Amenity Impact & Mitigation Report

Proposed Extension at
Mundham Quarry
Mundham
Norfolk

On behalf of
Earsham Gravels Limited

Technical Report Ref. IEC/3642/01/AVH

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Mundham Quarry

Mundham, Norfolk

Prepared For	Earsham Gravels Limited Bath Hills Road Earsham Bungay NR35 2AE
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1.0 Introduction

1.1 Earsham Gravels Limited is seeking to include an extension at Mundham Quarry within the 'call for mineral extraction sites' for the Norfolk Minerals Local Plan Review.

1.2 At the request of Earsham Gravels Limited, Independent Environmental Consultancy Limited has been commissioned to undertake an outline assessment of noise and dust from the proposed extensions. This assessment is considered a feasibility study in establishing how noise and dust from the extension area can be adequately mitigated to protect the amenity of local residents.

1.3 The outline assessment considers baseline conditions, determines suitable criterion based on relevant guidance and standards and discusses likely methods of mitigation to ameliorate noise and dust levels to reasonable and acceptable levels.

2.0 Site Description

2.1 Site Location and Noise-Sensitive Receptors

2.1.1 The extension area is located to the south of Mundham Road and north of the existing quarry. The proposed extension area is shown in Appendix B.

2.1.2 The nearest residential dwellings to the proposed extension area are located to the north and west of the site. The dwellings located to the north along Mundham Road are approximately 140m from the extraction area, whilst Mundham House is approximately 400m away to the west.

2.2 General Environs

2.2.1 The main significant sources affecting the existing noise climate relates to the following:

(i) Traffic using the local road network;
(ii) Agricultural activity;
(iii) Birdsong; and
(iv) Light aircraft.

3.0 Noise Criteria

3.1 Introduction

3.1.1 The following section outlines the key planning policy and guidance that relates to the assessment of residential amenity and protection of residents from environmental noise sources.

3.1.2 In the context of this assessment, noise is defined as sound that is unwanted by the recipient. The effects of noise on the neighbourhood are varied and complicated, and include such things as interference with speech, communication, disturbance of work, leisure or sleep. A further complicating factor is that in any one neighbourhood some individuals will be more sensitive to noise than others.

3.1.3 A measure that is in general use and is recommended internationally for the description of environmental noise is the equivalent continuous noise level or L_{Aeq} (Equivalent Continuous Sound Pressure Level) parameter.

3.1.4 In 2000, Building Research Establishment (BRE) conducted a national study[1] of environmental noise levels for the Department of the Environment (`The National Noise Incidence Study 2000'). The study found that 55 (+/- 3%) of the population of England and Wales live in dwellings exposed to day-time noise levels above the World Health Organisation (WHO) level of 55dB $L_{Aeq,day}$. It also found that 63 (+/- 3%) of the population were exposed above the level of 45dB $L_{Aeq,night}$.

3.2 National Planning Policy Framework (NPPF): 2012

3.2.1 The National Planning Policy Framework (NPPF)[2] was published on 27 March 2012 with immediate effect. The NPPF revokes and replaces a number of Planning Policy Statements (PPS), Planning Policy Guidance (PPG) and other guidance documents, including the following regarding noise:

- Planning Policy Guidance 24: Planning and Noise (1994) [3]

3.2.2 The following section within the NPPF refers specifically to noise.

"Conserving and enhancing the natural environment

The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*

[1] *Defra, (2002). The National Noise Incidence Study 2000. Building Research Establishment.*
[2] *National Planning Policy Framework NPPF, March (2012) Department for Communities and Local Government.*
[3] *Planning Policy Guidance: Planning and Noise PPG24, September (1994) Department of the Environment.*

- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established (subject to the provisions of the Environmental Protection Act 1990 and other relevant law); and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

3.2.3 The NPPF does not provide any prescriptive advice on how to achieve these objectives. Reference is made to the Noise Policy Statement[4] for England March 2010 (Department for the Environment, Food and Rural Affairs). However, this document does not provide any meaningful guidance with regards guidance on noise limits of guideline values. Therefore, it is appropriate to consider advice in the other guidance documents.

3.3 The Noise Policy Statement for England (NPSE): 2010

3.3.1 The Noise Policy Statement for England (NPSE) was published in March 2010. It specifies the following long-term vision in policy aims: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

3.3.2 The NPSE introduced three concepts to the assessment of noise, which includes:
NOEL – No Observed Effect Level
This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
LOAEL – Lowest Observable Adverse Effect Level
This is the level above which adverse effects on health and quality of life can be detected.
SOAEL – Significant Observed Adverse Effect Level
This is the level above which significant adverse effects on health and quality of life occur.

3.3.3 The above categories are however undefined in terms of noise levels and for the SOAEL the NPSE indicates that the noise level will vary depending upon the noise source, the receptor and the time of day/day of the week, etc. The need for more research is therefore required to establish what may represent an SOAEL. It is acknowledged in the NPSE that not stating specific SOAEL levels provides policy flexibility until there is further evidence and guidance.

3.3.4 The following commentary is given on the representation of NOEL, LOAEL and SOAEL in relation to existing British Standards/ International guidelines:
NOEL – Inaudibility

[4] *Noise Policy Statement for England NPSE, March (2010) Department for Environment, Food and Rural Affairs.*

LOAEL – The guideline values for community noise in specific environments as set out in Table 1 of the WHO Guidelines for Community Noise 1999 and Table 4 of British Standard 8233: 2014 Guidance on sound insulation and noise reduction in buildings.

3.3.5 The NPSE concludes how the LOAEL and SOAEL relate to the three aims listed in paragraph 3.1.5.' above. The initial aim relates to avoiding significant adverse effects on health and quality of life, it then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when:

> *"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development."*

3.3.6 The final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development.

3.3.7 The Government is undertaking a review of technical guidance but currently there is no agreed methodology for noise to accompany the NPPF guidance.

3.3.8 The Government has recently removed the existing Planning Policy Guidance on noise, which was known as PPG24: 1994. The National Planning Policy Framework, which has recently been published states *"109. The planning system should contribute to and enhance the natural and local* environment by:

- *Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;"*

3.4 National Planning Practice Guidance (NPPG): 2014

3.4.1 The Department for Communities and Local Government published the final version of the National Planning Practice Guidance (NPPG) on 06 March 2014.

3.4.2 The NPPG includes a table summarising the noise exposure hierarchy, based on the likely average response. Under the heading of 'perception' the 'noticeable and not intrusive' assessment of noise is defined as '*noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such there is a perceived change in the quality of life'*. The increasing effect level under these conditions is deemed to be '*no observed adverse effect*' and no specific measures are required.

