



**Air Quality Assessment of
Proposed Mineral Extraction
and Processing Operations**

**Land at Mill Hill and Barton
in Fabis, Nottinghamshire**

GREENFIELD ASSOCIATES

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QUALITY MANAGEMENT

Report Title: Air Quality Assessment of Proposed Mineral
Extraction and Processing Operations at
Land at Mill Hill and Barton in Fabis,
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NON-TECHNICAL SUMMARY

1. The plant required to work the land at Mill Hill and Barton in Fabis, together with associated vehicle movements have the potential to generate dust and other airborne pollutants in the immediate vicinity of their operations. The likelihood of problems caused by such pollutants will be largely influenced by the effectiveness of on site environmental control.
2. Hence potential dust sources have been identified and best practice dust control measures recommended in order to minimise any such disturbance at nearby sensitive locations.
3. The current dust climate has been measured at the nearest sensitive properties and these are seen to be typical of a rural area.
4. Climatic conditions local to the site have been accessed and analysed to give an indication of how often the site could be susceptible to fugitive dust events. Such occasions are relatively few.
5. A full PM₁₀ assessment in line with the latest recommendations has been undertaken and this clearly shows that the Air Quality Objectives are not expected to be exceeded.
6. Given the intended dust control measures, we are confident that the site can be operated with minimal impact on nearby nearest sensitive properties.

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CONTENTS

1.0	Introduction	1
2.0	Existing Environment	2
3.0	Potential Emissions	8
4.0	Climatic Conditions	10
5.0	Discussion	13
6.0	PM ₁₀ Assessment	16
7.0	Dust Management	20
8.0	Cumulative Impacts	21
9.0	Emissions Statement	22
10.0	Conclusions	24
11.0	References	25

FIGURE

1.0	Monitoring and Prediction Locations
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APPENDICES

1	Wind Rose
2	Mean Number of Days with Rainfall less than 0.2mm
3	Summary of Dust Control Measures

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1.0 INTRODUCTION

- 1.1 Greenfield Associates are putting forward a proposal for mineral extraction and processing operations on land at Mill Hill and Barton in Fabis. It is expected that a planning application will be submitted to Nottinghamshire County Council. Vibrock Limited were commissioned to undertake an air quality assessment of the proposals. The air quality assessment was undertaken in accordance with the guidance for dust emission provided in the Planning Practice Guidance to the National Planning Policy Framework.
- 1.2 The proposed scheme at Mill Hill and Barton in Fabis is located approximately 7km south west of Nottingham and to the north of the village of Barton.
- 1.3 It is estimated that within the potential extraction areas of site the total sand and gravel reserves lie at around 3 million tonnes. The anticipated lifetime of the site is estimated at 10 – 15 years, during which time the proposed output would be around 220,000 tonnes per annum, equating to a daily output of around 1,000 tonnes.
- 1.4 This report considers the effects of air quality from the extraction, processing and movement of material within the site.
- 1.5 The study benefits from a site inspection in September 2015.

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2.0 EXISTING ENVIRONMENT

2.1 Introduction

Windspeed and Direction

- 2.1.1 The generation of and dispersal of dust is highly dependent upon meteorological conditions prevalent at the time. WeatherNet, an independent meteorological organisation has advised that wind speed and direction data are recorded at Watnall approximately 8 miles from Barton-In-Fabis. Observations of the wind speed and direction are recorded over a ten year period with some 85,000 hourly observations used to compile the relevant wind roses.
- 2.1.2 WeatherNet considers that the data recorded at Watnall over the period January 2005 to December 2014 would be representative of the conditions experienced in the vicinity of the proposed quarry at Barton-in-Fabis. From our site inspection we consider that this data is not likely to be significantly affected by the site topography. An extract from the Watnall wind speed and direction data is presented in Appendix 1 as an annual wind rose.

Rainfall Data

- 2.1.3 An indication of the long term average annual number of dry days (i.e. less than 0.2 mm) for the quarry has also been taken from records collected at Watnall (Appendix 2) and indicates that there is an average of 159.5 days per year with rainfall less than 0.2 mm, i.e. about 44 % of the year.

2.2 Existing Air Quality

Deposited Dust

- 2.2.1 Existing levels of deposited dust will typically be of the order of 56 mg/m²/day (milligrams per square metre per day) annual median, for a general deposit in residential areas and town outskirts, MIRO February 2011. Obviously, values vary daily, particularly during dry weather but also because of local industry. Median (50th percentile) levels of 38 mg/m²/day for open country, and 90 mg/m²/day for commercial town centres are also given by that source. The table overleaf shows these and other dustfall rates.

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Location	Median (50th percentile) mg/m ² /day	90th percentile mg/m ² /day	95th percentile mg/m ² /day
Open Country	38	103	140
Residential areas and town outskirts	56	146	203
Commercial Town Centres	90	199	261

- 2.2.2 Within the area around the site the existing deposited dust levels are influenced mainly by quarry activity and farming activity. The area is considered to be residential and town outskirts.

PM₁₀ and PM_{2.5} Particulates

- 2.2.3 Particulate matter is generally categorised on the basis of the size of the particles. PM₁₀ particles are those with a mean aerodynamic diameter less than 10 micrometres (microns), with the smaller PM_{2.5} particles being defined as those with a mean aerodynamic diameter less than 2.5 microns.
- 2.2.4 Particulate matter is made up of a wide range of materials and arise from a variety of sources. Concentrations of particulate matter comprise primary particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. Particulate matter derives from both human activity and natural sources (such as sea spray and Saharan dust). In the UK the biggest human activity sources are stationary fuel combustion and transport.
- 2.2.5 As an indication of the likely level of PM₁₀ and PM_{2.5} particulates at the site, data has been accessed for the relevant 1km squares of the Automatic Urban and Rural Network (AURN). The PM levels for the grid squares which contain the closest residential receptors to the quarry are detailed. The data presented is for the year 2017 with projected concentrations for the years 2022, 2027 and & 2030.

