13.0 AIR QUALITY

13.1 INTRODUCTION AND METHODOLOGY

13.1.1 This Chapter assesses the likely significant effects of the Project on local air quality, particularly in relation to existing sensitive receptors surrounding the Site (e.g. residential, education and health facilities) and its future occupants. It assesses the likely effects from dust and road traffic exhaust emissions generated during the construction phase, together with road traffic exhaust emissions and plant emissions resulting from the Project, once completed and operational.

13.1.2 The policy context and methods used to assess the effects are described, together with the 'baseline' conditions that would be likely to exist in the area in the absence of the proposed Project. The potential effects of the Project are discussed, together with mitigation measures that have been developed to prevent, reduce or offset these effects. Finally, the likely residual effects that would arise with the mitigation measures in place are described.

13.1.3 The Chapter was written by Waterman Energy Environment and Design. **Appendix 13B** presents traffic data to support the assessment.

Methodology

13.1.4 This air quality assessment was undertaken using information from a variety of sources, as follows:-

- Consultation with Blaby District Council (BDC) to agree the methodology to be used within the assessment;
- Review of BDC air quality review and assessment documents in order to identify baseline conditions in the area and identify monitoring data to be used to verify the air quality model;
- Review of the local area to identify potentially sensitive receptor locations, both existing and proposed, that could be affected by changes in air quality that result from the proposed Project;
- Traffic flow data provided by the Project Transportation Consultants, Waterman Boreham, in relation to the **Transport Assessment** for the Project (see **Chapter 15: Traffic and Transport)**;
- Application of the methodology of the **Highway Agency's Design Manual for Roads and Bridges (DMRB) Localised Air Quality Assessment**[1], 2007 to predict the effect from additional traffic movements generated by the proposed Project on the future local air quality, as agreed with BDC. The new NO_2 from NO_X Calculator available from the Air Quality Archive website has been applied to derive the road-related NO_2 emissions from NO_X DMRB outputs;
- Comparison of the predicted levels with the UK air quality objectives and the Environmental Protection UK[2] significance criteria;

1 Highways Agency, 2007, 'Design Manual for Roads and Bridges (DMRB)': Air Quality Screening Method Version 1.03c.
2 Environmental Protection UK, 2010, 'Development Control: Planning for Air Quality'.

- Consideration of likely construction plant, activities and environmental management controls likely to be employed during the demolition and construction phase of the works;
- Review of heating plant and ventilation systems within the completed Project; and
- Identification of mitigation measures, where appropriate.

Construction

13.1.5 Construction-derived dust emission effects cannot be easily quantified. Therefore, a more qualitative approach was employed to predict potential effects from these works. The emphasis of this approach lies in the minimisation of potential effects at source through appropriate environmental management controls relating to, at least, 'good practice' site management practices. The approach included:-

- Consideration of the assumed construction activities and their potential to generate emissions; and
- Identification of good working practices and suitable mitigation measures in order to minimise the potential for dust emissions and nuisance risk.

13.1.6 During the construction phase the potential for dust effects would be mitigated at source, through appropriate site management and control practices. Premises and occupants within 100m of a construction site are generally considered to be most likely to suffer dust nuisance.

13.1.7 Examples of dust-sensitive receptors are listed in **Table 13a** below (taken from Minerals Policy Statement 2[3]).

Table 13a: Dust Sensitive Receptors

High Sensitivity	Medium Sensitivity	Low Sensitivity
Hospitals and Clinics	Schools	Farms
Retirement Homes	Residential Areas	Light and Heavy Industry
Hi-Tech Industries	Food Retailers	Outdoor Storage
Food Processing	Offices	

13.1.8 The proximity of sensitive receptors and their orientation in relation to the prevailing wind, in addition to the scale and duration of demolition and construction activities, would have a bearing on potential nuisance effects.

Operation

13.1.9 Assessing air quality effects from vehicle exhaust emissions with the **DMRB** methodology requires information on vehicle flows, speeds and types on the local road network, in both

3 Office of the Deputy Prime Minister, Minerals Policy Statement 2: Controlling and mitigating the environmental effects of mineral extraction in England - Annex 1: Dust, 2005.

the absence and presence of the proposed Project. Based on this information, ambient concentrations of nitrogen dioxide (NO_2), particulate matter (PM_{10}), carbon monoxide (CO), 1,3–butadiene (C_4H_6) and benzene (C_6H_6) may be predicted at selected receptor locations. In this way, changes in air quality that result from the Project can be established and compared to the Air Quality Strategy objectives.

13.1.10 In order to assess the effect of the proposed Project on local air quality, future 'without Project' and 'with Project' scenarios were assessed. The Project is programmed to be complete in 2026; this is therefore the year for which these future scenarios were modelled. The year 2009 was modelled to establish the existing baseline situation.

13.1.11 The **DMRB** methodology requires information on all major roads within 200m of the selected receptor location. It assumes that roads greater than 200m from a receptor location do not contribute significant amounts of pollution. Traffic flow data for the surrounding road network were obtained from Waterman Boreham. The data used within the assessment are presented in **Appendix 13B**.

13.1.12 Initially, the **DMRB** was used to predict annual mean NO_2 concentrations at three BDC NO_2 diffusion tube monitoring locations to allow a comparison between predicted and monitoring concentrations in order to verify the performance of the model. The comparison of data and the verification process are shown in **Appendix 13B**.

Significance Criteria

Construction

13.1.13 The assessment of construction effects was based on:

- A review of likely construction activities; and
- A review of the sensitive uses in the area immediately surrounding the Site in relation to their distance and orientation.

13.1.14 The significance of effect was concluded through professional judgement based on the following:

- The baseline air quality conditions in the area surrounding the Site;
- The mitigation measures that would be proposed; and
- The knowledge of how such mitigation measures are routinely and successfully applied to construction projects throughout the UK.

