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NOISE ASSESSMENT

PLANNING APPLICATION FOR MINERALS EXTRACTION AT WAKERLEY QUARRY, NORTHAMPTONSHIRE

THE BURGHELY ESTATE TRUSTEES

MAY 2007

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**PLANNING APPLICATION FOR
MINERLAS EXTRACTION AT
WAKERLEY QUARRY,
NORTHAMPTONSHIRE**

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1. INTRODUCTION

Acoustics Noise and Vibration (ANV) has been appointed by The Burghley Estate Trustees to carry out an assessment of the noise levels generated by a proposed quarry at Wakerley, Northamptonshire.

The site was formally an ironstone quarry, which has been restored. The old mining permission, which remains active, allows limestone to be extracted from the site. This assessment seeks to ensure noise from the proposed extraction and restoration of the quarry is minimised, by adopting current Standards and guidelines.

Section 2 of this report describes the noise units adopted when assessing environmental noise, with a description of the relevant standards provided in Section 3. Section 4 presents the noise monitoring exercise carried out to determine the existing noise environment at the potentially affected noise sensitive receptors. Section 5 presents the calculations of noise levels likely to be generated by site activities and assesses the levels against the criterion proposed in the principal UK guidance. A recommendation for a draft planning condition to cover the eventuality that blasting may be required on site is provided in Section 6. Finally Section 7 provides a summary of the assessment.

2. NOISE UNITS AND STANDARDS

2.1 Noise Units

Decibels (dB)

Noise can be considered as 'unwanted sound'. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit that has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq} , L_{Amax} , L_{A10} , and L_{A90})

Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax S}$, or Slow, is averaged over 1 second. All L_{Amax} values referred to in this report are Fast.

The L_{A10} is the noise level exceeded for 10% of the measurement period. It has been used in the UK for the assessment of road traffic noise.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise that is present even during the quieter parts of measurement period.

3. APPLICABLE STANDARDS

3.1 Minerals Policy Statement 2

The principal planning guidance on noise is PPG 24 [1]. PPG 24 advises that *guidance on the control of noise from surface mineral workings can be found in MPG 11* [2]. MPG 11 was replaced in 2005 by Annex 2 of Minerals Policy Statement 2 (MPS2) [3].

MPS 2 advises that Mineral Planning Authorities should consider the environmental effects of proposals on the surrounding environment and communities and, where the effects cannot be adequately controlled or mitigated, permission should be refused. MPS 2 states that the Government looks to the minerals industry to keep noise emissions to a level that reflects the highest environmental standards. In this regard, MPS 2 quotes the following passage from the World Health Organisation Guidelines for Community Noise [4]:-

to protect the majority of people from being seriously annoyed during the daytime, the outdoor noise level from steady continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq} .

For normal daytime works MPS 2 advises that the following limits should not exceed:

- 10 dB above the background (L_{A90}) noise level; subject to
- a maximum value of 55 dB $L_{Aeq, 1 \text{ hour}}$ (free field).

Where background noise levels are low, it may be very difficult not to exceed the background noise level by more than 10 dB. This is recognised in MPS 2 which states:-

This will in many circumstances, be difficult to achieve without imposing unreasonable burdens on the mineral operator. In such cases, the limit set should be as near that level as practicable during normal working hours and should not exceed 55 dB $L_{Aeq, 1 \text{ hour}}$ (free field).

MPS 2 suggests that in the evening (19:00 – 22:00) $L_{Aeq, 1 \text{ hour}}$ noise levels should not exceed the background (L_{A90}) noise level by more than 10 dB and a night-time limit of 42 dB $L_{Aeq, 1 \text{ hr}}$.

In addition to the general daytime works, MPS 2 advises that all mineral operations will have some particularly noisy short-term activities that cannot meet the limits set for normal operations. These include soil-stripping, construction or removal of bunding or spoil heaps and construction of new permanent landforms. A level of 70 dB $L_{Aeq, 1 \text{ hr}}$ is suggested as a limit for these activities for periods of up to eight weeks in any one year. Where the duration of temporary works may exceed eight weeks it can be appropriate to apply a lower limit for a longer period. MPS 2 also recognises that, in wholly exceptional cases, where there is no viable alternative, a limit of more than 70 dB $L_{Aeq, 1 \text{ hour}}$ may be appropriate in order to obtain other environmental benefits.

3.2 Northamptonshire Minerals Local Plan

Northamptonshire County Council adopted the current Minerals Local Plan in May 2006 [5], which covers the period from 1 January 2001 to 31 December 2016.

With regard to noise, the plan contains the following Aims and Policies, which seek to ensure any potential impacts upon residents of the surrounding areas are minimised:

Aim 2 – To Minimise the Impact of Mineral Extraction on Local Amenity and the Environment

Objectives

- *To protect the county's residents and businesses from noise, dust, visual intrusion and other amenity effects of mineral extraction ...*
- *To carry out regular monitoring and review of all mineral sites ...*
- *To avoid unacceptable cumulative impacts on the local amenity and the environment*

Policy 15 Buffer Zones

Proposals for mineral development should include the provision of a buffer zone where this is necessary to safeguard local amenity. The scale and location of the buffer zone should reflect:

- *the nature of the mineral and the processes involved;*
- *the character and nature of the surrounding land and land use; and*
- *the proposed hours of working.*

Non-mineral development will not be permitted in a buffer zone if it would prevent or prejudice the working of the site. Mineral development in a buffer zone will not be permitted if it negates the purpose of the buffer zone.