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Year	PM ₁₀ Annual Mean µg/m ³	PM _{2.5} Annual Mean µg/m ³
2017	17.4	12.0
2022	16.9	10.9
2027	16.8	10.7
2030	16.8	10.6

- 2.2.6 Within the surrounding area of the proposed development at Barton-In-Fabis, the PM₁₀ and PM_{2.5} levels would be influenced by quarry activity and traffic movements on the local road network. Additionally global PM₁₀ and PM_{2.5} emissions will also have a considerable influence.

2.3 Air Quality Standards

Deposited Dust

- 2.3.1 Dust in the community is normally perceived as an accumulated deposit on surfaces such as washing, window ledges, paintwork and other light coloured horizontal surfaces, e.g. car roofs. When the rate of accumulation is sufficiently rapid to cause noticeable fouling, discoloration or staining (and thus decrease the periods between cleaning) then the dust is generally considered to be a nuisance. The point at which an individual makes a complaint regarding dust is highly subjective.
- 2.3.2 In the UK and Europe there are no definitive standards for deposited particulates, however, criteria and guidelines have been developed in many other countries. Studies undertaken in Australia, for example, have resulted in the adoption of a deposited dust criteria linked to the onset of loss of amenity of about 133 mg/m²/day, averaged over one month. In the UK, long term deposited dust nuisance criteria have been suggested for urban/semi-rural areas at, typically 200 mg/m²/day, averaged over a monthly period.
- 2.3.3 Custom and practise at quarries, coal, construction and demolition sites have used the figure of 200 mg/m²/day as a nuisance threshold for sites in the UK.

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PM₁₀ and PM_{2.5} Particulates

- 2.3.4 The UK National Air Quality Strategy (NAQS) defines air quality standards for eight major pollutants, one of which is for PM₁₀ and sets objectives for reductions in the concentrations of those pollutants to be achieved by 2005.
- 2.3.5 The original PM₁₀ standard of 50 µg/m³ as a 24 hour running mean was to be achieved with no more than 4 exceedances per year by the end of 2005. This was considered to be an unrealistic target and as such it was replaced by the limits within the EU Daughter Directive on Air Quality which set a limit of 50 µg/m³ as a daily mean to be achieved by 31st December 2004 and maintained thereafter, with no more than 35 exceedances and an annual average of 40 µg/m³.
- 2.3.6 Under the 2010 Air Quality Standard Regulations, pollutants of particle size PM_{2.5} should be limited to an annual concentration of 25 µg/m³ from the year 2015 and 20 µg/m³ from the year 2020.

2.4 Health Impact Studies

- 2.4.1 Medical studies have consistently failed to find any link between dust arising from mineral working and public health. A local doctor who claimed that a nearby site produced demonstrable adverse medical effects upon his patients presented evidence to the Derlwyn Public Inquiry in South Wales. However, that evidence has since been discredited and shown, as an epidemiological study to be fundamentally flawed (British Medical Journal 305, 1992).
- 2.4.2 In 1992 the Institute of Occupational Medicine (IOM) concluded a three-year epidemiological study of the respiratory health of some one thousand two hundred and forty nine opencast mine employees working over nine sites selected by the IOM (Institute of Occupational Medicine Ltd 1992).
- 2.4.3 The main conclusions of that study were that dust exposures were low for most occupational occurrences and that neither asthma nor chronic bronchitis is related to exposure to dust in any part of opencast workings. It is only for those workers exposed for 10 years or more in the dustiest of opencast jobs that a small risk of pneumoconiosis was demonstrated.
- 2.4.4 The Health and Safety Executive have set the occupational exposure limit for dust at 10 mg/m³ as an 8 hour time weighted average. As previously mentioned such a figure may have significance within a site if workers are immediately adjacent to a particular operation prone to high dust emissions. However, due to dilution and dispersion it is extremely unlikely that any residential property around a site would ever experience concentrations of dust as high as this, with environmental dust levels some 100 times less being the norm.

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- 2.4.5 In 1999 the then DETR published the results of a relevant research project by the University of Newcastle upon Tyne under the title "Do particulates from opencast coal mining impair children's respiratory health?"
- 2.4.6 The Committee on the Medical Effects of Air Pollutants considered the content of this study, finding that it was "...of a high standard".
- 2.4.7 The Committee agreed with the findings of the authors of the report that:
- i) Opencast coal mining was associated with a small increase in the mean concentration of airborne particle measured as PM₁₀ in areas close to opencast sites. This was due to an increased concentration of shale.
 - ii) The respiratory health of children living in communities close to opencast coal sites was very similar to that of children living in communities distant from such sites.
- 2.4.8 Overall, the number of consultations made to general practitioners was similar for children who lived close to opencast sites compared to those who did not.
- 2.4.9 The Committee noted that the increase in particle concentrations close to opencast sites was not due to the release of coal particles but was more likely due to earth moving and excavation. Such levels of exposure to these materials, as may occur in local communities as a result of any opencast mining, are most unlikely to have any detectable effects on health.
- 2.4.10 They concluded that from what is known of the long term effects of coal mining on the health of opencast coal miners, that it is most unlikely that opencast sites would have any long term effects on the health of local communities.
- 2.4.11 The study noted that the differences between opencast areas and the control communities studied during the research was some 2.0 µg/m³ in terms of the gravimetric mean of daily differences in measured PM₁₀ values.
- 2.4.12 Of significance, however, was their finding that the differences between opencast and control communities were not found to be greater under conditions when the contribution of site related PM₁₀ dust had been expected to be raised. In such circumstances as when the wind was blowing from the site to the community monitor or during permitted site working hours.
- 2.4.13 Further guidance with regard to the assessment of PM₁₀ is given within the Planning Practice Guidance documentation to the National Planning Policy Framework.
- 2.4.14 The general basis of this guidance is that dust should as far as possible be controlled, mitigated or removed at source. The document further confirms, with minor refinements, the assessment methodology of the University of Newcastle upon Tyne study.