3.4.3 Full details of the National Planning Practice Guidance on effects are provided in Table 3.1.

Table 3.1: Noise Exposure Hierarchy

Perception	Example of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
	Lowest Observed Adverse Effect Level		
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
	Significant Observed Adverse Effect Level		
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

3.4.4 The section in the NPPG headed `Assessing environmental impacts from minerals extraction' (Ref paragraphs 19 to 22) is provided below for ease of reference:

"19. Those making mineral development proposals, including those for related similar processes such as aggregates recycling and disposal of construction waste, should carry out a noise impact assessment, which should identify all sources of noise and, for each source, take account of the noise emission, its characteristics, the proposed operating locations, procedures, schedules and duration of work for the life of the operation, and its likely impact on the surrounding neighbourhood.

Proposals for the control or mitigation of noise emissions should:

- *consider the main characteristics of the production process and its environs, including the location of noise-sensitive properties and sensitive environmental sites;*
- *assess the existing acoustic environment around the site of the proposed operations, including background noise levels at nearby noise-sensitive properties;*
- *estimate the likely future noise from the development and its impact on the neighbourhood of the proposed operations;*
- *identify proposals to minimise, mitigate or remove noise emissions at source;*
- *monitor the resulting noise to check compliance with any proposed or imposed conditions.*

20. Mineral planning authorities should take account of the prevailing acoustic environment and in doing so consider whether or not noise from the proposed operations would:

- *give rise to a significant adverse effect;*
- *give rise to an adverse effect; and*
- *enable a good standard of amenity to be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure would be above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.

Noise Standards

21. Mineral planning authorities should ***aim*** *to establish a noise limit, through a planning condition, at the noise-sensitive property that does not exceed the background noise level ($L_{A90,1h}$) by more than 10dB(A) during normal working hours (0700-1900).* ***Where it will be difficult not to exceed the background level by more than 10dB(A) without imposing unreasonable burdens on the mineral operator, the limit set should be as near that level as practicable.*** *In any event, the total noise from the operations should not exceed 55dB(A) LAeq, 1h (free field). For operations during the evening (1900-2200) the noise limits should not exceed the background noise level ($L_{A90,1h}$) by more than 10dB(A) and should not exceed 55dB(A) LAeq, 1h (free field). For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property.*

Where the site noise has a significant tonal element, it may be appropriate to set specific limits to control this aspect. Peak or impulsive noise, which may include some reversing bleepers, may also require separate limits that are independent of background noise (e.g. Lmax in specific octave or third-octave frequency bands – and that should not be allowed to occur regularly at night.)

Care should be taken, however, to avoid any of these suggested values being implemented as fixed thresholds as specific circumstances may justify some small variation being allowed.

Temporary Operations

Activities such as soil-stripping, the construction and removal of baffle mounds, soil storage mounds and spoil heaps, construction of new permanent landforms and aspects of site road construction and maintenance.

Increased temporary daytime noise limits of up to 70dB(A) LAeq 1h (free field) for periods of up to eight weeks in a year at specified noise-sensitive properties should be considered to facilitate essential site preparation and restoration work and construction of baffle mounds where it is clear that this will bring longer-term environmental benefits to the site or its environs.

Where work is likely to take longer than eight weeks, a lower limit over a longer period should be considered. In some wholly exceptional cases, where there is no viable alternative, a higher limit for a very limited period may be appropriate in order to attain the environmental benefits. Within this framework, the 70 dB(A) LAeq 1h (free field) limit referred to above should be regarded as the normal maximum."

3.4.5 To summarise, for routine daytime operations, the NPPG suggests that a suitable noise level criteria would be a limit of 10 dB above the background noise level (whilst considering not placing unreasonable burdens on a mineral operator), subject to a maximum of 55 dB $L_{Aeq, 1hour}$

3.4.6 The guidance also acknowledges that certain temporary operations are unable to meet noise limits for routine operations. Therefore, a limit of 70 dB $L_{Aeq, 1hour}$ should be regarded as the normal maximum by local authorities to facilitate such works for a period of up to 8 weeks in any year.

3.4.7 Noise levels in proximity to the nearest noise sensitive receptors should be determined over a suitably representative period in order to characterise the existing background noise climate.

3.4.8 Reference should be made to NPPF and NPPG to establish suitable noise criteria at the nearest noise sensitive receptors, with regard to the prevailing background noise climate or maximum permissible limits.

3.4.9 The prediction routines within British Standard 5288:2009+A1:2014[5] should be used to predict the worst-case noise levels arising from the proposed operations. The resultant noise levels should be compared with the criteria noise levels to establish the acceptability of the scheme, and determine the extent of mitigation measures to reduce site noise, where required.

[5] *British Standard 5228-1: 2009 + A1: 2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise.'*

4.0 Air Quality Criteria

4.1 Introduction

4.1.1 There is no universally adopted definition of dust but for the purposes of this assessment dust is taken to comprise either organic or inorganic particles in the size range of 1-75 μm (micron). Particles less than 1 μm behave more like gases than solids and are generally referred to as "fume", whilst particles larger than 75 μm are termed "grit".

4.1.2 Dust causes concern when it is deposited in and around homes, schools and other sensitive locations in visible quantities.

4.1.3 Larger particles of 30-75 μm which are relatively high mass and settling velocity generally deposit within 100m from source. Intermediate sized particles (10-30 μm) make up only a small proportion of dust and tend to deposit within 500m from source, with the majority deposited with 250m.

4.1.4 Smaller particles (less than 10 μm) and termed PM_{10} can travel 1000m or more from the source. Smaller $PM_{2.5}$ are less than 2.5 micrometres in diameter.

4.2 National Planning Policy Framework (NPPF): 2012

4.2.1 The National Planning Policy Framework (NPPF) states the Government's policy on planning and is a material consideration for local planning authorities and decision-takers in determining applications. Under the heading 'Facilitating the sustainable use of minerals', the NPPF states:

"When determining planning applications, local planning authorities should:

- *ensure, in granting planning permission for mineral development, that there are no unacceptable adverse impacts on the natural and historic environment, human health or aviation safety, and take into account the cumulative effect of multiple impacts from individual sites and/or from a number of sites in a locality; and*

- *ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source…". The NPPF is supported by the National Planning Practice Guidance (NPPG), including sections focusing on both air quality generally and minerals specifically The Minerals section of the NPPG provides the principles to be followed in considering the environmental effects of surface mineral workings and states that: "Where dust emissions are likely to arise, mineral operators are expected to prepare a dust assessment study, which should be undertaken by a competent person/organisation with acknowledged experience of undertaking this type of work."*

4.3 National Planning Practice Guidance (NPPG): 2014

4.3.1 The National Planning Practice Guidance (NPPG) for England states that:

"Where dust emissions are likely to arise, mineral operators are expected to prepare a dust assessment study, which should be undertaken by a competent person/ organisation with acknowledged experience of undertaking this type of work".

