Junction *((Roadside Diffusion Tube)*	17.65	16.53	17.39	0.86
11	Wakefield Road, approach Burton Road *(Diffusion Tube)*	17.11	16.06	16.81	0.75
12	49 Harborough Hill Road *(Roadside Diffusion Tube)*	24.96	22.61	23.81	1.20
13	Mottram Street / Eldon Street *(Roadside Diffusion Tube)*	14.69	13.99	14.05	0.06
14	Wakefield Rd, approach Burton Road *(Diffusion Tube)*	18.03	16.85	17.83	0.99
15	Slip Road / Harborough Hills Road *(Diffusion Tube)*	17.64	16.47	16.86	0.39
16	Pontefract Road / Queens Road *(Roadside Diffusion Tube)*	16.17	15.24	15.46	0.22
17	Victoria Rd / Huddersfield Road *(Roadside Diffusion Tube)*	16.76	15.75	15.96	0.21
18	Pontefract Road / Clyde Street *(Diffusion Tube)*	15.24	14.45	14.56	0.11
19	Victoria Road / Huddersfield Road *(Diffusion Tube)*	17.40	16.26	16.29	0.03
20	Burton Road - Rotherham Road Junction *(Diffusion Tube)*	17.47	16.38	16.78	0.40
21	Wakefield Road / Smithies Lane *(Roadside Diffusion Tube)*	16.71	15.73	16.30	0.57
22	135 Wakefield Road	16.39	15.44	16.01	0.57
23	23 Twibell Road	15.79	14.94	14.93	-0.01
24	123 Old Mill Lane	18.68	17.45	18.03	0.59
25	113 Old Mill Lane	19.18	17.88	18.70	0.82
26	14 Burton Road	15.44	14.64	14.92	0.28
27	1 Wakefield Road	15.92	15.05	15.46	0.40
28	21 Wakefield Road	16.65	15.67	16.29	0.62
29	42 Wakefield Road	16.02	15.13	15.61	0.48
30	121 Wakefield Road	16.44	15.48	16.07	0.59
31	1 to 11 Smithies Lane	15.80	14.94	15.25	0.31
32	120 Smithies Lane	14.67	13.97	14.02	0.04
33	7 Carlton Road	16.15	15.24	15.42	0.19
34	20 Carlton Road	15.22	14.44	14.52	0.08
35	167 Wakefield Road	16.82	15.82	16.37	0.55
36	199 Wakefield Road	14.96	14.22	14.43	0.21
37	6 Meadow Street	17.12	16.07	16.43	0.36
38	1 Meadow Street	16.96	15.93	16.27	0.34
39	107 Harborough Hills Road	23.10	21.07	22.07	1.00
40	134 Old Mill Lane	17.03	15.99	16.25	0.26
41	47 Old Mill Lane	18.06	16.86	17.22	0.35
42	74 Old Mill Lane	16.96	15.92	16.18	0.26
43	23 Old Mill Lane	17.92	16.74	17.08	0.34
44	92 Sheffield Road	19.19	17.84	17.89	0.06
45	56 Sheffield Road	19.07	17.74	17.80	0.06

PM_{10} Daily Mean AQS Objective days allowed in exceedences per annum (50 µg/m^3)	2004 35	Source UK Air Quality Strategy

Receptor Number	Receptor Name/Description	2010 baseline	2015 without development	2015 with development	Change
Existing Receptors					
1	113 Harborough Hills Road *(Roadside Diffusion Tube)*	2	1	2	1
2	Harborough Hills Road / Redfearn Street *(Roadside Diffusion Tube)*	2	1	1	0
3	Canal Street *(Roadside Diffusion Tube)*	1	0	0	0
4	Harborough Hills Road / Meadow Street *(Roadside Diffusion Tube)*	2	1	1	0
5	Burton Road *(Roadside Diffusion Tube)*	0	0	0	0
6	Burton Road *(Kerbside Diffusion Tube)*	0	0	0	0
7	Old Mill Lane / Eldon Street *(Diffusion Tube)*	2	1	1	0
8	Old Mill Lane / Honeywell Street *(Diffusion Tube)*	1	1	1	0
9	Harborough Hills Road, adj ex-bakery *(Roadside Diffusion Tube)*	14	8	11	3
10	Wakefield Road - Burton Road Junction *((Roadside Diffusion Tube)*	1	1	1	0
11	Wakefield Road, approach Burton Road *(Diffusion Tube)*	1	0	1	1
12	49 Harborough Hill Road *(Roadside Diffusion Tube)*	12	7	10	3
13	Mottram Street / Eldon Street *(Roadside Diffusion Tube)*	0	0	0	0
14	Wakefield Rd, approach Burton Road *(Diffusion Tube)*	1	1	1	0
15	Slip Road / Harborough Hills Road *(Diffusion Tube)*	1	0	1	1
16	Pontefract Road / Queens Road *(Roadside Diffusion Tube)*	0	0	0	0
17	Victoria Rd / Huddersfield Road *(Roadside Diffusion Tube)*	1	0	0	0
18	Pontefract Road / Clyde Street *(Diffusion Tube)*	0	0	0	0
19	Victoria Road / Huddersfield Road *(Diffusion Tube)*	1	0	0	0
20	Burton Road - Rotherham Road Junction *(Diffusion Tube)*	1	0	1	1
21	Wakefield Road / Smithies Lane *(Roadside Diffusion Tube)*	1	0	0	0
22	135 Wakefield Road	0	0	0	0
23	23 Twibell Road	0	0	0	0
24	123 Old Mill Lane	2	1	1	0
25	113 Old Mill Lane	2	1	2	1
26	14 Burton Road	0	0	0	0
27	1 Wakefield Road	0	0	0	0
28	21 Wakefield Road	1	0	0	0
29	42 Wakefield Road	0	0	0	0
30	121 Wakefield Road	0	0	0	0
31	1 to 11 Smithies Lane	0	0	0	0
32	120 Smithies Lane	0	0	0	0
33	7 Carlton Road	0	0	0	0
34	20 Carlton Road	0	0	0	0
35	167 Wakefield Road	1	0	0	0
36	199 Wakefield Road	0	0	0	0
37	6 Meadow Street	1	0	0	0
38	1 Meadow Street	1	0	0	0
39	107 Harborough Hills Road	8	5	6	1
40	134 Old Mill Lane	1	0	0	0
41	47 Old Mill Lane	1	1	1	0
42	74 Old Mill Lane	1	0	0	0
43	23 Old Mill Lane	1	1	1	0
44	92 Sheffield Road	2	1	1	0
45	56 Sheffield Road	2	1	1	0