Policy 16 Proposals for Plant and Machinery

Proposals for mineral development involving plant and machinery or other associated development will not be permitted unless the development would satisfy all of the following criteria:

- *it is designed and located within the site to minimise visual intrusion;*
- *it is adequately and harmoniously screened from sensitive locations;*
- *it is appropriately finished and coloured to enable it to be assimilated into its surroundings;*
- *it would be removed from the site at cessation of mineral extraction unless there are overriding advantages in retention in connection with a related proposal;*
- *the primary use is associated directly with the mineral extracted at the site;*
- *it would not give rise to unacceptable traffic or pollution issues, or unacceptable impact on amenity.*

Policy 18 Traffic and Access

Development involving the transport of minerals by road will be allowed only where:

- *alternative transport modes including rail, water and conveyor have been investigated and demonstrated not to be practical or viable options, and*
- *the site access and the local and strategic highway network can safely accommodate traffic associated with the development, and*
- *the impact of traffic generated by the development would not be unacceptably detrimental to road safety, the environment or local amenity.*

Applications shall be accompanied by a Transport Assessment including the anticipated impact of vehicle movements, any mitigation works required in connection with the development and any cumulative impact on the transport system with other existing, permitted, proposed or allocated development.

The above policies have been considered within this assessment, based upon the guidance contained within MPS 2 as being the most appropriate when assessing noise from minerals sites.

4. EXISTING NOISE ENVIRONMENT

4.1 Identification of Potentially Affected Noise-Sensitive Locations

The following noise-sensitive receptors potentially most affected by activities within the quarry have been identified from mapping and a site visit carried out on 20 September 2006:

- i) Dwellings in Wakerley village to the north;
- ii) The Church to the north east;
- iii) Laxton Hall to the south;
- iv) Town Wood Farm to the south; and
- v) The Bungalows to the west.

The potentially affected locations are shown on Figure 1.

4.2 Noise Measurements

Unattended Noise Survey

In order to evaluate the variation in noise levels at the potentially most affected dwellings in Wakerley village, an unattended noise survey was carried out at The Manor House, between 12 – 20 September 2006.

A Rion NL-32 Class 1 Sound Level Meter was utilised for the survey, which was calibrated before and after the exercise using a Rion NC-74 Class 1 Sound Level Calibrator. The instrument was fitted with the NX-22J Sound Recording Card, which enabled sample audio recordings of the noise environment to be obtained throughout the survey period, along with audio recordings of events where a pre-determined threshold was exceeded.

The equipment was located at the rear of the garden of the dwelling, which is on the south side of the village, closest to the quarry. The microphone was positioned free-field, at a height of 2 metres above local ground level.

Measurements were made over contiguous 15 minute periods during the survey period. The results have subsequently been analysed into hourly periods using the Rion NL-22PB1 software for reporting purposes.

Weather conditions during the survey period remained generally fine and dry with light winds, which were suitable for carrying out a noise survey.

The results of the survey are presented in Appendix A, with a graphical representation on Figure 2. A summary of the daytime noise levels, when the proposed quarry would operate are provided in Table 4.1 below.

Date	Free-field Noise Levels [dB]	
	Average Hourly L_{Aeq}	Average Hourly L_{A90}
Tuesday 12 September	52.6	34.8
Wednesday 13 September	49.0	36.9
Thursday 14 September	54.0	39.5
Friday 15 September	53.8	41.1
Saturday 16 September (a.m.)	48.9	38.1
Monday 18 September	50.3	39.4
Tuesday 19 September	52.0	43.8
Average	51.5	39.1

Table 4.1 Summary Results of Measurements Made at Oak Farm

Daytime noise levels within the village were principally influenced by activities at nearby RAF Wittering, with Harrier aircraft observed overhead at times during the day and general activities audible within the base at other times of the day. The other influence on the noise environment was principally associated with distant road traffic.

Attended Noise Measurements

To supplement the unattended noise survey, sample attended noise measurements were at the following four locations on Tuesday 12 September 2006:

- Adjacent to Wakerley Church;
- On the northern boundary of Laxton Hall;
- Adjacent to Town Wood Farm; and
- Adjacent to The Bungalows at Shotley.

The measurements were made using a Rion NL-32 Class 1 Sound Level Meter, calibrated with a Rion NC-74 Class 1 Sound Level Calibrator.

Two measurements, each of 15 minutes duration were made at each location. The measurements were made free-field and carried out at a height of 1.2m above the prevailing ground height, in accordance with the guidelines in MPS 2. The weather conditions during the survey were fine and dry with very light winds.

The results of the measurements are presented in Table 4.2 below.

Measurement Position	Measurement Period	Measured Free-field Noise Levels [dB]			
		L_{Aeq}	L_{A10}	L_{A90}	$L_{Amax,F}$
2 Wakerley Church	10:00 – 10:15	47.7	48.9	33.2	70.6
	12:30 – 12:45	37.6	39.8	31.6	54.2
3 Laxton Hall	11:30 – 11:45	36.3	39.4	30.3	53.9
	11:45 – 12:00	40.3	60.4	32.1	60.4
4 Town Wood Farm	10:50 – 11:05	36.0	39.3	29.8	52.2
	11:05 – 11:20	35.3	38.5	29.6	48.3
5 The Bungalows	12:55 – 13:10	45.4	43.2	27.3	66.1
	13:10 – 13:25	47.1	45.3	29.5	67.5

Table 6.2: Results of Sample Noise Measurements

Noise levels during the survey periods were principally influenced by distant road traffic and occasional traffic on the local roads. Noise from the operation of the air base was generally not audible during the survey period, although one Harrier taking off was paused out of the measurement made at the church at 12:45.