13.1.15 In addition to the above, the classification system provided in **Table 13b** below was adopted, again based on professional judgement, for the assessment of potential adverse air quality effects arising from dust generated by construction activities associated with the proposed Project.

Table 13b: Construction Significance Criteria

Effect Significance	Definition
Major adverse	Receptor is less than 10m from a major active construction or demolition site.
Moderate adverse	Receptor is within 100m of a major active construction or demolition site.
Minor adverse	Receptor is between 100m and 200m from a major active construction or demolition site or up to 100m from a minor active construction site, demolition site or construction compound.
Negligible	Receptor is over 100m from any minor construction site or over 200m from any major construction site.

Operation

13.1.16 The significance of any changes in local air quality that are predicted, based on background pollutant concentrations and predicted traffic flows, can be established through the consideration of the following factors:

- Geographical extent (local, district or regional);
- Duration (temporary or long term);
- Reversibility (reversible or permanent);
- Magnitude of pollutant concentration changes;
- Exceedance of standards (e.g. Air Quality Objectives); and
- Changes in pollutant exposure.

13.1.17 The **Environmental Protection UK Guidance 'Development Control: Planning for Air Quality (2010)** provides an approach to defining magnitude of changes and describing the air quality effects at specific receptors recommended by the Institute of Air Quality Management (IAQM).

13.1.18 **Table 13c** below presents the magnitude of change descriptors, based on the change in concentration predicted to be brought about by a scheme as a percentage of the assessment level (i.e. the UK Objective, Limit Value of Environmental Assessment Level). **Tables 13d** and **13e** present the effect significance descriptors that take account of the magnitude of changes (both positive and negative) given in **Table 13c**, and the concentration in relation to the air quality objective. The term 'slight' has been replaced with the term 'minor'.

Table 13c: Magnitude of Change Descriptor in Relation to Changes in Concentrations of NO_2 and PM_{10}

Magnitude of Change	Annual Mean NO_2/PM_{10}	Days PM_{10} > 50µg/m^3
Large	Increase/decrease > 10% (>4µg/m^3)	Increase/decrease >4 days
Medium	Increase/decrease 5 - 10% (2 - 4µg/m^3)	Increase/decrease 2 - 4 days
Small	Increase/decrease 1 - 5% (0.4 - 2µg/m^3)	Increase/decrease 1 - 2 days
Imperceptible	Increase/decrease < 1% (<0.4µg/m^3)	Increase/decrease <1 days

Note: Percentage calculated as a change of the level of assessment

Table 13d: Effect Significance Criteria for Annual Mean NO_2 and PM_{10}

Concentration in Relation to Standard	Small	Medium	Large
Decrease with Development			
Above objective ***without*** development (>40µg/m^3)	**Minor beneficial**	**Moderate beneficial**	**Substantial beneficial**
Just below ***without*** development (36 - 40µg/m^3)	**Minor beneficial**	**Moderate beneficial**	**Moderate beneficial**
Below objective ***without*** development (30 - 36µg/m^3)	**Negligible**	**Minor beneficial**	**Minor beneficial**
Well below objective ***without*** scheme (<30µg/m^3)	**Negligible**	**Negligible**	**Minor beneficial**
Increase with Development			
Above objective ***with*** development (>40µg/m^3)	**Minor adverse**	**Moderate adverse**	**Substantial adverse**
Just below ***with*** development (36 - 40µg/m^3)	**Minor adverse**	**Moderate adverse**	**Moderate adverse**
Below objective ***with*** development (30 - 36µg/m^3)	**Negligible**	**Minor adverse**	**Minor adverse**
Well below objective ***with*** scheme (<30µg/m^3)	**Negligible**	**Negligible**	**Minor adverse**

Note: an imperceptible change would be described as 'negligible'

Table 13e: Effect significance criteria for PM_{10} daily mean

Concentration in Relation to Standard	Small	Medium	Large
Decrease with Development			
Above objective ***without*** development (>35days)	**Minor beneficial**	**Moderate beneficial**	**Substantial beneficial**
Just below ***without*** development (32 - 35 days)	**Minor beneficial**	**Moderate beneficial**	**Moderate beneficial**
Below objective ***without*** development (26 - 32 days)	**Negligible**	**Minor beneficial**	**Minor beneficial**
Well below objective ***without*** scheme (<26 days)	**Negligible**	**Negligible**	**Minor beneficial**
Increase with Development			
Above objective ***with*** development (>35days)	**Minor adverse**	**Moderate adverse**	**Substantial adverse**
Just below ***with*** development (32 - 35 days)	**Minor adverse**	**Moderate adverse**	**Moderate adverse**
Below objective ***with*** development (26 - 32 days)	**Negligible**	**Minor adverse**	**Minor adverse**
Well below objective ***with*** scheme (<26 days)	**Negligible**	**Negligible**	**Minor adverse**

Note: an imperceptible change would be described as 'negligible'

13.2 PLANNING CONTEXT

National

13.2.1 Air pollutants at high concentrations can give rise to adverse effects on the health of people and ecosystems. European Union (EU) legislation on air quality forms the basis for national UK legislation and policy on air quality. The **EU air quality 'framework' Directive on Ambient Air Quality Assessment and Management**[4] came into force in September 1996. This is a framework for addressing air quality through setting European–wide air quality limit values in a series of daughter directives. The first four 'daughter' directives have been transposed into national legislation and recently consolidated in the **Air Quality Standards Regulations 2007**[5]. A new air quality directive

4 EC, Council Directive 96/62/EC on Ambient Air Quality Assessment and Management, 1996.
5 HMSO, 'The Air Quality Standards Regulations 2007 (Statutory Instrument 2007 No. 64)', 2007.

came into force in June 2008[6]. This has been transposed into national legislation through the **Air Quality Standards Regulations 2010**[7] and came into force on 11th June 2010.