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2.5 Significance of Existing Air Quality

- 2.5.1 As shown in the table below, dust levels were monitored using sticky pads with analysis in effective area coverage per day. This has been calculated into mg/m²/day for comparison with nuisance criteria. All of the results obtained were below the nuisance criterion.

Measured Air Quality – 23/09/15 – 15/10/15

Location	Deposited Dust (Approximation) mg/m ² /day
1 Todd Close	38
Burrows Farm	70
Fabis Barn, Chestnut Lane	49
Middlewicket Cottage, The Strand	46
14 Barbury Drive	38

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25/07/2017

- 2.5.2 During the survey period the weather conditions consisted of sunshine and showers.
- 2.5.3 During the LAQM review and assessment process the local authority in which the extension area falls; Rushcliffe Borough Council has not designated any Air Quality Management Areas in relation to PM₁₀ or PM_{2.5}.

3.0 POTENTIAL EMISSIONS

3.1 Introduction

- 3.1.1 The operations involved in the extraction and processing of mineral have the potential to generate dust emissions.

3.2 Mineral Extraction

- 3.2.1 The extraction of mineral will be conducted with the use of a hydraulic excavator and loaded into dump trucks and in turn a field conveyor for transportation to the processing plant.
- 3.2.2 The drop height from the excavator bucket will be minimised and vehicles will be loaded evenly to avoid spillage and thus the generation of dust from this activity should be minimal.

3.3 Internal Movement of Material

- 3.3.1 The major source of potential dust emissions on any minerals site is from the movement of heavy plant on haul roads. This source of dust emission will be generated by the movement of site dump trucks when required to transport mineral.
- 3.3.2 The following dust mitigation measures will be conducted. A site speed limit will be implemented of 10 mph in the extraction area. Dust suppression with the use of an on-site water bowser will be implemented to mitigate dust generation.
- 3.3.3 Internal haul roads shall be regularly maintained by grading in order to minimise dust generation.
- 3.3.4 Mobile plant exhausts and cooling fans will be discharged away from the ground to prevent dust mobilisation.
- 3.3.5 All mobile plant to be regularly maintained.

3.4 Mineral Processing

- 3.4.1 Mineral processing at Barton-In-Fabis consists of a static processing plant. The sand and gravel will be processed via screens, the processed material is then stockpiled.
- 3.4.2 Where possible, stockpiled material which is awaiting processing or has been processed will be protected from the prevailing wind and dampened as required to minimise dust generation.

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- 3.4.3 The drop height from the loading shovel into both plant and road lorries will be minimised and thus the generation of dust from this activity should be minimal.

3.5 Haulage of Material Off Site

- 3.5.1 The main source of potential dust emissions will be the movement of road lorries. Road lorries leaving the site will be sheeted. Speed controls of 10 mph will be implemented around the processing and concrete batching plants.
- 3.5.2 All goods vehicles will pass over a rumble strip before exiting site.
- 3.5.3 A road sweeper will be used as required on the site access road. Good maintenance and housekeeping of haul road surfaces at all times will reduce the potential for dust emission.

3.6 Restoration Activities

- 3.6.1 Any soils handled as part of restoration activities will be managed in accordance with the site restoration scheme as soon as is practicable in order to minimise the potential for dust generation.

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4.0 CLIMATIC CONDITIONS

- 4.1 The frequency of use and the effectiveness of the control measures outlined in Appendix 3 will largely depend upon climatic conditions together with the separation distances involved between any potential dust source and residential locations.
- 4.2 The highest potential for dust dispersal and deposition occurs on dry windy days and the risk of dust deposition at a particular location is determined by the frequency of these dry winds blowing towards them from a dust generating activity.
- 4.3 In the guidance 'The Environmental Effects of Dust from Surface Mineral Workings' published in 1995 by the DoE (now part of DEFRA) together with guidance in the former MPS2, it is generally accepted that wind blow of dust does not occur on days when rainfall is above 0.2mm.
- 4.4 The meteorological data from Watnall, Nottinghamshire has been analysed in order to quantify the number of dry working days in which the wind direction is in a particular sector.
- 4.5 Information provided by WeatherNet as monitored at Watnall is detailed below:-

Wind Direction	Frequency of Occurrence %
North	5.2
North North East	7.4
East North East	8.3
East	4.4
East South East	3.1
South South East	3.6
South	6.4
South South West	14.4
West South West	20.7
West	13.4
West North West	8.4
North North West	4.7
Calm/variable	0.1

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25/07/2017

Rainfall less than 0.2 mm

159.5 days per year (Appendix 2).

The information adapted to allow for working days only, i.e. 5½ days per week, 47 weeks per year, is 113 working days per year with rainfall less than 0.2mm.