4.3.2 *Specifically relating to dust assessments, the Minerals section of the NPPG states that:*

"There are five key stages to a dust assessment study:
- *establish baseline conditions of the existing dust climate around the site of the proposed operations;*
- *identify site activities that could lead to dust emission without mitigation;*
- *identify site parameters which may increase potential impacts from dust;*
- *recommend mitigation measures, including modification of site design; and*
- *make proposals to monitor and report dust emissions to ensure compliance with appropriate environmental standards and to enable an effective response to complaints."*

4.4 Air Quality Standards

4.4.1 Statutory standards exist for concentrations of suspended particulate matter (both PM_{10} and the $PM_{2.5}$), set under The Air Quality Standards Regulations 2010[6] which implement limit values prescribed by the European Directive 2008/50/EC.

4.1: UK Air Quality Criteria

Pollutant	Averaging Period	Limit Value/Objective	Date to be achieved by
Particulate Matter (PM_{10})	Daily Mean	50 µg/m^3, not to be exceeded more than 35 times per year	-
	Annual Mean	40 µg/m^3	-
	Annual Mean	Target of 15% reduction in concentrations at urban background locations	Between 2010 and 2020
Particulate Matter ($PM_{2.5}$)	Annual Mean	Variable target of up to 20% reduction in concentrations at urban background locations	Between 2010 and 2020
	Annual Mean	25 µg/m^3	2020

4.4.2 Local Air Quality Management Technical Guidance (TG16)[7] provides a methodology and associated tools that local authorities should use to screen sources of pollution. In terms of fugitive or uncontrolled sources, the guidance recommends that the following approach is taken:

- Where properties are within 200 metres to the source, local authorities are advised to investigate whether any dust nuisance complaints have been reported, as this may give a guide to potential problems (up to 1km if background PM_{10} > 28µg/m^3).

4.4.3 If it is demonstrated that the impact is likely to be significant, then the operator would be required to implement best practice to control particulate emissions, as well as

[6] *Air Quality Standards (England) Regulations, 2010. Statutory Instrument 2010 No.1001.*
[7] *DEFRA Technical Guidance (2016) 'Local Air Quality Management' (TG16).*

monitor and control the PM_{10} concentrations through measurement and operational restrictions.

Deposited Dust

4.4.4 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.

4.4.5 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.

4.4.6 Custom and practice at mineral extraction sites have used the figure of 200 mg/m²/day as a nuisance threshold in the UK.

4.4.7 For surface soiling the public response nuisance thresholds as described in Table 4.2 have been applied.

4.2: Public Response Levels to Surface Soiling

% Effective Area Covered (EAC) per day	Outcome
0.2	Noticeable
0.5	Possible Complaint
0.7	Objectionable
2.0	Probable Complaint
5.0	Serious Complaint

† Table based on Beaman and Kingsbury (1981)[8], quoted in Environment Agency M17[9].

[8] *Beaman, A. L. and Kingsbury, R. W. S. M. (1981) "Assessment of Nuisance from Deposited Particulates using a Simple and Inexpensive Measuring System ", Clean Air, 11(2), 1981, pp77 – 81.*
[9] *Environment Agency, Monitoring of particulate matter in ambient air around waste facilities, TGN M17 (March 2013).*

5.0 Existing Noise Climate

5.1 Introduction

5.1.1 A baseline noise survey was carried out at two locations in the vicinity of the proposed extension area (refer to Appendix C). The purpose of the baseline monitoring was to establish existing noise levels and determine likely noise criterion according to NPPG.

5.2 Environmental Noise Survey Methodology

5.2.1 The baseline environmental noise monitoring was carried out at two locations in order to characterise the ambient and background noise climate in the vicinity of the extension site. The monitoring was carried out on the following date:

- Monday 26th June 2017

5.2.2 The instrumentation displayed below was used for the measurements undertaken during the noise monitoring.

Table 5.1: Details of Instrumentation

Manufacturer	Equipment	Serial No.	Calibration Due Date
Norsonic	Sound Level Meter Type 118	31832	05/04/2018
Norsonic	Sound Level Meter Type 118	31337	05/04/2018
Norsonic	Acoustic Calibrator 1251	34495	31/08/2017

5.2.3 The sound level meters were calibrated with the electronic calibrator prior to the commencement and on the completion of the survey. No significant drift in calibration was observed. The meters used during the survey are a precision grade Type 1.

Calibration Setting: 114 dB @ 1kHz
Meter Setting: Fast Response

5.3 Measurement Procedure

5.3.1 Noise monitoring was undertaken at least 3.5m from any vertical reflecting surface and at a height of 1.5m of ground level.

5.3.2 The noise monitoring was conducted in climatic conditions suitable for monitoring environmental noise levels in accordance with advice given in British Standard 7445: 2003 `Description and measurement of environmental noise'[10].

[10] *BS7445:2003 Description and measurement of environmental noise. British Standards Institution, 2003.*

5.4 Baseline Noise Survey Results

5.4.1 The results of the survey are summarised in Table 5.2 (full results are displayed in Appendix D.1-D.2).

Table 5.2: Environmental noise levels measured at monitoring locations

Location Ref.	Location Description	Statistical Parameters (dB)	
		$L_{Aeq,1hour}$	$L_{A90,1hour}$
P1	Dwellings along Mundham Road	57.2	32.7
P2	Track south of Mundham House	41.8	31.0

5.4.2 The measurements were carried out over 1-hour monitoring periods. The monitoring duration should provide a reasonable indication of typical and representative noise levels for the purposes of a feasibility study. However, full impact assessments accompanying any subsequent planning application are likely to require a longer monitoring period.

5.5 Operational Noise Limits

5.5.1 For routine daytime operations, The National Planning Practice Guidance (NPPG) suggests that a suitable noise level criterion would be a limit of 10 dB above the background noise level, subject to a maximum of 55 dB $L_{Aeq,\ 1hour}$. On this basis, criterion for routine operations at each of the identified receptor locations are presented in Table 5.3.

Table 5.3: Noise criterion for routine operations based on NPPG

Location Ref.	Location Description	Background Noise Level $L_{A90,1hour}$ (dB)	Criterion L_{A90} + 10 dB
P1	Dwellings along Mundham Road	33	43
P2	Track south of Mundham House	31	41

5.5.2 The guidance also acknowledges that certain temporary operations are unable to meet noise limits for routine operations. Therefore, a limit of 70 dB $L_{Aeq,\ 1hour}$ should be regarded as the normal maximum by local authorities to facilitate such works for a period of up to 8 weeks in any year.