The UK Air Quality Strategy

13.3.2 In a parallel process, the **Environment Act 1995**[8] required the preparation of a national air quality strategy setting health–based air quality objectives for specified pollutants and outlining measures to be taken by Local Planning Authorities (LPAs) in relation to meeting these (the Local Air Quality Management (LAQM) system).

13.2.3 The **UK Air Quality Strategy**, adopted in 1997[9], was subsequently reviewed and revised in 2000 as the **Air Quality Strategy for England, Scotland, Wales and Northern Ireland**[10]. An amendment to the Strategy was published in 2003[11]. In 2007 a new **Air Quality Strategy for England, Scotland, Wales and Northern Ireland** was published, introducing a national level policy framework for exposure reduction for fine particulates[12].

13.2.4 The standards and objectives relevant to local air quality management have been prescribed through the **Air Quality (England) Regulations (2000)**[13] and the **Air Quality (England) (Amendment) Regulations 2002**[14]. These are presented in **Table 13f**. LPAs are obliged to assess against, and work towards, these air quality objectives.

Table 13f: National Air Quality Strategy Objectives for the Purposes of Local Air Quality Management

Pollutant	Standard		Objective Date
	Concentration	Measured as	
Benzene	16.25µg/m^3	Running Annual mean	31/12/2003
	5µg/m^3	Annual mean	31/12/2010
1,3 Butadiene	2.2µg/m^3	Running annual mean	31/12/2003
Carbon monoxide (CO)	10mg/m^3	Maximum daily running 8–hour mean	31/12/2003

6 EC, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe
7 HMSO, 2010, 'The Air Quality Standards Regulations 2010 (Statutory Instrument 2010 No. 1001)'.
8 Office of the Deputy Prime Minister (ODPM), The Environment Act 1995
9 HMSO, London. Department of the Environment (DoE), 1997, 'The UK National Air Quality Strategy'. HMSO
10 Department of the Environment, Transport and the Regions, 'UK Air Quality Strategy for England, Scotland, Wales and Northern Ireland'. HMSO, London, 2000.
11 Department for the Environment, Food and Rural Affairs (DEFRA), Scottish Executive, Welsh Assembly Government and the Department of the Environment in Northern Ireland, 2003, 'The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: (Addendum)'. DEFRA, London.
12 Department of the Environment, Food and Rural Affairs (DEFRA), 2007. The Air Quality Strategy for England, Scotland, Wales & Northern Ireland
13 HSMO, The Air Quality (England) Regulations 2000 (Statutory Instrument 928 No.), 2000.
14 HMSO, 'The Air Quality (England) (Amendment) Regulations 2002 (Amended Statutory Instrument 2002 No. 3034)'. HMSO, London, 2002.

Pollutant	Standard		Objective Date
	Concentration	Measured as	
Nitrogen dioxide (NO_2)	200µg/m^3	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40µg/m^3	Annual mean	31/12/2005
Particles (PM_{10})	50µg/m^3	24–hour mean not to be exceeded more than 35 times per year	31/12/2004
	40µg/m^3	Annual mean	31/12/2004

13.2.5 The EU and the **Air Quality Standards Regulations 2007** set NO_2 objectives for 2010, which are equal to the UK Air Quality Strategy NO_2 objectives. The 2007 Air Quality Strategy introduced an exposure reduction approach for $PM_{2.5}$. However, there is currently no method which allows this to be assessed.

13.2.6 There are currently no statutory UK standards in relation to deposited dust and its propensity to cause nuisance. A deposition rate of 200mg/m^2/day (averaged over a month) is sometimes used as a threshold value for potentially significant nuisance effects[15].

Local Authority Responsibility

13.2.7 Part IV of the **Environment Act 1995** provides a system of Local Air Quality Management (LAQM) under which LPAs are required to review and assess the existing and future quality of the air within their administrative boundaries by way of a staged process. In the event that this process suggests that any of the Air Quality Strategy Objectives will not be met by the target dates, the LPA must consider the declaration of an Air Quality Management Area (AQMA) and the subsequent preparation of an Air Quality Action Plan to improve the air quality in that area in pursuit of the Objectives.

Planning Policy Statement 23: Planning and Pollution Control, 2004

13.2.8 **Planning Policy Statement 23 (PPS 23)**[16] states that "*LPAs must be satisfied that planning permission can be granted on land use grounds taking full account of environmental effects* [so as to] *ensure that in the case of potentially polluting developments:*

- *The relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework; and*
- *The effects of existing sources of pollution in and around the site are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable.*"

15 Bate, K. J. and Coppin, N. J. (1991) 'Dust impacts from mineral workings', Mine and Quarry, 20 (3), 1991, pp31 – 35.
16 Planning Policy Statement 23: Planning and Pollution Control, 2004

13.2.9 Further emphasis is given to the importance of air quality objectives and AQMAs in the Appendices to **PPS23** which states that "*the impact of a development on air quality is likely to be particularly important:-*

- *Where the development is proposed inside, or adjacent to an AQMA;*
- *Where the development could in itself result in the designation of an AQMA; and*
- *Where to grant planning permission would conflict with, or render unworkable, elements of a LA's air quality action plan*".

13.2.10 In addition, **PPS23** states that "*it is not the case that all planning applications for developments inside or adjacent to AQMAs should be refused if the developments would result in a deterioration of local air quality. Such an approach could sterilise development, particularly where authorities have designated their entire areas as AQMAs*".

Regional

East Midlands Regional Plan, March 2009

13.2.11 Policy 1 'Regional Core Objective' of the **East Midlands Regional Plan (Regional Spatial Strategy)**[17] states that, "*to secure the delivery of sustainable development within the East Midlands, all strategies, plans and programmes having a spatial impact should meet the following core objectives ….*

d) to improve health and mental, physical and spiritual well being of the Region's residents through improvements in:-

- *Air quality…*

k) to minimise the adverse environmental impacts of new development and promote optimum social and economic benefits through the promotion of sustainable design and construction techniques."