- 4.6 Combined with the prevailing wind directions, the number of dry working days each year can be represented as follows:-

Wind Direction	No. of Dry Working Days
North	5.9
North North East	8.4
East North East	9.4
East	5.0
East South East	3.5
South South East	4.1
South	7.2
South South West	16.3
West South West	23.4
West	15.1
West North West	9.5
North North West	5.3
Calm/variable	0.1

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25/07/2017

- 4.7 Considering that dust is not likely to be carried by winds of less than 5.6 ms^{-1} (i.e. less than 11 knots), an assessment of the likelihood of a dust occurrence is presented below:-

Wind Direction	No. of Dry Windy Working Days (Rounded)
North	2
North North East	4
East North East	2
East	2
East South East	2
South South East	2
South	3
South South West	5
West South West	9
West	6
West North West	6
North North West	3

- 4.8 This value of 5.6 ms^{-1} derives from the Beaufort Wind Scale and is very much in line with the value of 5.4 ms^{-1} as used by the United States Environmental Protection Agency in their dust emission calculations. The value is also below the 5.8 ms^{-1} stated within guidance from MIRO and the Department of the Environment for the initiation of dust emission for disturbed pebbly soils.

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5.0 DISCUSSION

- 5.1 The proposed methods of dust suppression are based on Vibrock and Greenfield Associates' experience of handling potentially dusty materials over many years in a wide variety of situations. These tried and tested methods of dust suppression have been successfully used at numerous minerals sites. The proposed dust control measures are recognised as industry best practice and are summarised in Appendix 3.
- 5.2 A dust event will only occur if the necessary conditions are present. It is necessary to have a fine material available which is able to be picked up, carried and then deposited by the wind. Such materials are more readily available if dry and physically disturbed. Thus not all site operations are dusty because of the lack of physical disturbance. There must also be a wind of sufficient strength to transport fine particles, and for a particular property to be at risk the wind must blow in that particular direction from the source. The critical wind speed at which a particle becomes airborne depends on many factors including particle size, shape and density. For most mineral dusts the critical wind speed is about 5.6 ms^{-1} (12 mph - 11kts - Force 4 on Beaufort Scale).
- 5.3 For a dust event to occur there must also be a failure of dust control measures. Particles greater than $30\mu\text{m}$ make up the greatest proportion of dust emitted from mineral processing and largely deposit within 100m of sources. Particles between 10 and $30\mu\text{m}$ are likely to travel from 250 to 500m, while sub $10\mu\text{m}$ particles, which make up a small proportion of dust emitted from most mineral processing operations, may travel up to 1km from sources.
- 5.4 In considering the climatic conditions, it is clear the winds will predominate from the south west quadrant with an analysis of the number of dry windy working days giving a maximum of some 37 such days likely in a south west direction in any one year. The property locations are identified in Figure 1.
- 5.5 The former Technical Guidance to the National Planning Policy Framework, presents examples of dust sensitive facilities as detailed below: (after *Ireland M*, 1992)

High sensitivity	--> Medium sensitivity	--> Low sensitivity
Hospitals and clinics Retirement homes Hi-tech industries Painting and furnishing Food processing	Schools Residential areas Food retailers Glasshouses and nurseries Horticultural land Offices	Farms Light and heavy industry Outdoor storage

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1 Todd Close

- 5.6 1 Todd Close is located approximately 480 metres from the east boundary of the site, inside which processing operations will take place.
- 5.7 Winds from the west, west north-west and north north-west would blow from the site towards 1 Todd Close. A total of 15 dry windy working days per annum are expected during which wind is of sufficient strength and would blow from the site towards property.

Burrows Farm

- 5.8 Burrows Farm is located to the east of the mineral extraction area of the site with the closest approach being in excess of 125 metres. The calculated number of dry windy working days with winds blowing from the south south-west (5), west south-west (9), west (6), west north-west (6) and north north-west (3) would blow from mineral extraction areas of the site towards property.

Fabis Barn, Chestnut Lane

- 5.9 Fabis Barn, Chestnut Lane is a residential property located to the south of the closest phase of the proposed mineral extraction operations. The closest of site operations to property is in excess of 135 metres in distance.
- 5.10 The calculated number of dry windy working days with winds blowing from the north (2), north north-east (4) east north-east (2) west north-west (6) and north north-west (3) would blow from mineral extraction areas of the site towards property.

Middlewicket Cottage, The Strand

- 5.11 Midwicket Cottage, The Strand is located over 540 metres to the north west of the closest point of site mineral extraction operations.
- 5.12 The calculated number of dry windy working days with winds blowing from the east south-east (2), south south-east (2) and south (3) would blow from mineral extraction areas of the site towards property.

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14 Barbury Drive

- 5.13 14 Barbury Drive is located in excess of 700 metres to the south east of extraction and processing operations at the land at Mill Hill and Barton in Fabis.
- 5.14 The calculated number of dry windy working days with winds blowing from the west north-west (6) and north north-west (3) would blow from the site towards property.