5. ASSESSMENT

5.1 Proposed Noise Limits and Assessment Criteria

MPS 2 specifies a free-field daytime noise limit of 55 dB $L_{Aeq, 1 \text{ hour}}$ at noise-sensitive properties, unless this would exceed existing background noise levels (L_{A90}) by more than 10 dB(A). Where background noise levels are below 45 dB L_{A90} MPS2 advises that *“the limit set should be as near that level as practicable during normal working hours and should not exceed 55 dB $L_{Aeq, 1 \text{ hour}}$ (free field)”*. It has therefore been considered appropriate that a lower limit of 45 dB $L_{Aeq, 1 \text{ hour}}$, be imposed where the background noise levels monitored were low, which is in accordance with the superseded MPG 11 guidance.

Adopting this guidance, the following freefield noise limits have been proposed based upon the measurement results, which would apply for normal operations whilst working the quarry.

Measurement / Assessment Position	Average Measured L_{A90} [dB]	Proposed Site Noise Limit $L_{Aeq, 1 \text{ hour}}$ [dB]
1 Wakerley Village	39	49
2 Wakerley Church	33	45
3 Laxton Hall	31	45
4 Town Wood Farm	30	45
5 The Bungalows	28	45

Table 5.1: Proposed Site Noise Limits for Normal Working

For all temporary operations, MPS 2 specifies a limit of 70 dB $L_{Aeq, 1 \text{ hour}}$ for site operations, which would be unlikely to be exceeded given the large distances between the site and nearest dwellings.

5.2 Potential Sources of Impact

At the present time it is understood that a mineral operator has not been appointed to work the site and therefore the final plant requirements have not been determined. It is anticipated that an operator would be selected following consent to work the land.

Plant and equipment have therefore been determined from those operating on similar sites working an annual output of around 250,000 tonnes per annum, which are likely to include:

- A mobile crushing and screening plant working close to the quarry face;
- One loading shovel working at the quarry face;

- Two loading shovels working on stock handling and vehicle loading; and
- A dozer ripping the limestone.

Blasting may be required to release the limestone, however, this is now considered unlikely given the higher power plant now available and the relatively weak limestone in this part of the country. With this in mind, it has not been considered necessary to carry out a full assessment of the potential blasting at this stage and it has been recommended that appropriate planning conditions should be imposed to limit levels of noise and vibration from this activity and to seek details prior to any blasting taking place on site.

It is anticipated that the topsoil and overburden would be generally stripped using an excavator and articulated dump truck with the material transferred to the adjacent phase for storage or for storage on the perimeter of the site. On commencement of the next phase, the stored soils would be used to restore land within the previous phase. As this operation is seasonal and likely to be of less than 8 weeks duration in any one year, it would be considered to be a temporary working.

The normal method of operation would be to rip the limestone using a dozer, which would then be collected by a loading shovel for processing in a mobile crusher and screen which would be located close to the quarry face. The processed material would then be stored prior to transportation off site.

Vehicles accessing the site would use the haul route which would be constructed at the commencement of site operations.

Noise source terms for the items of plant assumed for the assessment have been measured previously by ANV for similar operations. Table 5.1 lists the plant assumed for the calculations along with the source term information

Item of Plant	Noise Level [dB(A)]	Distance [m]	Index
Hydraulic Excavator	75.0	10	L _{Aeq}
Articulated Dump Truck	84.9	10	SEL
Crusher and Screens	89.9	10	L _{Aeq}
Loading Shovel	79.1	10	L _{Aeq}
Dozer	85.0	10	L _{Aeq}
HGV Movement (Laden)	79.3	10	SEL
HGV Movement (Unladen)	84.8	10	SEL

Table 8.1: Noise Source Terms for Equipment Likely to be used on Site

5.3 Estimated Noise Levels

Noise levels have been predicted for the principal items of plant likely to be used during normal operations using the methodology described in BS 5228:Part 1 [6]. Where barrier performances have been calculated, the methodology described in a 'Calculation of Road Traffic Noise' (CRTN) [7] has been adopted.

Estimated worst-case noise levels, based on a realistic operating scenario, have been compared to the criteria described in Section 5.1 in order to determine whether mitigation is likely to be necessary to achieve the standards of noise required by MPS2 guidelines.

The predicted levels are worst case because:

- i) it has been assumed that the main items of plant will operate 100% of the time; and
- ii) the need for mitigation has been determined on the basis of the shortest distance/minimum attenuation between the proposed areas of activity and the potentially most affected dwellings.

The calculations procedures presented in BS 5228 generally predict noise levels at relatively short distances. Given the large distances between the quarry and potentially affected receptors, it is considered likely that the methodology would over estimate the calculated noise levels. Furthermore, with the exception of the locations where boundary bunding will be provided, the calculations have not taken account of any attenuation afforded by the quarry sides, which would further reduce noise levels from site operations.

The calculation details are given in Appendix B.