13.2.12 Policy 36 'Regional Priorities for Air Quality' states that "*Local Development Frameworks and the strategies of relevant bodies should:-*

- *Contribute to reducing air pollution in the region;*
- *Consider the potential effect of new development and increased traffic levels on air quality…"*

Leicestershire, Leicester and Rutland Structure Plan 1996 to 2016, published 2005

13.2.13 None of the saved policies of the **Leicestershire, Leicester and Rutland Structure Plan**[18] relate to air quality.

17 Government Office for the East Midlands, East Midlands Regional Plan, March 2009
18 Leicestershire, Leicester, and Rutland Structure Plan 1996-2016, Adopted 2005

Local

Blaby District Local Plan, 1999 (saved policies)

13.2.14 Policy T3 of the saved policies of the **BDC Local Plan**[19] states that "*Where the district council is the determining authority for development involving a new access, road scheme or improvement, planning permission will only be granted if the proposed access, road scheme or improvement incorporates:.. (ii) safeguards for living and working conditions and the environment in general including considerations of visibility, access, layout, privacy, light, noise, disturbance, emissions, congestion, overbearing effect and the character or appearance of the area*".

Blaby District Council Core Strategy Submission Version) July 2009

13.2.15 The **BDC Core Strategy**[20] will set out the spatial plan for the District up to 2026.

13.2.16 Policy 3 'Sustainable Urban Extension' of the BDC Core Strategy states that the Masterplan for the Sustainable Urban Extension at the Site "*will need to include appropriate measures to mitigate the noise and air quality impacts of traffic using the M1 and M69 motorways".* Policy 9 'Transport Infrastructure' of the BDC Core Strategy states that "*The Council will encourage (mainly through Green Travel Plans) car share facilities, car clubs, and use of low emission motor vehicles in order to reduce congestion and pollution".*

Blaby District Council Air Quality Action Plan, 2004

13.2.17 An **Air Quality Action Plan**[21] was prepared by BDC detailing options for improving air quality under the following groups, specific to the different locations where problems are or may be experienced in Blaby:-

1. "*Controlling exposure to NO_X emissions from traffic on the M1*
2. *Controlling exposure to NO_X emissions from traffic in the vicinity of the Narborough Road South AQMA*

a. *Improving traffic flows*
b. *Reducing traffic volumes through diversion to other modes or routes, reducing demand for transport, etc.*
c. *Use of cleaner vehicles*
d. *Driver training*
e. *etc.*

3. *General measures to control emissions;*

a. *Planning conditions*
b. *Public information campaigns*
c. *Environmental management*
d. *etc.*

4. *Control of PM_{10} emissions from the various activities carried out at Croft Quarry.*"

19 Blaby District Council Adopted Local Plan 1999
20 Blaby District Council, Core Strategy Submission Version, July 2009
21 Blaby District Council Air Quality Action Plan May 2004

13.3 BASELINE CONDITIONS

Blaby District Council Review and Assessment of Air Quality

13.3.1 The major source of emissions in BDC is road traffic and as a results of their first round of review and assessment of air quality, BDC declared three AQMAs in 1999 for NO_2[22] as follows:-

- AQMA1: A5460 Narborough Road South;
- AQMA2: The M1 corridor in Enderby and Narborough; and
- AQMA3: The M1 corridor between Thorpe Astley and Kirby Muxloe.

13.3.2 Consequent to the designations of the AQMAs, an **Air Quality Action Plan** was prepared by BDC detailing options for improving air quality as outlined above.

13.3.3 A further review and assessment of air quality (i.e. stage 4 review and assessment) in relation to these AQMAs, and a further detailed assessment of air quality within a wider area, was undertaken by BDC[21]. The outcome of these assessments recommended alterations to the existing AQMA 3 boundary and the designation of further AQMAs in relation to NO_2 as follows:-

- AQMA 4 - St Johns, Enderby and Enderby Road, Whetstone; and
- AQMA 5 - Branting Hill.

13.3.4 The nearest AQMAs to the Site are shown in **Figure 13.1**.

Local Air Quality Monitoring

13.3.5 BDC measures air quality in the Borough using a continuous monitor and NO_2 diffusion tubes. The automatic continuous monitor is located at the junction of the A426 Blaby bypass and B582 Enderby Road, Whetstone. However, this is not located in proximity to the Site (it is approximately 2.0km away) and therefore, is not considered further here.

13.3.6 BDC monitors NO_2 concentrations using diffusion tubes at many locations throughout the Borough. The diffusion tube monitoring results at locations close to the Site, which are all kerbside locations, are shown in **Table 13g**, and are shown in **Figure 13.2**.

Table 13g: Annual Mean NO_2 Concentrations at Kerbside Diffusion Tube Sites ($\mu g/m^3$)

Site I.D. and Grid Reference	2007	2008	2009	NO_2 Objective
Hinckley Road, M1 Bridge (453593,303384)	**47**	**45**	**48**	**40**
Priestman Road, Thorpe Astley (454300,302229)	32	35	31	**40**

22 Blaby District Council Air Quality Detailed Assessment Final Copy July 2005

Site I.D. and Grid Reference	2007	2008	2009	NO_2 Objective
St Andrews Church, Hinckley Road (453137,303321)	29	31	30	**40**
64 Packer Avenue (453488,303637)	**42**	**43**	**44**	**40**
NO_X Box A (454482,298573)	33	33	31	**40**
NO_X Box B (454482,298573)	33	34	32	**40**
NO_X Box C (454482,298573)	32	34	33	**40**
K Edward Avenue (454521,298151)	**45**	**50**	**49**	**40**
Cumberwell Drive (454507,298338)	**40**	**40**	38	**40**
St Johns, Enderby (454968,298825)	34	36	34	**40**

13.3.7 The monitoring results in **Table 13g** indicate that there are exceedences of the annual mean NO_2 objective at a number of the monitoring sites, which is consistent with the AQMA designations.