6.0 Existing Air Quality

6.1 Deposited Dust

6.1.1 Typical dust deposition rates range from 10 to 50 mg/m²/day (milligrams per square metre per day) in rural areas, from 30 to 80 mg/m²/day in suburban areas and from 80 to 160 mg/m²/day in town centre or industrial areas[11]. The area around the extension is best considered as "rural" which indicates a typical background dust deposition rate of around 10-50 mg/m²/day[12].

6.1.2 In open country, existing levels of deposited dust will typically be around 38 mg/m²/day based on an annual median. On a daily basis, values will vary due to weather conditions and agricultural or industrial activity. A general summary of dustfall rates are presented in Table 6.1 below[13].

Table 6.1: 5-year means of the annual percentiles of monthly dustfall rates (mg/m²/day insoluble deposits) determined using a dry Frisbee gauge

Location	Median (50th percentile)	90th percentile	95th percentile
Open country	38	103	140
Residential areas and the outskirts of town	56	146	203
Commercial centres of towns	90	199	261

6.1.3 The existing deposited dust levels around the site are influenced mainly by road traffic, agricultural activity and mineral extraction.

6.2 PM_{10} & $PM_{2.5}$ Particulates

6.2.1 Particle matter consists of a wide range of materials and arises from a variety of sources. Concentrations of particle matter comprise primary particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. Particle matter derives from both human-made and natural sources (such as sea spray and Saharan dust). In the UK the biggest human-made sources are stationary fuel combustion and transport.

6.2.2 As an indication of the likely level of PM_{10} and $PM_{2.5}$ particulates at the sites, data has been accessed for the relevant 1km square of the background concentration projections on the Defra website[14]. The PM_{10} and $PM_{2.5}$ levels are for the grid square E633500 / N297500. The PM_{10} levels for the local grid squares are presented in Table 6.2.

[11] *The Environmental Effects of Surface Mineral Workings (1991) HMSO.*
[12] *Warren Spring Laboratory (WSL) The investigation of Atmospheric Pollution – Deposit Gauge and Lead Dioxide Observations (October 1965 – March 1982).*
[13] *Good Practice Guide: Control and measurement of nuisance dust and PM10 from the extractive industries. Mineral Industry Research Organisation, February 2011.*
[14] *https://uk-air.defra.gov.uk/data/laqm-background-home*

Table 6.2: Modelled PM_{10} & $PM_{2.5}$ data provided by Local Air Quality Management support section via the DEFRA air quality website (µg/m³) for 2017

Location	*PM_{10} Annual Mean µg/m³*	*$PM_{2.5}$ Annual Mean µg/m³*
E633500/N297500	16.3	11.0

6.2.3 Within the surrounding area PM_{10} levels would be influenced by existing local traffic movements. Further influence on the PM_{10} levels of the area would come from power generation and industrial operations within the vicinity. Additionally global PM_{10} emissions will also have a considerable influence.

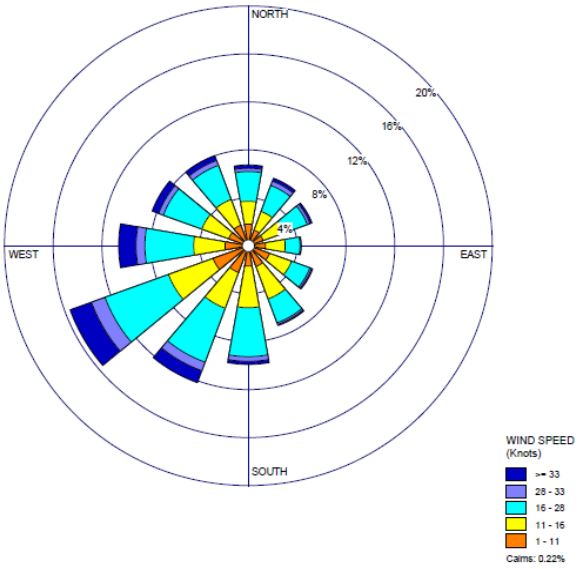
6.3 Meteorological Factors

Wind Speed and Direction

6.3.1 The generation of and dispersal of dust is highly dependent upon meteorological conditions prevalent at the time. WeatherNet, a commercial meteorology service, has advised that wind speed and direction data are recorded at Wattisham, Suffolk (some 55 kilometres south-west of the site). Observations of the wind speed and direction are recorded over a ten year period with greater than 87,000 hourly observations used to compile the relevant wind rose.

6.3.2 The data recorded at Wattisham over 10 years between 2003 and 2012 would be representative of the conditions experienced in the vicinity of the sites. We consider that this data is unlikely to be significantly affected by site topography. An extract from the Wattsiham wind speed and direction data is presented in Figure 6.1 as an annual wind rose.

Figure 6.1: Wind Rose for Mean Wind Speed 2003-2012 Wattisham, Suffolk



Rainfall Data

6.3.3 An indication of the long term average annual number of dry days (i.e. less than 0.2 mm) for the site has also been taken from records collected at Wattisham.

6.3.4 The data from Wattisham indicates that there is an average of 173 days per year with rainfall less than 0.2 mm, i.e. about 47% of the year.

6.4 Baseline Monitoring

6.4.1 As part of any future planning application, baseline monitoring would be carried out using frisbee gauges fitted with adhesive pad adaptor (as recommended in Environment Agency M8 guidance[15]). The monitoring should be carried out at least three months before any works commence within the relevant extension area[16].

[15] *Environment Agency Technical Guidance Note Monitoring. May 2011.*
[16] *Guidance on the Assessment of Mineral Dust Impacts for Planning (2016) Institute of Air Quality Management.*

7.0 Assessment of Noise Impact

7.1 Introduction

7.1.1 The actual noise levels generated by the development would vary at the nearest local receptors and will depend upon a number of variables, the most significant which are:

- The amount of noise generated by the plant or equipment being used on site; generally expressed as Sound Power Level (L_{WA});
- The periods of operation of the plant on site, known as the "on-time";
- The distance between the noise source and the receiving position;
- The attenuation due to ground absorption or barrier effects; and
- The reflection of noise due to the facades of buildings, etc.

7.2 Prediction Methodology

7.2.1 The prediction methods used in this outline assessment have been based on those detailed in BS5228: 2009+A1:2014. The Standard provides guidance on the attenuation of noise due to the effect of barriers, and the absorbing effect of soft ground, lying between the noise source and receptor.