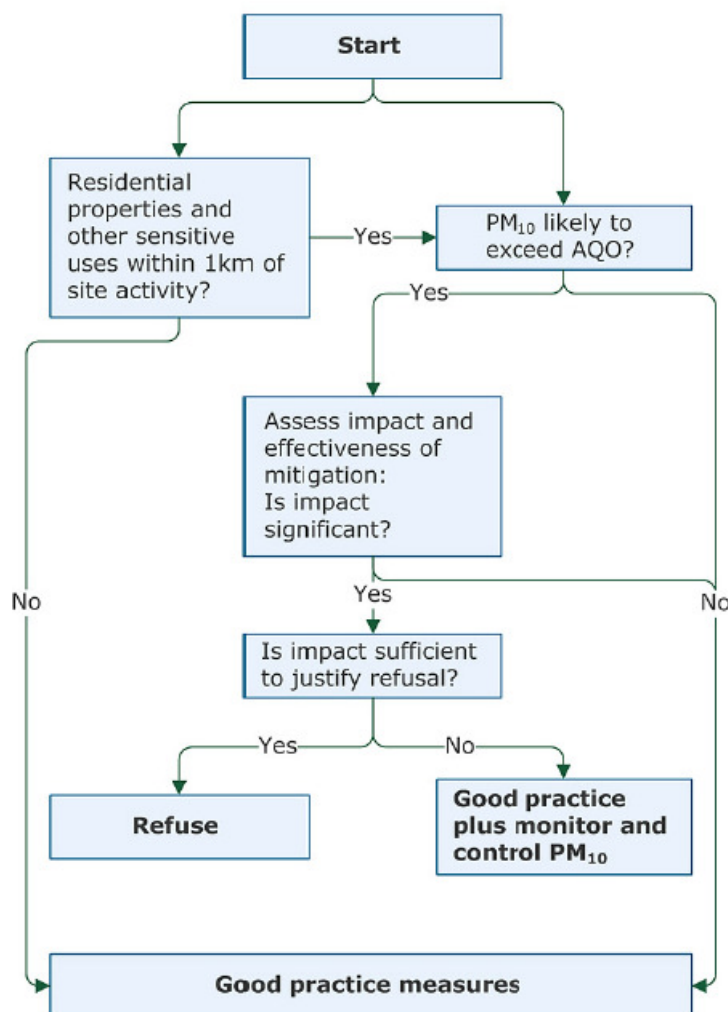
General

- 5.15 Located north of the proposed development are several lodges / chalets of which it is unclear if they are permanently occupied residences. At closest approach the nearest property is some 350 metres north of the extractive operations taken place in Phase 5, and some 1200 metres to the plant area. Typical adverse dust impacts from sand and gravel sites are uncommon beyond 250 metres, and in the absence of other information it is commonly accepted that the greatest potential impacts from high rates of dust deposition and elevated PM₁₀ particles will be within 100 metres of a source, including both large (>30um) and small dust particles.
- 5.16 In cases whereby receptors are located between 400 metres, or 250 metres (depending on the rock type) and 1 kilometre of operations, it would normally be assumed that a detailed disamenity dust impact assessment is not required, in this case assessment for the lodges / chalets have been screened out.
- 5.17 When conditions for dry windy working days do occur, the implementation of the dust suppression measures discussed in Section 3 and Appendix 3, will ensure that dust emissions are minimised. The use of such best practice measures, which have been implemented at mineral extraction sites throughout the United Kingdom, suggest that such measures will be effective.

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6.0 PM₁₀ ASSESSMENT

- 6.1 The 1999 DETR publication “Do particulates from opencast coal mining impair children’s respiratory health?” recommends an assessment framework with respect to PM₁₀ particulates.
- 6.2 The framework takes a step by step approach to PM₁₀ looking at various factors in time via a scheme of straightforward questions set out in a “Proposed Site Assessment Flowchart”. If the site is not likely to have a significant impact then best practice measures are recommended. If, however, its impact is significant, either a refusal should follow or additional monitoring and control.
- 6.3 The Planning Practice Guidance to the National Planning Policy Framework contains an amended version of the assessment framework (shown below).



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- 6.4 To follow the framework the first step is to assess whether the site has a community or particularly sensitive users / premises within 1000 metres of the site boundary.

- 6.5 The second step is then to assess whether the extra burden of PM₁₀ particulates from the site is likely to exceed the National Air Quality Objectives (AQO).

Summary of Limit Values and Objectives for Suspended Particulate Matter

PM fraction	Averaging period	Objective/Limit Value	Max allowable exceedances	Target Date
PM ₁₀	24 hours	50 µg/m ³	35 times per calendar year	-
	Annual	40 µg/m ³		-
PM _{2.5}	Annual	Target of 15% reduction in concentrations at urban background locations		Between 2010 and 2020 (a)
		Variable target of up to 20% reduction in concentrations at urban background locations(c)		Between 2010 and 2020 (b)
	Annual	25 µg/m ³		01.01.2020(a)
		25 µg/m ³		0.101.2015(b)
(a) Target date set in UK Air Quality Strategy 2007				
(b) Target date set in Air Quality Standards Regulations 2010				
(c) Aim to not exceed 18 µg/m ³ by 2020				

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- 6.6 To undertake this assessment it is recommended that Automatic Urban and Rural Network (AURN) data be accessed.
- 6.7 If the AURN data indicates that the additional load attributable to site operations, to be taken as 1 µg/m³ for the scope of this assessment, as discussed below, would bring the area above the AQO, then this would indicate that there may be a need for monitoring and control mechanisms. These would be required to be put into place in order to reduce the potential to create PM₁₀ dust from the site on those days that exceed the standard.
- 6.8 If the AURN data indicates that the additional load attributable to site operations alone of 1 µg/m³ would not cause any breach of the AQO, this would indicate that there would be no justification for any additional monitoring and controls over and above best practice measures.

- 6.9 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2003 suggests that quarrying and construction work are thought to account for less than $1 \mu\text{g}/\text{m}^3$ of PM_{10} levels. It could therefore be considered that a loading of $1 \mu\text{g}/\text{m}^3$ is a worst case calculation. The Newcastle Study discussed within Section 2 of this report was based upon an assessment of opencast coal operations and considered a loading of $2 \mu\text{g}/\text{m}^3$ as a process contribution. Opencast coal sites in general move far greater volumes of overburden and have a larger plant compliment than many sand and gravel and hard rock quarry operations. This lower dust generating potential for other types of mineral sites is acknowledged in the IAQM Minerals Dust Guidance.
- 6.10 This study has therefore accessed air quality data for Rushcliffe Borough Council (E452500 N333500). The 2017 PM_{10} annual mean burden displayed below, is $17.4 \mu\text{g}/\text{m}^3$ for the relevant 1 kilometre grid square containing the proposed workings at Barton-In-Fabis.