5.4 Assessment of Noise from Site Operations

Location 1 – Wakerley Village

Wakerley village is to the north of the quarry. The initial phases (Phases 1 and 2) will be over 1 kilometre from the dwellings in the village, with the latter phases closer to the village, although remaining in excess of 500 metres. It is proposed to construct a haul road utilising an existing track along the northern boundary of Long Wood to carry the HGV traffic to and from the site, which is approximately 400 metres from the closest dwellings in the village.

Noise levels at the dwellings within the main village during Phases 1 and 2 are anticipated to be of the order of 39 – 41 dB L_{Aeq} , based on the assumption that there would be no additional attenuation from the sides of the quarry.

It is intended to construct an overburden bund to the north of the Phase 3 working prior to the commencement of works in this phase. The bund would be constructed to a height of 5 metres above existing ground level. The location of the bund would ensure that the dwellings in the village were screened from the working area. Noise levels during the working of this phase are anticipated to be of the order of 38 dB L_{Aeq} .

The bund would be extended as works progress into Phases 4 and 5 and it is recommended that this is maintained at a height of 5 metres during work in these areas to protect the occupants. Site noise levels during these phases are anticipated to be between 40 – 41 dB L_{Aeq} within the village.

The calculations have accounted for HGVs accessing the quarry along the proposed haul route. It is anticipated that on average there would be 40 vehicles in and 40 vehicles out of the quarry and the calculations have been made on the basis of 5 in and 5 out per hour. The calculations indicated that the noise associated with the vehicle movements would be of the order of 13 dB $L_{Aeq, 1 \text{ hour}}$ at the dwellings within the central area of the village and of the order of 20 dB $L_{Aeq, 1 \text{ hour}}$ at Manor House Farm, which would be the closest property to the haul route. Whilst individual vehicle movements may be audible within the village, noise levels associated with the passbys would have no influence on the period (L_{Aeq}) noise levels at the dwellings in the village.

Whilst no specific noise mitigation measures have been proposed for the haul route, it is recommended that the surface of the haul route is maintained in good condition and repairs made quickly, should any deformations in the surface occur. This measure will seek to ensure that any body slap from empty vehicles passing on the haul route, which is a potential source of disturbance even at low levels, is minimised.

The calculations indicate that noise levels will remain substantially below the proposed criterion for normal operations of 49 dB $L_{Aeq, 1 \text{ hour}}$ within the village, providing the bunding is constructed along the northern boundary during the working of Phases 3 – 5. No additional noise mitigation measures have therefore been proposed which would seek to further protect the residents of the village.

Location 2 – Wakerley Church

Wakerley Church is situated to the south east of the village and is elevated above the properties within the village. The church is not considered to be particularly noise sensitive, however, it has been considered to ensure any potential disturbance is minimised during services held in the church.

During the initial three phases, activities within the quarry are anticipated to be over one kilometre from the church, with noise levels anticipated to be of the order of 38 – 41 dB L_{Aeq} during this period.

Noise levels would increase during work in Phases 4 and 5 and it is recommended that the boundary bund is constructed prior to the commencement of working in these phases. With the bunding in place, noise levels are anticipated to be between 41 – 43 dB L_{Aeq} , whilst working these phases.

The haul route will be approximately 250 metres from the church and it is considered likely that the HGV movements would be audible at the church. However, period noise levels associated with the vehicle movements are anticipated to be 24 dB $L_{Aeq, 1 \text{ hour}}$ and would therefore have no influence on the ambient noise environment at the church.

With the mitigation in place during Phases 4 and 5, noise levels from the operation of the quarry would remain acceptable to ensure any potential disturbance during services at the church were minimised.

Location 3 – Laxton Hall

This property is situated to the south east of the quarry, approximately 1200 metres from the closest working in Phase 1.

Noise levels would be at a maximum at the commencement of operations on site during Phase 1. Noise levels during this period have been calculated to be 42 dB L_{Aeq} on the basis of solely distance attenuation, which is below the proposed normal working limit of 45 dB L_{Aeq} at this property.

Site noise levels would decrease during the remainder of the phases, as these are further away from the property and are anticipated to remain below 40 dB L_{Aeq} .

Site noise levels are therefore considered to remain acceptable throughout the working life of the quarry at this location and are not anticipated to exceed the normal working limit of 45 dB L_{Aeq} .

Location 4 – Town Wood Farm

This property is located approximately 800 metres from the southern boundary of the quarry.

It is proposed to construct a 2 metre high bund along the southern boundary of the site prior to commencement of working of Phases 1 and 2, which would remain in place until restoration nears completion in these areas.

With the bunding in place, worst case noise levels during operations in Phases 1 and 2 are anticipated to be between 36 – 40 dB L_{Aeq} , which are substantially below the normal working limit of 45 dB L_{Aeq} at this property.

Noise levels will generally decrease as the extraction progressed into the later phases and site noise levels are not anticipated to exceed 40 dB L_{Aeq} during the working of Phases 3 to 5.

With the provision of the boundary bunding during Phases 1 and 2, noise levels at this location are therefore considered to remain acceptable throughout the working life of the quarry.

Location 5 – The Bungalows

These properties are located to the west of the quarry, approximately 1300 metres from the closest working area during Phase 2.

The calculations indicated that, at worst, site noise levels during the working of Phase 2, are not anticipated to exceed 40 dB L_{Aeq} at these dwellings, which are substantially below the 45 dB L_{Aeq} working limit proposed at this location.