7.2.2 Barrier shielding has been calculated using CRTN or Maekawa attenuation prediction routines.

7.2.3 The calculation for attenuation due to propagation over soft ground, where appropriate, is taken from BS5228. Attenuation due to air absorption (usually a minimal figure) has been ignored for the purposes of this assessment.

7.3 Plant Complement

7.3.1 The plant complement for the purposes of this feasibility study have been provided by Earsham Gravels Limited. At this stage the complement is indicative but is considered a reasonable representation of the likely working scenario.

Table 7.1: Plant complement for routine and temporary operations

Stage of Works	Plant Complement
Soil Stripping/Bund Formation/Archaeology (Temporary Operations)	1 no. Volvo E220EL 360° Excavator 2 no. Volvo A25D Dumptruck 1 no. D6H CAT Bulldozer (part-time) 1 no. Tractor & Bowser (dust suppression)
Mineral Extraction (Routine Operations)	1 no. Volvo E220EL 360° Excavator 1 no. Volvo L90H Loading Shovel 1 no. Volvo A25D Dumptruck 1 no. Powerscreen Chieftain Dry Mobile Screen

7.3.2 The sound power levels used are either from manufacturer's data, measured data or from BS5288. Table 7.2 below presents the noise level data used for the calculation routines.

Table 7.2: Sound power levels (L_{WA}) for plant associated with development

Description	Sound Power Level L_{WA} (dB)	Data Source
Volvo E220 EL 360° Excavator	103	Manufacturers Data
Volvo A25D Dumptruck	111	Manufacturers Data
D6H CAT Bulldozer	109	Manufacturers Data
Volvo L90H Loading Shovel	105	Manufacturers Data
Powerscreen Chieftain Dry Mobile Screen	111	IEC Database
Road Lorry (Site Access Road)	108	IEC Database

7.4 Impact Assumptions

7.4.1 The outline noise prediction routines are based on a number of assumptions concerning the working of the site. The worst-case situation is only likely to occur intermittently, with longer term noise levels being significantly less.

7.4.2 The calculation routines include screening provided by a 4m metre high bund between routine operations and the closest receptors. We have been advised that there will be an approximate average working depth of 4m.

7.4.3 Based on information supplied by Earsham Gravels Limited, plant "on-times" for routine operations are assumed to be as follows:

- 1 Volvo E220EL 360° Excavator (60%);
- Volvo L90H Loading Shovel (80%);
- Volvo A25D Dumptruck (20%); and
- Powerscreen Chieftain Dry Mobile Screen (50%).

7.4.4 A source height of 2m has been used in the calculation routines.

7.5 Impact Assessment

7.5.1 Prediction routines for the proposed extension area has been carried out at the nearest noise sensitive receptor positions. The predicted noise levels are for indicative purposes and are based on likely mitigation measures to meet NPPG criterion.

7.5.2 A summary of the predicted noise impact at the nearest noise-sensitive receptors (NSRs) is given in Table 7.3.

Table 7.3: Calculated L_{Aeq} Noise Levels

Noise-Sensitive Receptor	Predicted Noise Level $L_{Aeq,1hour}$ dB		Maximum Noise Criteria $L_{Aeq,1hour}$ dB	
	Routine Operations	Temporary Operations	Routine Operations	Temporary Operations
P1) Dwellings along Mundham Road	40-43	49-61	43	70
P2) Track south of Mundham House	38-41	43-50	41	70

7.5.3 Table 7.3 shows the highest predicted noise levels from the combined effect of all the relevant plant working within the extension area. The range of levels is based on the plant working at the closest anticipated approach and working at depth in the void or the combination of both relative to the nearest receptor property boundary.

7.5.4 The results of the outline prediction exercise indicate that with appropriate noise mitigation measures in place (see Noise Mitigation Strategy), all plant noise levels would be within the relevant guidance limit at the nearest receptor positions.

7.6 Noise Mitigation Strategy

7.6.1 In order to meet the best practice without placing unreasonable burden on the mineral operator, an outline Noise Mitigation Strategy has been considered with Earsham Gravels Limited and appointed consultants. The strategy will include the following:

- 140 metre stand-off between extraction operations and nearest residential properties;
- Formation of 4m high bund along the northern site boundary where the closest residential properties are located;
- Mineral extraction to take place at lower level of quarry face (approximate average depth of 4m);
- Quarry to be worked from south to north with plant located within 20m of quarry face;
- Minimise drop heights of materials; and
- The mobile plant with be fitted with broadband type reverse alarms to minimise any tonal noise characteristics.

7.6.2 Further mitigation measures to reduce the noise impact of the proposed extensions have been outlined below and would be adopted by Earsham Gravels Limited.

7.6.3 The site operator will select the use of inherently quiet plant where appropriate. Such machines may be fitted with properly lined and sealed acoustic covers which would be kept closed whenever the machines are in use. The site operator will continue to implement their policy of replacing older machinery with new, quieter machinery as it becomes available and as the business development allows

7.6.4 All plant will be subject to regular maintenance checks. All plant and machinery would be fitted with effective exhaust silencers and would be regularly inspected in order to ensure they are meeting the manufacturers' noise rating levels. Any silencers which become defective would be replaced immediately.

7.6.5 Start up plant rather than all plant together. All plant will be operated in a proper manner with respect to minimising noise emissions, for example minimisation of drop heights, no unnecessary revving of engines, switching off plant not in use, etc.

7.6.6 Wherever practically possible, plant fitted with reversing alarms will reverse in a direction away from the nearest noise sensitive properties. In addition, plant would wherever possible manoeuvre in a circular manner to avoid the use of reversing alarms.

7.6.7 Good site management is also an effective method of reducing the potential impact of the quarry workings. Earsham Gravels Limited management will aim to be proactive, to anticipate when potential noise problems may occur and to take the necessary preventative action. Site noise mitigation measures would be regularly reviewed and where appropriate, new equipment and/or practices implemented.

8.0 Assessment of Dust Impact

8.1 Introduction

8.1.1 Mineral extraction operations must be carried out in a carefully controlled way so that potential environmental impacts are suitability mitigated to an acceptable level.

8.1.2 Earsham Gravels Limited are aware of the potential for mineral extraction processes to generate dust nuisance and are committed to operating the site in accordance with current best practice guidance. Through the implementation of best practice measures to control and mitigate the generation and transportation of dust, emissions of dust from the site should be adequately controlled.

8.2 Dust Sensitive Receptors

8.2.1 Dust emissions from the mineral extraction processes, have the potential to increase levels of deposited dust and suspended particulates in the surrounding area. The potential impact of the site on receptors is dependent upon its location and wind direction.

8.2.2 As the extension area will be worked in a general south to north direction, the distance between source and receptor is likely to change during the operational life of the site. Typically, dust levels at receptor locations would decrease as the works move further away.