Year	Projected PM_{10} Burden	
	Number of Exceedances of $50 \mu\text{g}/\text{m}^3$	Annual Mean $\mu\text{g}/\text{m}^3$
2017	1.7	18.4
2022	1.3	17.9
2027	1.3	17.8
2030	1.3	17.8

E452500	2017	$17.4 \mu\text{g}/\text{m}^3$ annual mean
N333500	2022	$16.9 \mu\text{g}/\text{m}^3$ annual mean
	2027	$16.8 \mu\text{g}/\text{m}^3$ annual mean
	2030	$16.8 \mu\text{g}/\text{m}^3$ annual mean

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25/07/2017

- 6.11 For 2022 the projected PM_{10} concentration for the area is $16.9 \mu\text{g}/\text{m}^3$, which gives a concentration of $17.9 \mu\text{g}/\text{m}^3$ when combined with the site attributable load of $1 \mu\text{g}/\text{m}^3$.
- 6.12 1.3 daily exceedances of $50 \mu\text{g}/\text{m}^3$ would be expected in 2022.
- 6.13 The projected PM_{10} concentration for the site in 2027 is $16.8 \mu\text{g}/\text{m}^3$, which, combined with the potential additional load attributable to site operations of $1 \mu\text{g}/\text{m}^3$ gives a concentration of $17.8 \mu\text{g}/\text{m}^3$ for 2027.
- 6.14 1.3 daily exceedances of $50 \mu\text{g}/\text{m}^3$ would be expected in 2027.
- 6.15 For 2030 the projected PM_{10} concentration for the area is $16.8 \mu\text{g}/\text{m}^3$, which gives a concentration of $17.8 \mu\text{g}/\text{m}^3$ when combined with the site attributable load of $1 \mu\text{g}/\text{m}^3$.
- 6.16 1.3 daily exceedances of $50 \mu\text{g}/\text{m}^3$ would be expected in 2030.

- 6.17 Hence mineral extraction and processing operations at the Land at Mill Hill and Barton in Fabis, would satisfy the UK Air Quality Objectives of no more than 35 exceedances per year of a 24 hour mean of $50\mu\text{g}/\text{m}^3$ and an annual mean of $40\mu\text{g}/\text{m}^3$.
- 6.18 As previously noted within this report, sub $10\mu\text{m}$ particles, which make up a small proportion of dust emitted from most mineral operations, may travel up to 1 kilometre from sources. Of the total PM_{10} dust fraction there will be a percentage of the smaller $\text{PM}_{2.5}$ particulate matter.
- 6.19 In the May 2016 publication by the Institute of Air Quality Management "Guidance on the Assessment of Mineral Dust Impacts for Planning" it is stated that: "The other potential air quality impact is the increase in ambient suspended particulate matter (PM) concentrations local to the site. As noted earlier, the PM_{10} fraction is relevant to health outcomes. For quarries most of this suspended dust will be in the coarse sub-fraction ($\text{PM}_{2.5-10}$), rather than in the fine ($\text{PM}_{2.5}$) fraction."
- 6.20 On the basis of the above comment and the nationally derived ratio of $\text{PM}_{2.5}/\text{PM}_{10}$; 0.7, it is considered an additional burden of $0.5\mu\text{g}/\text{m}^3$ $\text{PM}_{2.5}$ to the annual mean would represent a worst case.

Grid Square 452500 333500

Year	PM_{10} Annual Mean $\mu\text{g}/\text{m}^3$	$\text{PM}_{2.5}$ Annual Mean $\mu\text{g}/\text{m}^3$
2017	17.4	12.0
2022	16.9	10.9
2027	16.8	10.7
2030	16.8	10.6

- 6.21 The application of a $0.5\mu\text{g}/\text{m}^3$ loading to the highest $\text{PM}_{2.5}$ concentration considered in this assessment of $12\mu\text{g}/\text{m}^3$ for the year 2017 at grid square 452500 333500 gives a projected $\text{PM}_{2.5}$ burden with the addition of quarry operations of $12.5\mu\text{g}/\text{m}^3$. The worst case projected concentration therefore complies with the $\text{PM}_{2.5}$ 2015 annual mean criterion of $25\mu\text{g}/\text{m}^3$.
- 6.22 If the development is permitted, an increase in the annual mean concentration of PM_{10} and $\text{PM}_{2.5}$ would not exceed the Air Quality Objectives.

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7.0 DUST MANAGEMENT

- 7.1 The impact on air quality from site operations with suitable mitigation measures is expected to be negligible, in line with The National Planning Policy Framework, which states that “unavoidable dust emissions should be controlled, mitigated or removed at source”. The following measures will be taken to ensure that the dust control measures identified in Section 3.0 and Appendix 3 are effectively implemented.
- 7.2 The site operator will comply with any conditions which may be specified in the planning conditions imposed by the Mineral Planning Authority relating to dust. The operator will refer to the planning conditions and determine an appropriate response, taking into account current and forecast weather conditions.
- 7.3 All site personnel shall be trained as to the potential sources and effective mitigation of dust.
- 7.4 Regular visual inspections will be conducted within the site and on the local road network by the site personnel, as deemed necessary and especially during dry windy conditions to ensure that any dust sources are identified and dealt with promptly.
- 7.5 A complaints log will be held on site. In the event of receiving a dust complaint, the name and location of the complainant, the nature of the dust related complaint, the site activity and prevailing weather conditions at the time of the complaint shall be noted. The site foreman shall investigate the complaint and take any remedial action which is deemed appropriate.
- 7.6 In the event of a failure of dust mitigation measures, for example in extreme weather conditions, the dust generating activity shall be temporarily suspended, until appropriate dust mitigation is implemented or until a change in weather condition occurs.