Background Pollutant Concentrations

13.3.8 The DMRB methodology requires the use of background pollutant concentration data, to which the model adds contributions from nearby roads. Background concentrations of NO_X, NO_2, PM_{10}, CO, benzene and 1,3-butadiene are available from the UK Air Quality Archive for the 1 x 1km grid squares.

13.3.9 The UK Air Quality Archive provides background concentration maps for NO_2, NO_X and PM_{10} for assessment years between 2006 and 2020. For CO, benzene and 1,3-butadiene backgrounds are available for a limited number of discrete years, which are then projected forward for future years as per Local Air Quality Management Technical Guidance LAQM.TG(03)[23].

13.3.10 The Site covers a number of 1 x 1km grid squares and therefore all of the pollutant background concentrations used within this assessment are presented in **Appendix 13B.**

13.4 PROJECT DESIGN

13.4.1 The Project and its design has responded to constraints analysis work undertaken in relation to a number of technical topics, in order to establish a Project that seeks to minimise any adverse environmental impact, and to maximise environmental benefits. This included analysis work in relation to air quality, and also noise.

23 Department for the Environment, Food and Rural Affairs (DEFRA), 2003. 'Technical Guidance LAQM TG(03)'.

13.4.2 The adjacent M1 and M69 Motorways were identified as the key source of air pollutants affecting the Site. In addition, it was determined that noise associated with the M1 and M69 were a key constraint associated with the Site.

13.4.3 In order to minimise the potential impacts of these noise sources upon proposed sensitive receptors a number of key design measures were incorporated into the parameter plans as outlined in **Chapter 12: Noise and Vibration**. Given that air quality at the Site would be affected by the same key sources, the design measures incorporated directly in relation to noise would also affect air quality. Particularly, limiting the numbers of residential units located in proximity to the M1 and M69.

13.5 ASSESSMENT OF EFFECTS

Construction

13.5.1 At this stage, a detailed construction programme has not been developed; however the construction plan is a 3 phased approach with first phase developing the most northern and southern portions of the Site; second and third concentrating on upper and lower middle. The actual numbers of dwellings for the future phases is not yet known although the infrastructure will be triggered at set stages of the development.

13.5.2 Given it is estimated that the Project would not be complete and operational until 2026, together with the size of the Site, it is considered that it would constitute a major construction site in accordance with **Table 13b**. The demolition and construction works have the potential to affect local air quality conditions, as follows:-

- Dust generated from construction activities;
- Emissions from construction plant e.g. piling rigs, compressors, excavators, concrete mixers and generators; and
- Emissions from vehicles (e.g. lorries, cars and vans) associated with the demolition of the existing building, construction of the Project, import of building materials and removal of waste materials, accessing and leaving the Site on the local road network.

13.5.3 The National Air Quality Objectives seek to address the health implications of fine particulate matter (e.g. PM_{10}), which comes largely from combustion sources such as motor vehicle engines. The majority of particles released from ground excavation works, demolition and construction tend to be larger and generally settle out close to the works where they may cause annoyance due to their soiling capability. However, there are no formal standards or criteria for adverse effects caused by deposited particulate matter.

13.5.4 Dust from construction activities within the urban environment generally does not arise at distances beyond approximately 200m from the works (in the absence of mitigation), and the majority of any deposition that might give rise to significant soiling tends to occur within 50 to 100m[24]. In addition, in built up areas, neighbouring buildings would limit the movement of dust by acting as a screen.

24 Arup Environmental/Ove Arup and Partners, 1995, 'The Environmental Effects of Dust from Surface Mineral Workings' (HMSO, 1995).

13.5.5 A number of residential properties exist, and would be retained, within the Site. Abbey Cottages and the Bungalow (ER2), Abbey Farm (ER3), and Hopyard Farm (ER4) are not located in proximity to any proposed major construction works, being surrounded by open space and Scheduled Monument land uses within the Project. Therefore, there would be **negligible** effects from Site construction activities at these properties. However, Lawn Cottages (ER1) is located adjacent to proposed residential uses R7. Therefore, it is likely that without mitigation, there would be the potential for **temporary major adverse** effects from Site construction activities in relation to R7 at the ER1 properties, particularly during dry and windy conditions.

13.5.6 Residential properties are located along much of the northern boundary of the Site. The properties along/off Forest House Lane, Guinevere Way and Lancelot Close are located between 100m and 200m of areas of the proposed Project where major construction works are likely (i.e. construction of residential uses and a school). Therefore, it is likely that without mitigation, there would be the potential for **temporary moderate adverse** effects from Site construction activities at these properties, particularly during dry and windy conditions.

13.5.7 Specific management controls would be implemented to reduce the potential for dust effects on these properties (see mitigation section below).

13.5.8 Plant operating on the Site and construction vehicles entering and leaving the Site would have the potential to contribute to local levels of air pollution, particularly NO_2 and PM_{10}.

13.5.9 Although data relating to anticipated construction vehicle movements are not available at this stage, it is anticipated that the effect of construction traffic on local air quality is likely to be at worst **minor adverse** on roads closest to/accessing the Site but **negligible** on the wider main road network and in context of local background concentrations and existing vehicles emissions.

13.5.10 Any emissions from plant operating on the Site would be small in comparison to the emissions from the road traffic movements on the roads adjacent to the Site, and therefore would be **negligible**. In addition, the proposed mitigation measures (described below) would further reduce any effect.

Operation

Plant

13.5.11 Potential operational air quality effects can result from emissions from space heating and other building plant that is provided. Most modern space heating is achieved either through burning gas, which results in only low gaseous or particulate emissions or by using electricity, which gives rise to indirect emissions, at the power generation facility only.