No additional mitigation has therefore been recommended to protect the occupants from noise from the operation of the quarry.

6. NOISE AND VIBRATION ASSOCIATED WITH BLASTING

As discussed earlier, with modern plant utilised within the quarry, it is considered unlikely that blasting would need to be carried out to release the limestone. Consequently, a detailed assessment of the potential impacts arising from blasting has not been carried out at this stage.

However, as a slight possibility remains, particularly should a hard area of limestone be uncovered within the quarry, it is recommended that conditions are attached to the planning consent to ensure that any potential disturbance to the occupants of surrounding premises is minimised, should there be a requirement in the future. The following draft condition has been recommended:

“Prior to any blasting being carried out at the quarry, details of the methods to be employed to minimise vibration and air overpressure from blasting operations should be submitted to and approved in writing by the MPA. All blasting operations shall take place only in accordance with the approved scheme.”

In addition, it is recommended that blasting should only take place between 10:00 – 16:00 hours Mondays to Fridays, which are considered to be the potentially least sensitive hours, particularly given the noise from the nearby Wittering Airbase, which tends to be most active during these times.

7. SUMMARY

An assessment of the noise generated from activities associated with limestone extraction at Wakerley Quarry has been carried out. The quarry has permission for limestone extraction under an historic planning consent, although in order to operate, an application is required to enable modern minerals conditions to be attached.

MPS 2 and the Northamptonshire Minerals Local Plan provide the relevant guidance when assessing noise from future operations within the quarry. Noise limits at potentially affected noise-sensitive locations have been determined from background noise levels obtained from noise surveys carried out in September 2006.

It is proposed that the quarry would only operate within the normal daytime periods recommended in MPS 2 and the following relevant limits have been proposed.

Measurement / Assessment Position	Average Measured L_{A90} [dB]	Proposed Site Noise Limit $L_{Aeq, 1 \text{ hour}}$ [dB]
1 Wakerley Village	39	49
2 Wakerley Church	33	45
3 Laxton Hall	31	45
4 Town Wood Farm	30	45
5 The Bungalows	28	45

Table 7.1: Proposed Site Noise Limits for Normal Working

Calculations have been made based on the proposed operations within the quarry at the potentially most affected noise-sensitive locations. The assessment of the calculated levels indicates that the proposed criteria would not be exceeded and would be within the limits suggested by MPS 2 with the proposed boundary bunding provided.

In summary, this assessment indicates that noise from activities associated with the working of the quarry would be within acceptable noise limits and no further mitigation measures have been recommended to reduce noise levels from site operations.

References

1. Department of the Environment. Planning Policy Guidance PPG 24, Planning and Noise. 1994. HMSO.
2. Department of the Environment. Minerals Planning Guidance: The Control of Noise at Surface Mineral Workings. MPG 11. 1993.
3. Office of the Deputy Prime Minister. Minerals Policy Statement 2. Controlling and mitigating the environmental effects of mineral extraction in England. Annex 2: Noise. March 2005.
4. Guidelines for Community Noise. The World Health Organisation, Geneva. 2000.
5. Northamptonshire County Council. Northamptonshire Minerals Local Plan. Adopted May 2006.
6. British Standards Institute. Noise and Vibration Control on Construction and Open Sites. Part 1. Code of Practice for Basic Information and Procedures for Noise and Vibration Control. BS 5228: Part 1. 1997.
7. Calculation of Road Traffic Noise (CRTN). Department of Transport 1988. HMSO.

Figures



NOT TO SCALE

Figure 1 : Noise Monitoring and Calculation Positions

**Appendix A
Results of Unattended Noise Survey at Wakerley**

The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Results of Noise Measurements Carried Out Between
12 - 20 September 2006

Equipment Used: Rion NL-32 Class 1 Sound Level Meter
 Location: Manor House, At Rear of Garden, Freefield, 2 Metres Mic Height.

Date	Start Period	Measured Noise Levels [dB]			
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
Tuesday 12/09/2006	10:00	51.3	73.6	53.2	34.9
	11:00	50.1	71.2	53.6	34.5
	12:00	68.0	99.6	52.8	35.6
	13:00	59.9	93.9	50.4	31.9
	14:00	45.1	69.8	46.2	33.8
	15:00	52.4	78.3	50.4	37.9
	16:00	55.0	80.4	53.9	37.5
	17:00	45.7	67.2	49.7	33.0
	18:00	46.3	61.5	50.6	34.3
	19:00	43.7	65.7	43.6	31.3
	20:00	33.1	48.1	35.6	27.8
	21:00	32.9	56.6	33.8	25.4
	22:00	30.9	62.9	34.0	24.1
Wednesday 13/09/2006	23:00	31.5	55.5	32.1	21.7
	0:00	32.7	47.7	33.1	22.0
	1:00	26.4	51.8	28.7	18.9
	2:00	34.4	60.9	33.8	20.1
	3:00	40.0	57.9	38.7	29.5
	4:00	30.0	49.7	32.7	24.4
	5:00	48.3	75.9	37.6	26.3
	6:00	53.4	79.8	53.6	33.8
	7:00	46.5	70.7	49.9	36.3
	8:00	48.4	76.3	50.8	36.3
	9:00	55.0	84.8	50.5	37.0
	10:00	47.6	78.3	47.0	35.7
	11:00	50.2	76.7	48.4	36.2
12:00	60.6	88.9	50.5	39.6	
13:00	44.8	67.6	47.6	36.6	
14:00	46.1	66.7	48.9	38.9	
15:00	46.7	65.8	49.6	37.8	
16:00	48.3	73.5	49.2	37.7	
17:00	47.6	64.6	51.1	37.8	
18:00	46.4	66.6	49.8	33.5	
19:00	43.7	67.3	44.3	30.2	
20:00	33.1	54.3	34.8	27.6	
21:00	33.3	59.0	33.8	24.8	
22:00	39.3	59.6	39.8	32.6	
23:00	33.1	54.5	35.1	26.5	
Thursday 14/09/2006	0:00	47.8	82.0	42.0	26.6
	1:00	57.4	75.0	57.2	44.2
	2:00	34.5	57.6	36.2	30.6
	3:00	34.9	68.8	32.9	26.2
	4:00	36.6	63.5	34.3	27.0
	5:00	39.6	68.7	38.1	32.2
	6:00	54.2	82.9	49.8	38.1
7:00	49.7	81.1	51.3	40.8	