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8.0 CUMULATIVE IMPACTS

- 8.1 There is a proposed Clifton Pastures Scheme consisting some 3000 residential properties, and 20ha of land used for industrial purpose. The scheme also involves the proposal of some 300 residential properties to be developed on the edge of Clifton. The construction and subsequent occupancy of dwellings has the potential to result in emissions to air.
- 8.2 The separation distance from the proposed residential development of the Clifton Pastures Scheme at the closest approach to the proposed mineral site processing plant location is greater than 250 metres. The typical adverse dust impacts from sand and gravel sites are uncommon beyond 250 metres, and in the absence of other information it is commonly accepted that the greatest potential impacts from high rates of dust deposition and elevated PM₁₀ particles will be within 100 metres of a source, including both large (>30um) and small dust particles.
- 8.3 If the mineral site adheres to the control and mitigation measures as highlighted in Section 7.0 above and Appendix 3, the impact from mineral extractive and processing operations will have minimal adverse effect, and will not be significant to the impact from the proposed Clifton Pastures Scheme.

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9.0 EMISSIONS STATEMENT

Introduction

- 9.1 Due to the absence of emission assessment techniques within the IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning, The Design Manual for Roads and Bridges – Air Quality, 2007 (DMRB) and Local Air Quality Management Technical Guidance (TG16) have been adopted in order to assess the possible need for a more detailed emissions assessment, including dispersion modelling.

Assessment Level – Scoping

- 9.2 DMRB – Air Quality describes scoping as, “seeking to decide which environmental topics are to be examined in environmental impact assessments and how much effort should be expended”.
- 9.3 DMRB - AIR Quality details a scoping exercise which indicates whether there is likely to be significant impact associated with development and sets out the following criteria for the identification of affected roads:
- Heavy Duty Vehicle flows will change by 200 AAT (average annual daily traffic)
 - Daily average speed will change by 10 km/hr or more; or
 - Peak hour speed will change by 20 km/hr or more

Designated Sites

- 9.4 As well as assessing the need for detailed emissions assessment in relations to human exposure, DRMB – Air Quality also provides the following scoping recommendations with regards to ecological considerations:

“The Designated Sites that should be considered for this assessment are those for which the designated features are sensitive to air pollutants, either directly or indirectly, and which could be adversely affected by the effect of local air quality on vegetation within the following nature conservation sites: SACs (SCIs or cSACs), SPAs, pSPAs, SSSIs and Ramsar sites. Only properties and Designated Sites within 200 m of roads affected by the project need be considered.”

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Non Road Mobile Machinery

- 9.5 Local Air Quality Management Technical Guidance (TG16) published by Defra details screening tools and methodology for the assessment of Air Quality. With regard to exhaust emissions from Non-Road Mobile Machinery (NRMM) and site traffic it advises that, with suitable controls and site management, NRMM are unlikely to make a significant impact on local air quality. The guidance goes on to suggest that, in the vast majority of cases, NRMM will not need to be quantitatively assessed.

Assessment

- 9.6 In order to assess the potential need for a detailed emissions assessment due to the proposed operations at Mill Hill and Barton in Fabis, both TG16 and DMRB – Air Quality have been utilised.
- 9.7 Daily HGV movements to and from the application site at Mill Hill and Barton in Fabis, are predicted to occur at a peak rate of 114 movements per day, causing no increase to the daily average speed or the peak average speed on the surrounding road traffic networks.
- 9.8 Holme Pit (SSSI) and Attenborough Nature Reserve (SSSI), lie in excess of 600 metres from roads affected by the proposed development.

Conclusion

- 9.9 Due to the development at Mill Hill and Barton in Fabis not meeting the scoping criteria within DMRB –Air Quality and following the guidance within TG16, it is concluded that an emissions assessment is not required for the development site.
- 9.10 Utilising the control measures detailed in Appendix 3 it is considered that emissions from site operations are unlikely to cause any significant decrease in local air quality at properties and SSSI's surrounding site.

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10.0 CONCLUSIONS

- 10.1 It is unlikely that any significant decrease in local air quality will occur due to the proposed operations at Mill Hill and Barton in Fabis. Any dust occurrence event will be limited and of short duration and will be minimised by implementation of the dust control recommendations.
- 10.2 With regard to PM₁₀ and PM_{2.5} dust levels from the site, analysis has been made of the air quality data. The conclusion of the analysis was that AQO will not be exceeded.

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11.0 REFERENCES

1. The Environmental Effects of Dust from Surface Mineral Workings, DOE, 1995.
2. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2003.
3. National Planning Policy Framework, Department for Communities and Local Government, March 2012.
4. Planning Practice Guidance, Department for Communities and Local Government, March 2014.
5. Development Control: Planning For Air Quality (2010 Update), Environmental Protection UK, April 2010.
6. Good Practice Guide: control and measurement of nuisance dust and PM₁₀ from the extractive industries. Mineral Industry Research Organisation, February 2011.
7. Minerals Policy Statement 2. Controlling and mitigating the environmental effects of minerals extraction in England. Annex 1: Dust, Office of the Deputy Prime Minister, 2005.
8. Her Majesty's Inspectorate of Pollution, Technical Guidance Note (Dispersion) 1, HMSO, 1993.