8.2.3 The following closest receptors to the site have been identified and have been rated according to sensitivity.

8.1: Closest Receptor Locations

Location Ref.	Location Description	Approximate Closest Distance from Extraction Area (metres)	Dust Sensitivity Category
P1	Dwellings along Mundham Road	140	Medium
P2	Track south of Mundham House	400	Medium

8.3 Potential Dust Sources

8.3.1 The mineral extraction processes has the potential for continued generation of dust and can be divided into the following operations:

- Topsoil/subsoil stripping;
- Overburden removal;
- Sand and gravel extraction;
- Transfer of material to processing area; and
- Restoration.

8.4 Dust Control Measures

8.4.1 Control measures to minimise the generation of dust from the extension areas will be based on the implementation of best management practice. The following dust control measures will be implemented:

- The plant will be subject to regular cleaning schedules;
- Minimal drop heights will be used during feeding of the screen;
- Correct matching of machinery to prevent spillage or clearance of any spilled material to avoid accumulations;
- Plant used within its design capacity;
- Switch off all plant when not in use;
- All plant to be regularly maintained;
- A mobile bowser will be available to water areas around the plant when required;
- The site will operate in accordance with Process Guidance Note PG3/8 (12) Secretary of State's Guidance for Quarry Processes[17];
- Monitoring of on-site wind speeds in order to assist site personnel with timing of operations; and
- Bunds and vegetation around the site boundary will reduce the levels of dust emitted to outside the site.

Site Management

8.4.2 Good site management is also an effective method of reducing the potential impact of the development. The site operator will ensure the following is implemented:

- Make all personnel aware of their responsibilities to minimise the generation of dust from site operations;
- Implement appropriate dust amelioration measures based on weather conditions and visual observation;
- Water is to be made available at all times to enable dust suppression measures to be implemented, when required;
- Review the performance of site personnel and dust amelioration measures in controlling dust emissions;
- Ensure all equipment is maintained; and
- Ensure records are maintained;

8.4.3 Earsham Gravels Limited management will aim to be proactive, to anticipate when potential dust problems may occur and to take the necessary preventative action. Site dust mitigation measures would be regularly reviewed and where appropriate, new equipment and/or practices implemented.

[17] *Defra (2012) Process Guidance Note PG3/8 (12) Secretary of State's Guidance for Quarry Processes.*

8.5 Dust Complaints

8.5.1 Any complaints received by Earsham Gravels Limited regarding nuisance dust generated by the site will be recorded in a log. The log will contain the date when the complaint was made, the nature of the complaint, details of any action implemented to resolve the complaint and when the complaint was resolved.

8.6 Impact Assessment

8.6.1 The outlined methods of dust suppression are based on best practice for handling potentially dusty materials. The dust control measures are recognised as good practice.

8.6.2 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. Materials of this nature are more readily available if dry and physically disturbed. Therefore, 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 various factors including particle density, size & shape.

8.6.3 In order for a dust event to occur there must also be a failure of adequate dust control measures. It is generally accepted that particles of less than 30µm (micron) would be carried by wind and therefore become fugitive. Particles greater than 30µm make up the greatest proportion of dust emitted from mineral extraction sites deposit within 100m of sources. Particles between 10-30µm are likely to travel from 250 to 500m, while particles below 10µm, which make up a small proportion of dust emitted from extraction operations, may travel up to 1km from sources.

8.6.4 In considering the climatic conditions, it is clear the winds will predominate from the south-west quadrant (south south west and west south west combined) with an analysis of the number of dry windy working days giving a maximum of some 30 (thirty) such days likely any one year as analysed in the years between 2003 and 2012.

8.6.5 The dwellings along Mundham Road are approximately 140m from the site boundary. The dwellings would be expected to experience 24 dry windy working days from the S/SSW (combined) per annum.

8.6.6 The vast majority of dust particles (95%) are deposited within 100m of the source. In addition, the receptor will be separated from the extension area by a screening bund (up to 4m high), as well as vegetation, which suppress dust emissions by reducing wind velocities over bare ground. Therefore, given the separation distance, number of dry windy days and mitigation measures proposed, the outline assessment has identified the extension area as having a low potential dust impact.

8.6.7 Mundham House is located approximately 390m from the site boundary. The dwelling would be expected to experience 11 dry windy working days from the west per annum.

8.6.8 The receptor will be separated from the extension area by an existing low screening bund, as well as vegetation, which suppress dust emissions by reducing wind velocities over bare ground. Therefore, given the separation distance, number of dry windy

days and mitigation measures proposed, the outline assessment has identified the extension area as having a low potential dust impact.

8.6.9 The NPPG contains a site assessment flowchart for the consideration of impacts from particulate (PM_{10}) air pollution from a mineral extraction site.

8.6.10 The framework takes a step by step approach to PM_{10}, taking into account various factors in a "Site Assessment Flowchart". If the site is not likely to have a significant impact then best practice measures are recommended. However, if its impact is significant either a refusal should follow or additional monitoring and control.

8.6.11 The first step of the framework is to assess whether the site has residential properties or other sensitive uses within 1000m of the site boundary. In this case there are residential properties within 1000m.

8.6.12 The next step is to assess whether the extra PM_{10} particulates burden from the site is likely to exceed the National Air Quality Objectives (AQO). To undertake this assessment data has been accessed from modelled data provided by Local Air Quality Management support section via the DEFRA air quality website.

8.6.13 There are difficulties associated with quantifying dust emissions from fugitive or uncontrolled sources (e.g. mineral extraction). However, it has been suggested that mineral extraction and construction work are thought to account for less than 1 µg/m³ of PM_{10} levels[18].

8.6.14 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?"[19] The research showed that PM_{10} concentrations measured at communities in the vicinity of opencast mines are on average only 2 μgm^{-3} higher than similar communities which are not close to opencast mines. Furthermore, increased PM_{10} levels in opencast communities could not be correlated with site working hours or monitored wind direction. The research also stated that there was no clear evidence to show that increased levels of respiratory illness in opencast communities, nor were asthmatic attacks in children more common or severe than demonstrated in the control communities.

8.6.15 If the DEFRA data indicates that the additional load attributable to site operations, to be taken as 2 µg/m³ for the scope of this assessment, would bring the area above the AQO then this would indicate that there may be a need for monitoring and control mechanisms.

8.6.16 If the data indicates that the additional load attributable to site operations alone of 2 µg/m³ would not cause any breach of the AQO, this indicates that there would be no justification for any additional monitoring and controls over and above best practice measures.