13.5.12 The Project would include the use of modern plant and facilities which would have improved efficiencies and low emissions as a result of tightened legislation. The detailed specification and installation of this plant would be in line with requirements of current Building Regulations, and would be designed to comply with **Her Majesty's Inspectorate**

of Pollution, HMIP Technical Guidance Note (Dispersion) D1 (often referred to as a D1 Calculation)[25]. This document and calculation complements the **Third Edition of the 1956 Clean Air Act Memorandum on Chimney Heights**[26] and is intended to ensure that flue systems comply with the **Clean Air Act 1993**[27] and **Environmental Protection Act 1990**[28]. Consequently, no unacceptable effects on air quality at local existing and proposed receptors would occur as a result of this plant. Therefore, the operation of the Project's proposed plant would have a **negligible** effect on local air quality.

Traffic

13.5.13 The approach adopted by the Air Quality Strategy is to focus on areas at locations close to ground level where members of the public (in a non–workplace area) are likely to be exposed to pollutants over the averaging time of the objective in question (i.e. over 1–hour, 24–hour or annual periods) as appropriate. Objective exceedances principally relate to annual mean NO_2 and PM_{10}, so that potentially sensitive locations relate mainly to residential properties and other sensitive locations (such as schools) where the public may be exposed for protracted periods.

13.5.14 **Table 13h** presents existing potentially sensitive receptors (residential properties) that were selected for their proximity to the road network that may be affected by the proposed Project. In addition, locations within the Site, closest to the M1, were selected to represent 'worst case' future potential sensitive (residential) locations within the Project itself. It should be noted that no sensitive (residential or school) land uses are proposed within the Project within 200m of the M69, hence similar consideration in relation the M69 is not required. The location of these receptors is presented in **Figure 13.3**.

25 Her Majesty's Inspectorate of Pollution (HIMP), 'Guidelines on Discharge Stack Heights of Polluting Emissions'. Technical Guidance Note (Dispersion) D1,1993.
26 HMSO, Third Edition of the 1956 Clean Air Act Memorandum on Chimney Heights, 1981.
27 HMSO, Clean Air Act, 1993.
28 HMSO. Environmental Protection Act,1990.

Table 13h: Selected Receptor Locations

Receptor Number	Address of Receptor
1	77 Hinckley Road
2	12 Beggars Lane
3	259 Hinckley Road
4	Willows Farm
5	20 Mill Hill
6	25 Priestman Road
7	55 Owen Close
8	119 Westover Road
9	Proposed Residential R17
10	Proposed Residential R15

13.5.15 Initially, the **DMRB** was used to predict annual mean NO_2 concentrations at the location of a number of the BDC diffusion tube monitoring sites to allow a comparison between the predicted and monitored data in order to verify the performance of the model. The comparison of data and the verification process are shown in **Appendix 13B**.

13.5.16 The results of the **DMRB** assessment for the baseline 2009 situation are presented in **Table 13i**.

Table 13i Results of DMRB Localised Air Quality Assessment for 2009

Receptor ID*	CO Annual Mean [mg/m^3]	Benzene Annual Mean [µg/m^3]	1,3-butadiene Annual Mean [µg/m^3]	NO_2 Annual Mean [µg/m^3]	PM_{10} Annual Mean [µg/m^3]	PM_{10} Days >50µg/m^3 [days]
1	0.37	0.79	0.63	44.28	26.61	16
2	0.27	0.49	0.19	25.62	18.91	2
3	0.38	0.60	0.27	31.48	20.78	4
4	0.30	0.50	0.22	26.92	19.54	2
5	0.32	0.56	0.22	27.00	19.72	3
6	0.22	0.49	0.18	20.59	20.00	3
7	0.33	0.59	0.29	32.28	22.79	7
8	0.29	0.62	0.29	32.62	20.91	4

Note: Results not included for Receptor 9 to 10 because they are within the proposed Project and therefore do not exist in the 2009 scenario.

13.5.17 The results in **Table 13i** show that there are no exceedances predicted of the benzene and 1,3-butadiene annual mean objectives, or the PM_{10} objectives, in 2009 at the modelled receptors.

13.5.18 The **DMRB** model predicts the annual mean concentration for CO. Therefore, this cannot be directly compared with the objective, which is an 8–hour mean concentration. Guidelines within the LAQM.TG(09) Technical Guidance note advise that if the annual mean CO concentration is below 2mg/m^3, there is little likelihood of the maximum daily running 8–hour mean concentration exceeding the objective. Predicted annual mean concentrations at all modelled receptor locations are well below 2mg/m^3. As such, no exceedences of the running 8–hour mean CO concentration would be anticipated.

13.5.19 However, the annual mean objective for NO_2 is predicted to be exceeded at one of the selected receptor locations, Receptor 1 which is close to the M1 and A47, which is consistent with BDC local air quality monitoring and designated AQMA in this area.

13.5.20 The results of the **DMRB** assessment for the future year of 2026 'with' and 'without' the proposed Project are presented in **Table 13j** below.