The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Results of Noise Measurements Carried Out Between
12 - 20 September 2006

Equipment Used: Rion NL-32 Class 1 Sound Level Meter

Location: Manor House, At Rear of Garden, Freefield, 2 Metres Mic Height.

Date	Start Period	Measured Noise Levels [dB]			
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
Thursday 14/09/2006	8:00	51.4	75.0	53.4	40.0
	9:00	58.3	87.3	51.0	36.9
	10:00	60.2	92.0	58.5	37.9
	11:00	57.4	75.5	55.1	35.0
	12:00	51.2	73.8	53.6	39.1
	13:00	63.7	94.5	55.9	42.3
	14:00	55.9	70.7	54.4	41.0
	15:00	49.1	71.9	52.3	41.3
	16:00	55.6	85.8	54.5	45.2
	17:00	50.1	65.6	52.5	38.8
	18:00	45.0	69.0	48.3	35.5
	19:00	44.4	69.4	45.9	31.6
	20:00	33.6	52.2	36.0	27.8
	21:00	37.0	60.2	38.5	28.5
Friday 15/09/2006	22:00	36.5	53.9	38.1	27.5
	23:00	33.8	55.1	36.6	27.0
	0:00	32.0	51.9	34.6	25.8
	1:00	32.2	60.7	33.0	25.3
	2:00	31.8	46.0	34.1	26.8
	3:00	30.5	48.9	33.1	25.7
	4:00	35.2	60.7	35.7	27.9
	5:00	48.0	80.5	39.8	32.2
	6:00	58.2	86.3	54.1	39.3
	7:00	49.2	73.7	50.4	40.7
	8:00	52.1	75.3	53.7	40.8
	9:00	58.1	90.2	54.4	42.5
	10:00	65.7	96.1	52.7	41.6
	11:00	53.3	79.2	54.4	41.1
Saturday 16/09/2006	12:00	57.9	90.7	52.9	41.1
	13:00	52.8	78.2	50.2	39.9
	14:00	57.2	89.4	50.9	41.0
	15:00	48.6	65.6	51.6	41.6
	16:00	50.2	72.9	52.5	40.6
	17:00	50.7	64.1	54.3	41.6
	18:00	49.6	69.9	51.8	41.2
	19:00	45.0	62.7	47.7	38.0
	20:00	44.1	61.7	46.7	38.6
	21:00	40.3	57.2	42.8	34.7
	22:00	39.3	60.1	41.9	34.4
	23:00	37.8	56.9	39.9	31.8
	0:00	39.0	53.9	41.7	33.4
	1:00	35.0	47.4	37.6	30.4
2:00	34.5	46.5	37.6	29.5	
3:00	33.2	52.6	35.9	28.3	
4:00	32.8	47.1	35.2	28.5	
5:00	35.9	55.7	38.1	30.4	

The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Results of Noise Measurements Carried Out Between
12 - 20 September 2006

Equipment Used: Rion NL-32 Class 1 Sound Level Meter

Location: Manor House, At Rear of Garden, Freefield, 2 Metres Mic Height.