8.6.17 This feasibility study has therefore accessed air quality data for the relevant South Norfolk Council area for 2017. The projected PM_{10} annual mean burden for 2017 is 16.3 µg/m³.

[18] *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2003.*
[19] *'The Newcastle Report' (1999) HMSO.*

8.6.18 The combined projected PM_{10} concentration for 2017 would be 18.3 µg/m³. This is well below the Air Quality Objective (AQO) of 40 µg/m³ and therefore would have no negative health effects.

8.6.19 The screening procedure adopted confirms that the PM_{10} from site activity in the extension area is unlikely to cause an exceedance of the Air Quality Objectives. Therefore, best practice measures proposed for dust control are likely to be adequate.

9.0 Conclusions

9.1 The purpose of this outline noise and dust impact assessment is to establish the feasibility of mitigating impacts to sensitive receptors located in proximity to the extension area.

9.2 All site operational activities have been assessed, which includes site soil movement, construction of earth embankments, extraction of mineral and the restoration of the site. The likely range of noise levels generated from site operations with all main plant items operating under realistic site working methods have been calculated based on indicative proposals.

9.3 Mitigation measures included within the outline assessment include a minimum 140 metre stand-off between extraction operations and residential properties, as well as bunds up to 4m in height.

9.4 The results of the noise prediction calculations using the appropriate methodology (BS 5228:2009+A1:2014) has shown the following:

i. Noise from the use of quarry plant within the extension area should not exceed a noise limit level of 10 dB(A) above the background noise level, as required by the National Planning Practice Guidance (NPPG) for routine mineral operations.

ii. The results of the assessment also show that for temporary noise events, such as soil stripping, bund formation and site restoration would not exceed the short term maximum levels of 70 dB $L_{Aeq,1hour}$ for 8 weeks per year.

9.5 It can be concluded that `best practice' techniques to control noise should ensure that the extension would meet appropriate and reasonable criterion for mineral extraction.

9.6 The majority of dust generated from the proposed mineral extraction area will be larger particles (>30 µm). Particles of this size generally deposit within 100m of the source.

9.7 It is unlikely that any significant decrease in local air quality will occur due to the working of the extension. Any dust occurrence event will be limited and of short duration, and will be minimised by implementation of the dust control recommendations detailed in full impact assessments submitted as part of any subsequent planning application.

9.8 With regard to PM_{10} dust levels from the extension areas, analysis has been made of the projected air quality data from the DEFRA website. This has been combined with the extra burden of 2 µg/m³ for the mineral extraction operations. These results show that the Air Quality Objectives will not be exceeded.

9.9 The outline assessment has concluded that, with the implementation of mitigation measures as described in this report, there would be insignificant impacts in terms of noise and dust on properties located in proximity to the extension.

Appendices

Appendix A

A.0 NOISE PERCEPTION AND TERMINOLOGY

A.1 Terminology

A.1.1 Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

A.1.2 The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB(A).

A.1.3 The following lists the sound pressure level in dB(A) for common situations.

Table A.1: Noise Levels for Common Situations

Typical Noise Level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library Refrigerator humming at 2m
50	Quiet office, no machinery Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m Vacuum cleaner at 3m
80	General factory noise level
90	Heavy goods vehicle from pavement Powered lawnmower, operator's ear
100	Pneumatic drill at 5m
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

A.1.4 The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly

reduced compared to daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

A.1.5 A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level, L_{A90}. This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a 1-hour period the L_{A90} will be the noise level exceeded for 54 minutes.

A.1.6 The equivalent continuous A-weighted sound pressure level, L_{Aeq}, is the single number that represents the total sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy level from individual sources that vary in level over their operational cycle.

A.1.7 The R_w is a single number rating used to describe the sound insulation of building elements. Traditional masonry walls will achieve no less than 48 dB R_w, single glazed windows approximately 25 dB R_w. The figure is mostly used when calculating noise transmission through building elements.

A.1.8 Human subjects, under laboratory conditions, are generally capable of noticing changes in steady levels of 1 dB(A). However, in the general environment changes of around 3 dB(A) can be detected. It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of loudness. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to changes in road traffic flow, or intermittent noise sources).

A.2 Perception - Frequency

A.2.1 Frequency is the rate at which the air particles vibrate. The more rapid the vibrations, the higher the frequency and perceived pitch. Frequency is measured in Hertz (Hz).

A.2.2 A young person with average hearing can generally detect sounds in the range 20 Hz to 20,000 Hz (20 kHz). Figure A.1[20] below illustrates the range of frequencies, for example, the lowest note on a full scale piano, 'A', has a fundamental at 28 Hz, and the highest, 'G', a fundamental at 4186 Hz (there will be higher order harmonics). Human speech is predominantly in the range 250 Hz - 3000 Hz.

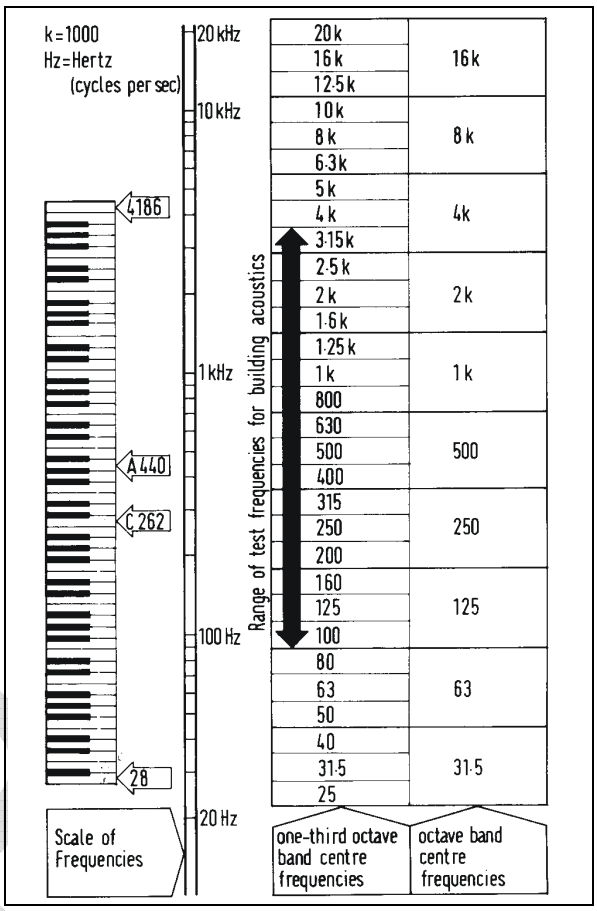
A.2.3 The musical term 'octave' is the interval between the first and eighth note in a scale and represents a doubling of frequency. A series of octave and one-third octave bands have been derived, as shown in the Figure overleaf, and these are commonly used in noise measurements where it is necessary to describe not only the level of the source noise but also the frequency content. The frequency content of a noise source can be useful for identifying acoustic features such as a whine, hiss or screech.