Table 13j: Results of DMRB Localised Air Quality Assessment for 2026

	CO Annual Mean [mg/m^3]			Benzene Annual Mean [µg/m^3]			1,3–butadiene Annual Mean [µg/m^3]			NO_2 Annual Mean [µg/m^3]			PM_{10} Annual Mean [µg/m^3]			PM_{10} Days >50µg/m^3		
Receptor ID	Without Project	With Project	mg/m^3 Change	Without Project	With Project	µg/m^3 Change	Without Project	With Project	µg/m^3 Change	Without Project	With Project	Change	Without Project	With Project	% Change	Without Project	With Project	No of Days Change
1	0.42	0.43	**0.01**	0.85	0.88	**0.02**	0.70	0.72	**0.02**	33.40	34.51	**1.11**	23.06	23.32	**0.26**	8	8	**0**
2	0.33	0.33	**0.00**	0.50	0.51	**0.01**	0.22	0.23	**0.00**	14.13	14.44	**0.31**	16.92	16.98	**0.06**	0	0	**0**
3	0.43	0.44	**0.02**	0.60	0.63	**0.02**	0.30	0.32	**0.02**	18.88	20.04	**1.16**	18.22	18.47	**0.25**	1	1	**0**
4	0.62	0.65	**0.03**	0.50	0.54	**0.03**	0.24	0.27	**0.03**	13.75	15.97	**2.22**	17.31	17.79	**0.48**	0	1	**1**
5	0.37	0.38	**0.01**	0.56	0.59	**0.03**	0.24	0.26	**0.01**	16.19	16.70	**0.51**	17.49	17.61	**0.12**	1	1	**0**
6	0.29	0.38	**0.09**	0.50	0.60	**0.10**	0.23	0.32	**0.10**	12.66	20.64	**7.98**	18.04	19.57	**1.53**	1	2	**1**
7	0.40	0.43	**0.04**	0.59	0.67	**0.08**	0.31	0.40	**0.08**	20.60	23.48	**2.88**	19.53	20.11	**0.58**	2	3	**1**
8	0.35	0.36	**0.01**	0.60	0.62	**0.03**	0.30	0.34	**0.03**	21.35	22.37	**1.02**	17.76	17.93	**0.17**	1	1	**0**
9	-	0.32	-	-	0.64	-	-	0.44	-	-	19.25	-	-	19.53	-	-	2	-
10	-	0.37	-	-	0.77	-	-	0.61	-	-	26.57	-	-	21.32	-	-	5	-

*Based on 2025 DMRB calculation year and backgrounds for CO, benzene and 1,3-butadiene; and 2020 backgrounds for NO_X, NO_2 and PM_{10}

Note: Results not included for Receptor 9 to 10 for the 'without Project' scenario because they do not exist without the Project in place

13.5.21 The results in **Table 13j** show that there are no exceedances predicted of the benzene, 1,3-butadiene, CO, NO_2 or PM_{10} objectives predicted 'without' or 'with' the Project in place at any of the receptor locations in 2026. This applies to the eight existing receptor locations, and the two locations within the Project to represent 'worst case' future potential sensitive locations (Receptor 9 and 10) within the Project.

13.5.22 The Project is predicted to result in increases in pollutants concentrations at all of the existing modelled receptors. The following changes, in relation to the magnitude of change descriptors outlined in **Table 13c**, were predicted:

- An 'imperceptible' change in annual mean NO_2 at Receptor 2;

- 'Small' changes in annual mean NO_2 at four receptor locations (Receptor 1, 3, 5 and 8);
- 'Medium' changes in annual mean NO_2 at two receptor locations (Receptor 4 and 7);
- 'Large' changes in annual mean NO_2 at one receptor locations (Receptor 6);
- 'Imperceptible' changes in annual mean PM_{10} at five receptors (Receptor 1 – 3, 5 and 8) and small changes at the remaining existing receptors;
- 'Imperceptible' changes in daily mean PM_{10} at five receptors (Receptor 1 – 3, 5 and 8) and 'small' changes in daily mean PM_{10} concentrations at three receptor locations (Receptor 4, 6, 7).

13.5.23 **Table 13k** summarises the significance of the effects on NO_2 and PM_{10} in accordance with the significance criteria identified in **Table 13d** and **Table 13e.**

Table 13k: Magnitude of Change Descriptor in Relation to Changes in Concentrations of NO_2 and PM_{10}

	Receptor Location	NO_2 Annual Mean	PM_{10} Annual Mean	Days PM_{10}
1	77 Hinckley Road	**Negligible**	**Negligible**	**Negligible**
2	12 Beggers Lane	**Negligible**	**Negligible**	**Negligible**
3	259 Hinckley Road	**Negligible**	**Negligible**	**Negligible**
4	Willows Farm	**Negligible**	**Negligible**	**Negligible**
5	20 Mill Hill	**Negligible**	**Negligible**	**Negligible**
6	25 Priestman Road	**Minor Adverse**	**Negligible**	**Negligible**
7	55 Owen Close	**Negligible**	**Negligible**	**Negligible**
8	119 Westover Road	**Negligible**	**Negligible**	**Negligible**

13.5.24 As shown in **Table 13k**, the Project is predicted to have a **minor adverse** effect at one receptor location (Receptor 6) in relation to annual mean NO_2 concentrations and **negligible** effects at the remaining seven receptors. A **negligible** effect on daily and annual mean PM_{10} at all existing receptors modelled is predicted.

13.5.25 Although the Environmental Protection UK significance criteria do not apply to benzene, CO and 1,3-butadiene, maximum changes in benzene and butadiene of 0.10µg/m^3; and CO of 0.09mg/m^3 are predicted as a result of the Project. Given these slight changes, and that benzene, CO and 1,3-butadiene are predicted to be well below their respective objectives levels, these effects are therefore considered to be **negligible**.

13.5.26 The Project is not predicted to lead to any exceedances of the air quality objectives or lead to an extension of an AQMA. Additionally, given that air quality objectives are predicted to be met at Receptor 9 and 10, the effect of introducing residential uses to the Site would be **negligible**.

Cumulative Effects

Construction

13.5.27 The main impacts on air quality during the demolition and construction of developments are in relation to dust. Due to the typical dispersal and deposition rates of dust over distances, it is considered that the potential for dust to create a cumulative effect is only likely to be an issue for the closest developments, i.e. those within 50 to 100m of the three application sites, if they were to be constructed at the same time. The proposed SUEs at Barwell and Earl Shilton are located further than 100m from the Site and therefore there would be no cumulative effects.

13.5.28 It is expected that demolition and construction traffic routes for each of the cumulative schemes would be agreed with the LPA and thus traffic could be re-routed to minimise or avoid potential impacts if the schemes were to be constructed at the same time. On that basis, the impact of generated traffic on local air quality would be at worst **minor adverse**. However, these impacts would be temporary in nature.

Completed Project

13.5.29 The air quality assessment is inextricably linked to the **Transport Assessment (TA)** and the predicted changes in traffic flows. Traffic data used to establish the impacts of the completed and operational Project on air quality accounted for the cumulative schemes.