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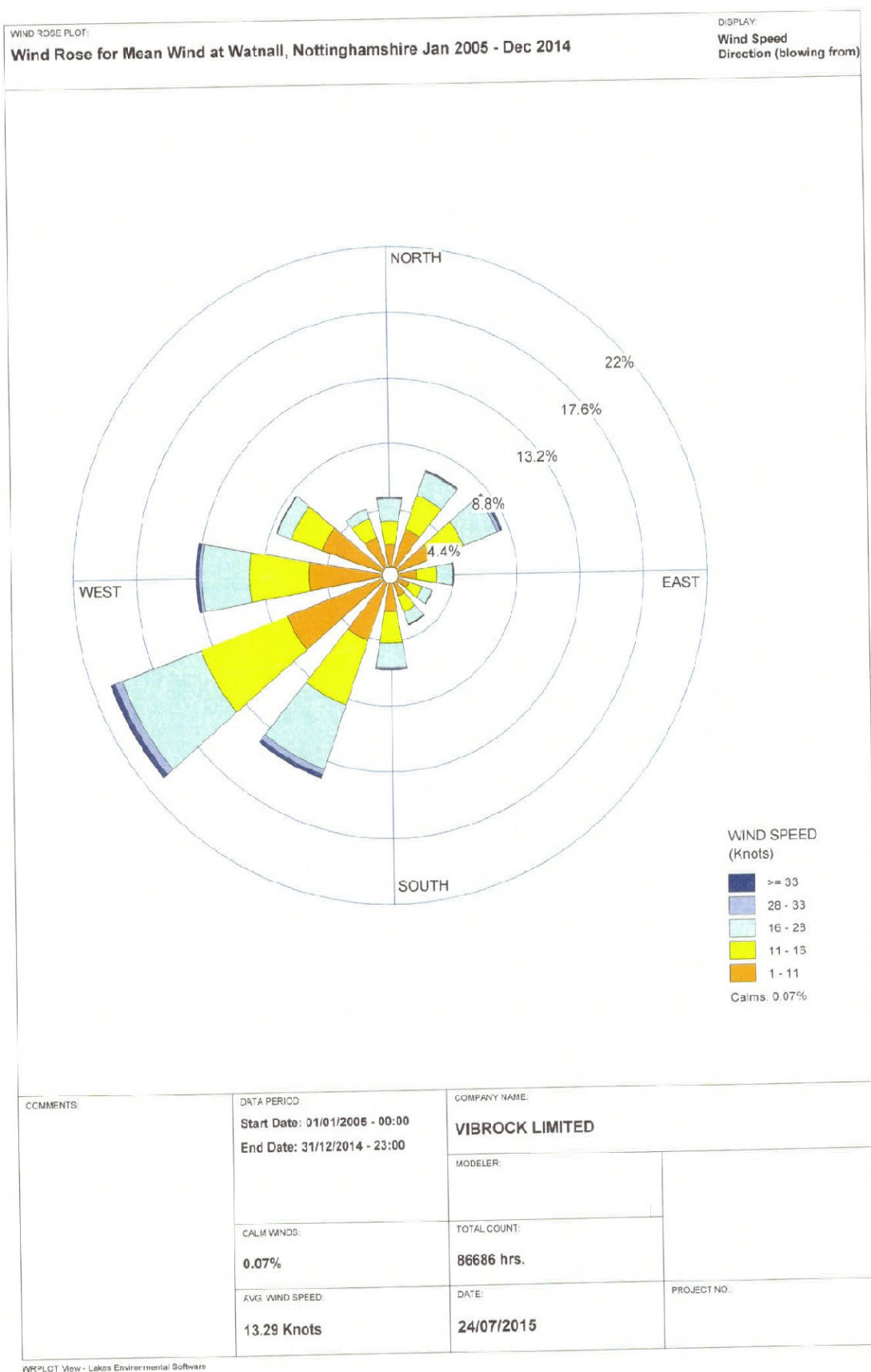
FIGURE 1 – MONITORING AND PREDICTION LOCATIONS



1. 1 Todd Close
2. Burrows Farm
3. Fabis Barn, Chestnut Lane
4. Middlewicket Cottage, The Strand
5. 14 Barbury Drive

APPENDIX 1

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APPENDIX 2

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MEAN NUMBER OF DAYS WITH RAINFALL LESS THAN 0.2 MM

10 YEAR PERIOD FROM JANUARY 2005 – DECEMBER 2014

Site: Watnall, Nottinghamshire

Month	No of days
January	10.6
February	11.9
March	13.4
April	14.4
May	16.4
June	16.9
July	14.8
August	15.6
September	15.0
October	11.9
November	8.1
December	10.5
Annual	159.5

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APPENDIX 3

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SUMMARY OF DUST CONTROL MEASURES

Site Operation	Dust Control Measures
Mineral Extraction/Movement	Controlled use of fixed short haul routes Haul routes to be regularly maintained by grading to minimise dust generation Drop heights to be minimised Mobile plant exhausts and cooling fans to point away from ground All plant to be regularly maintained
Mineral Processing	Stockpiled material to be protected from prevailing wind where possible Water to be used as required Vehicle speeds limited to 10mph around plant All vehicles to pass over rumble strip before exiting site All vehicles to pass through water sprinkler system when entering and exiting site
Access Road	Use of water on access road when required Use of road sweeper on access road when required All lorries leaving site to be sheeted

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