A.2.4 In most instances it is necessary only to specify and use the overall A-weighted noise values, for example when assessing noise from fixed plant (pumps, motors, refrigeration plant etc.), road traffic and general industrial sources. However, in certain circumstances it is necessary to consider the contribution to the overall A-

[20] *BRE and CIRIA (1993) Sound Control for Homes. BRE Report 238, CIRIA Report 127.*

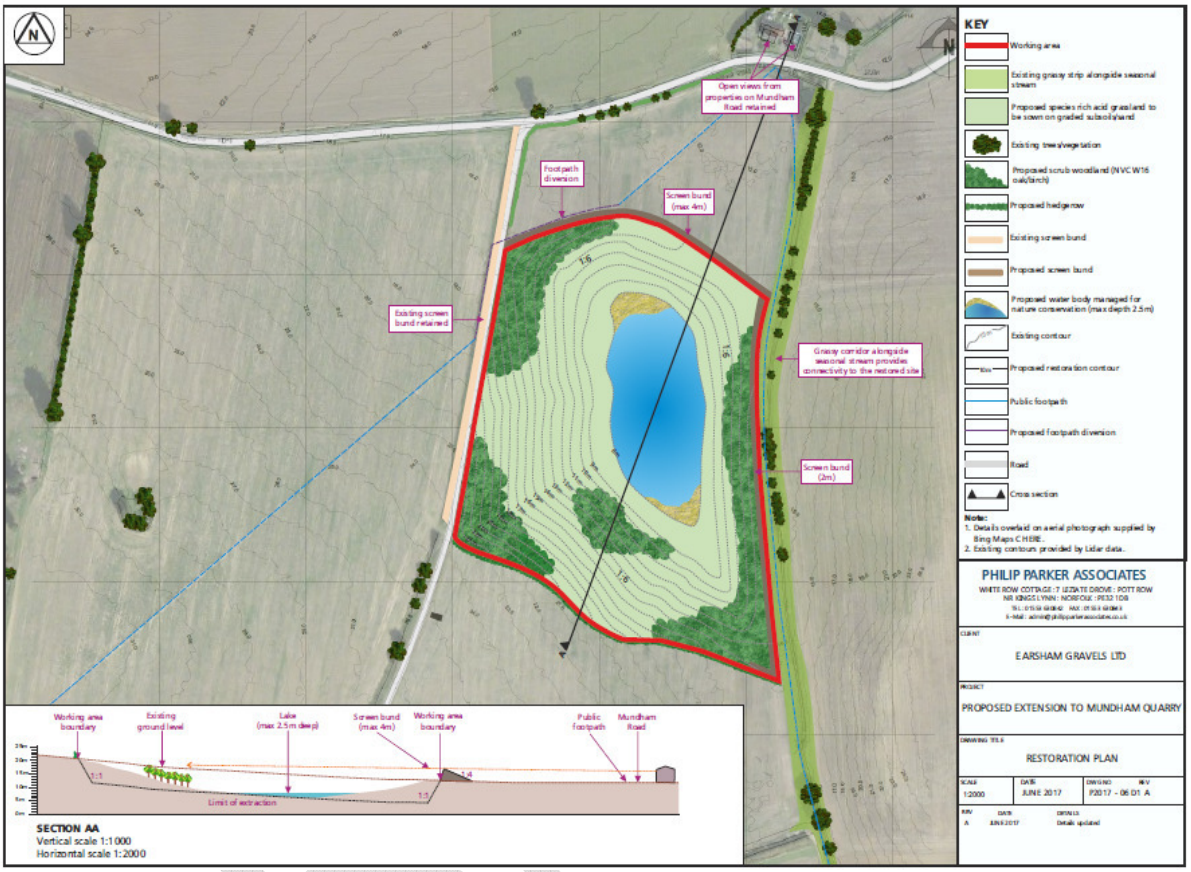
weighted noise level in individual octave frequency bands, such as when assessing architectural acoustics or noise from amplified music events.

Figure A.1: 1/1 Octave and 1/3 Octave Frequency Bands



Appendix B

Proposed Extension Area



Appendix C

Baseline Environmental Noise Monitoring Locations

Source: GoogleEarth

Appendix D.1

Baseline Environmental Noise Survey Results

Baseline Environmental Noise Monitoring: Location 1 - dwellings along Mundham Road

Date: 26/06/2017

Location Ref.	Start Time (hh:mm)	Run Duration (mm:ss)	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	Event Log & Subjective Observations
1	09:54	15:00	58.4	81.6	56.1	32.7	Road traffic, light aircraft and birdsong audible.
1	10:09	15:00	54.9	79.1	50.3	32.8	
1	10:24	15:00	56.0	81.1	52.3	32.3	
1	10:39	15:00	58.6	80.0	57.4	32.9	
	1-Hour Average		**57.2**	**81.6**	**54.0**	**32.7**	

Weather: Bright and dry with NW wind of 2-3 ms^{-1}.

Measuring Equipment:

Norsonic 118 Integrating Sound Level Meter SN. 31337 Calibration Due Date. 05/04/2018

Norsonic 1251 Acoustic Calibrator SN. 34495 Calibration Due Date. 31/08/2017

Monitoring By: Alex Hook BSc(Hons) MSc MIOA

Appendix D.2

Baseline Environmental Noise Survey Results

Baseline Environmental Noise Monitoring: Location 2 - track south of Mundham House							
Date: 26/06/2017							
Location Ref.	**Start Time (hh:mm)**	**Run Duration (mm:ss)**	**L_{Aeq}**	**L_{Amax}**	**L_{A10}**	**L_{A90}**	**Event Log & Subjective Observations**
2	10:01	15:00	43.3	66.8	44.0	31.5	Road traffic, light aircraft and birdsong audible.
2	10:16	15:00	40.2	67.4	43.8	30.4	
2	10:31	15:00	41.1	65.6	42.0	30.7	
2	10:46	15:00	42.3	71.2	40.6	31.3	
	1-Hour Average		**41.9**	**71.2**	**42.6**	**31.0**	
Weather:	Bright and dry with NW wind of 2-3 ms^{-1}.						
Measuring Equipment:							
Norsonic 118 Integrating Sound Level Meter SN. 31832 Calibration Due Date. 05/04/2018							
Norsonic 1251 Acoustic Calibrator SN. 34495 Calibration Due Date. 31/08/2017							
Monitoring By: Alex Hook BSc(Hons) MSc MIOA							

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