13.5.30 The traffic data used within the air quality assessment for the future year of 2026 includes traffic related to other cumulative schemes in the surrounding area and therefore comprises a cumulative impact assessment in this regard. For these reasons, the cumulative effects on local air quality of the Project and the cumulative schemes are those predicted in this Chapter.

Mitigation

Construction

13.5.31 A range of environmental management controls (mitigation measures) would be developed with reference to the Building Research Establishment (BRE) guidance 'Controlling Particles, Vapour and Noise Pollution from Construction Sites'[29]. Particular attention would be paid to operations which must unavoidably take place in proximity to where the closest residential properties are located (i.e. close to the northern Site boundary, and adjacent to Lawn Cottages). Such measures would include:-

- Damping down surfaces during dry weather;
- Providing appropriate hoarding and / or fencing to reduce dust dispersion and restrict public access;
- Sheeting buildings, chutes, skips and vehicles removing wastes with the potential for dust generation;

29 Building Research Establishment (BRE), 2003, 'Controlling particles, vapour and noise from pollution from construction sites'.

- Appropriate handling and storage of materials;
- Minimising the amount of, and length of time, materials are stockpiled on the Site and covering all stockpiles wherever possible;
- Restricting drop heights onto lorries and other equipment;
- Fitting all equipment with dust control measures such as water sprays wherever possible;
- Using a wheel wash, limiting speeds on the Site to 5mph (8kph), avoiding of unnecessary idling of engines and routing of Site vehicles as far from sensitive properties as possible;
- Using gas powered generators rather than diesel if possible (these are also quieter) and ensuring that all plant and vehicles are well maintained so that exhaust emissions do not breach statutory emission limits;
- Switching off all plant when not in use;
- Prohibiting fires on the Site; and
- Ensuring that a road sweeper is available to clean mud and other debris from hardstanding roads and footpaths.

13.5.32 Such measures are routinely and successfully applied to construction projects throughout the UK and are capable of significantly reducing the potential for adverse nuisance dust effects associated with the various stages of construction work.

13.5.33 With the implementation of a range of appropriate site management practices to control dust emissions, the likely residual effects associated with construction activities would be **negligible** to, at worst (particularly during dry and windy conditions) **moderate adverse** (at residential properties closest/adjacent to the Site boundary).

13.5.34 Any emissions from plant operating on the Site would be small in comparison to the emissions from the road traffic movements on the roads adjacent to the Site such that the residual effects would therefore be **negligible**.

Completed Project

13.5.35 As outlined in **Chapter 15: Traffic and Transport** in order to maintain and further improve accessibility to the Site a Travel Pack would be issued to all new residents to encourage the use of more sustainable modes of transport such as walking, cycling and using public transport, reduce unnecessary travel especially over short distances and encourage the use of sustainable travel by improving the facilities that are available and providing up to date information.

13.5.36 As part of the proposed employment use, a Travel Plan would be prepared which would include the information provided within the Travel Pack but also include monitoring and targets in which to reduce single car occupancy.

13.5.37 These measures would reduce travel by car and thus reduce further the predicted impact on the Project on air quality.

Residual Effects

Demolition and Construction

13.5.38 The effects of plant operating on the construction site would be **negligible** in the context of local background concentrations or existing adjacent road traffic emissions.

13.5.39 The effects of construction vehicles entering and leaving the Site would be **negligible** (on the wider main road network) to **minor adverse** (on roads closest to/accessing the Site) in context of local background concentrations and existing vehicles emissions.

13.5.40 Following the employment of appropriate environmental management controls as described above, it is envisaged that the effects of the demolition and construction works upon local air quality would be significantly reduced. As such, the worst-case (anticipated during dry and windy conditions only) residual effects resulting from demolition and construction related dust would be:-

- **Temporary**, **short** to **medium** term and of **major adverse** significance at Lawn Cottages (ER1); and
- **Temporary**, **short** to **medium** term and of **minor adverse** significance at properties along/off Forest House Lane, Guinevere Way and Lancelot Close.

Completed Project

13.5.41 The residual effect of operational phase heating plant systems on local air quality, with the imposition of suitable conditions to control effects, is considered to be **negligible**.

13.5.42 The operational traffic associated with the completed Project is predicted to result in **negligible** to **minor adverse** residual effects on local air quality.

13.5.43 The significance of introducing new sensitive receptors within the Site is considered to be of **negligible** significance.

13.6 STATEMENT OF EFFECTS

13.6.1 An assessment of the effect of the Project on local air quality arising from the construction and operational phases was undertaken. The construction effects of the Project would be related to dust and exhaust emissions from construction vehicles and plant. The effects of the completed Project could include emissions from traffic associated with the Project, and operational heating plant. A summary of the potential effects, mitigation measures and resulting residual effects are presented in **Table 13l**.

Table 13l: Summary of Potential Effects, Mitigation and Residual Effects

Issue	Potential Effect / Significance	Mitigation Measures	Residual Effect / Significance
Demolition and Construction			
Dust emissions from demolition and construction activities	**Moderate** to **major adverse**	Routine environmental management control measures to prevent and control dust	**Minor to Moderate adverse**
Emissions from on-site plant	**Negligible**	None required	**Negligible**
Emissions from construction vehicles	**Minor adverse** to **Negligible**	Routine environmental management control measures	**Minor adverse** to **Negligible**
Completed Project			
Operational plant emissions	**Negligible**	Use of routine controls on plant and ventilation systems	**Negligible**
Emissions from traffic associated with the completed Project	**Minor adverse** to **Negligible** in terms of NO_2 concentrations and **Negligible** in terms of PM_{10} concentrations	Travel Pack and Travel Plan	**Minor adverse** to **Negligible** in terms of NO_2 concentrations and **Negligible** in terms of PM_{10} concentrations
Introduction of new residential uses to the site	**Negligible**	None.	**Negligible**