Date	Start Period	Measured Noise Levels [dB]				
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}	
Saturday 16/09/2006	6:00	52.9	79.7	50.6	34.4	
	7:00	52.5	88.5	53.4	37.5	
	8:00	46.3	64.1	49.6	36.4	
	9:00	49.0	66.0	53.0	38.3	
	10:00	50.5	70.1	53.3	39.9	
	11:00	51.2	70.3	54.5	39.6	
	12:00	43.9	69.0	46.6	37.2	
	13:00	41.6	61.7	44.4	34.9	
	14:00	47.8	76.5	48.4	35.1	
	15:00	47.2	73.3	48.5	34.7	
	16:00	45.0	65.1	46.9	34.4	
	17:00	43.6	63.8	47.1	32.3	
	18:00	43.7	63.4	47.2	33.3	
	19:00	40.4	57.8	42.2	31.3	
	20:00	35.2	60.1	35.3	26.7	
	21:00	32.7	56.4	32.2	25.2	
	22:00	30.0	52.4	30.6	24.4	
	23:00	27.5	46.8	29.1	24.0	
	Sunday 17/09/2006	0:00	29.7	54.8	30.2	23.3
		1:00	27.1	51.0	28.6	22.5
		2:00	26.9	57.0	26.7	22.9
		3:00	26.4	54.5	22.6	19.9
		4:00	22.2	53.0	23.1	19.1
5:00		38.7	68.8	29.1	21.5	
6:00		52.7	82.2	51.3	31.0	
7:00		49.2	71.6	52.8	35.8	
8:00		48.6	66.2	52.2	37.4	
9:00		47.2	69.6	49.1	34.5	
10:00		49.3	76.1	47.6	34.8	
11:00		44.5	67.7	46.4	34.6	
12:00		47.1	70.3	47.0	34.3	
13:00		47.4	76.2	48.3	33.3	
14:00		44.6	73.9	45.9	32.5	
15:00		43.8	69.6	45.8	32.8	
16:00		46.6	70.9	45.6	33.5	
17:00		47.3	63.5	51.0	31.4	
18:00		46.7	67.8	47.7	30.7	
19:00		38.6	59.9	39.8	31.2	
20:00		32.7	48.0	34.6	29.5	
21:00		32.8	48.5	35.4	28.9	
22:00		29.9	67.9	29.9	25.3	
23:00	29.2	53.8	30.1	24.4		
Monday 18/09/2006	0:00	30.9	55.8	30.1	25.0	
	1:00	30.1	56.3	31.9	26.8	
	2:00	29.2	46.1	31.1	26.6	
	3:00	31.3	57.4	32.6	28.2	

The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Results of Noise Measurements Carried Out Between
12 - 20 September 2006

Equipment Used: Rion NL-32 Class 1 Sound Level Meter
 Location: Manor House, At Rear of Garden, Freefield, 2 Metres Mic Height.

Date	Start Period	Measured Noise Levels [dB]				
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}	
Monday 18/09/2006	4:00	34.3	56.0	35.8	31.6	
	5:00	35.6	64.7	33.1	26.5	
	6:00	45.1	72.8	47.3	32.8	
	7:00	47.5	71.1	49.5	34.9	
	8:00	45.7	67.4	49.5	35.8	
	9:00	56.3	85.7	53.4	38.5	
	10:00	55.7	82.5	50.4	34.7	
	11:00	47.5	66.2	50.5	39.4	
	12:00	51.0	70.0	54.1	42.5	
	13:00	52.4	78.5	52.8	42.8	
	14:00	50.2	70.6	52.6	44.5	
	15:00	51.1	66.4	54.4	44.5	
	16:00	56.1	85.0	53.2	43.8	
	17:00	47.2	63.5	50.6	39.6	
	18:00	48.2	66.0	51.0	38.5	
	19:00	46.7	71.0	47.5	38.4	
	20:00	49.4	64.2	52.2	43.9	
	21:00	47.8	62.9	50.7	41.9	
	22:00	46.1	66.1	48.3	41.2	
	23:00	50.3	65.5	53.2	45.0	
	Tuesday 19/09/2006	0:00	50.7	62.6	53.7	45.2
		1:00	48.3	61.1	50.3	42.6
		2:00	43.5	60.9	45.2	38.3
3:00		45.4	58.8	47.4	40.1	
4:00		41.1	57.6	42.6	35.8	
5:00		41.8	69.0	41.7	35.3	
6:00		50.1	81.4	50.0	40.2	
7:00		50.8	70.1	53.9	45.1	
8:00		51.7	71.3	54.6	45.0	
9:00		59.7	84.9	55.2	44.9	
10:00		52.6	65.4	55.5	47.7	
11:00		53.3	76.5	56.2	44.8	
12:00		52.4	74.5	54.6	44.7	
13:00		49.9	64.2	52.7	42.9	
14:00		50.8	66.1	53.4	43.1	
15:00		53.4	67.0	55.5	45.7	
16:00		52.0	72.3	54.5	45.9	
17:00		50.1	72.4	52.4	40.9	
18:00		47.8	69.5	51.2	35.7	
19:00		43.4	63.5	44.6	32.4	
20:00		39.1	58.5	41.5	32.4	
21:00		34.9	56.9	35.7	28.7	
22:00		34.9	60.3	36.4	28.7	
23:00	33.1	51.0	34.7	28.4		
Wednesday 20/09/2006	0:00	28.5	43.0	30.7	25.7	
	1:00	42.2	63.7	43.0	35.4	

**The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Results of Noise Measurements Carried Out Between
12 - 20 September 2006**

Equipment Used: Rion NL-32 Class 1 Sound Level Meter
Location: Manor House, At Rear of Garden, Freefield, 2 Metres Mic Height.

Date	Start Period	Measured Noise Levels [dB]			
		L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}
Wednesday 20/09/2006	2:00	43.7	56.7	46.1	39.3
	3:00	42.4	64.5	45.2	37.1
	4:00	32.9	47.0	34.8	28.2
	5:00	36.2	62.4	37.3	32.1
	6:00	51.1	82.6	49.8	37.0
	7:00	50.3	78.8	52.7	42.8
	8:00	52.0	75.8	53.5	43.6
	9:00	51.5	73.9	54.0	42.7

**Appendix B
Calculation Details**

**The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Calculated Noise Levels**

24-Apr-2007

Receptor: 1 - Dwellings in Wakerley Village
Height 50 m

Uses BS5228:1997

Predicted Freefield Noise Levels

	Ref LAeq @10m	No.	% On Time	Source Ht	Dist S-R	Barrier Ht	Dist S-B	Distance Attenuation		CRTN Barrier Attenuation	Max Attenuation	LAeq [dB]	Total LAeq [dB]
								Hard	Soft				
Soil Strip - Phase 1													
Excavator	75.0	1	100	100	1300			-42.3	-50.9	0.0	-50.9	24.1	
Articulated Dump Truck	49.3	30		100	1300			-42.3	-50.9	0.0	-50.9	13.3	
Dozer	86.9	1	100	100	1300			-42.3	-50.9	0.0	-50.9	36.0	36.3
Extraction - Phase 1													
Dozer	85.0	1	100	95	1300			-42.3	-50.9	0.0	-50.9	34.1	
Loading Shovel (Face)	79.1	1	100	90	1300			-42.3	-50.9	0.0	-50.9	28.2	
Loading Shovel (Stockpiles)	79.1	2	100	80	1350			-42.6	-51.3	0.0	-51.3	30.8	
Crusher and Screens	89.9	1	100	80	1325			-42.4	-51.1	0.0	-51.1	38.8	
Unladen HGV Movements (5 per hour)	49.2	5		80	700			-36.9	-44.1	0.0	-44.1	12.1	
Laden HGV Movements (5 per hour)	43.7	5		80	700			-36.9	-44.1	0.0	-44.1	6.6	40.8
Extraction Phase 2 & Restoration Phase 1													
Excavator	75.0	1	100	85	1300			-42.3	-50.9	0.0	-50.9	24.1	
Articulated Dump Truck	49.3	20		85	1300			-42.3	-50.9	0.0	-50.9	11.5	
Dozer	85.0	1	100	95	1400			-42.9	-51.7	0.0	-51.7	33.3	
Loading Shovel (Face)	79.1	1	100	90	1400			-42.9	-51.7	0.0	-51.7	27.4	
Loading Shovel (Stockpiles)	79.1	2	100	80	1450			-43.2	-52.0	0.0	-52.0	30.1	
Crusher and Screens	89.9	1	100	80	1450			-43.2	-52.0	0.0	-52.0	37.9	
Unladen HGV Movements (5 per hour)	49.2	5		80	700			-36.9	-44.1	0.0	-44.1	12.1	
Laden HGV Movements (5 per hour)	43.7	5		80	700			-36.9	-44.1	0.0	-44.1	6.6	39.0
Extraction Phase 3 & Restoration Phase 2													
Excavator	75.0	1	100	85	1400	90	350	-42.9	-51.7	-12.2	-55.1	19.9	
Articulated Dump Truck	49.3	20		85	1400	90	350	-42.9	-51.7	-12.2	-55.1	7.2	
Dozer	85.0	1	100	85	1000	90	70	-40.0	-48.0	-12.7	-52.7	32.3	
Loading Shovel (Face)	79.1	1	100	85	1000	90	70	-40.0	-48.0	-12.7	-52.7	26.4	
Loading Shovel (Stockpiles)	79.1	2	100	85	1050	90	120	-40.4	-48.5	-12.4	-52.8	29.3	
Crusher and Screens	89.9	1	100	85	1050	90	120	-40.4	-48.5	-12.4	-52.8	37.1	
Unladen HGV Movements (5 per hour)	49.2	5		80	700			-36.9	-44.1	0.0	-44.1	12.1	
Laden HGV Movements (5 per hour)	43.7	5		80	700			-36.9	-44.1	0.0	-44.1	6.6	38.2
Extraction Phase 4 & Restoration Phase 3													
Excavator	75.0	1	100	85	1000	90	70	-40.0	-48.0	-12.7	-52.7	22.3	
Articulated Dump Truck	49.3	20		85	1000	90	70	-40.0	-48.0	-12.7	-52.7	9.7	
Dozer	85.0	1	100	80	750	85	70	-37.5	-44.9	-13.0	-50.5	34.5	
Loading Shovel (Face)	79.1	1	100	80	750	85	70	-37.5	-44.9	-13.0	-50.5	28.6	
Loading Shovel (Stockpiles)	79.1	2	100	80	800	85	120	-38.1	-45.6	-12.8	-50.9	31.3	
Crusher and Screens	89.9	1	100	80	800	85	120	-38.1	-45.6	-12.8	-50.9	39.0	
Unladen HGV Movements (5 per hour)	49.2	5		80	700			-36.9	-44.1	0.0	-44.1	12.1	
Laden HGV Movements (5 per hour)	43.7	5		80	700			-36.9	-44.1	0.0	-44.1	6.6	40.1
Extraction Phase 5 & Restoration Phase 4													
Excavator	75.0	1	100	85	800	85	70	-38.1	-45.6	-8.8	-46.9	28.1	
Articulated Dump Truck	49.3	20		85	800	85	70	-38.1	-45.6	-8.8	-46.9	15.5	
Dozer	85.0	1	100	80	700	85	50	-36.9	-44.1	-13.4	-50.3	34.7	
Loading Shovel (Face)	79.1	1	100	80	700	85	50	-36.9	-44.1	-13.4	-50.3	28.8	
Loading Shovel (Stockpiles)	79.1	2	100	80	750	85	100	-37.5	-44.9	-12.9	-50.5	31.7	
Crusher and Screens	89.9	1	100	80	750	85	100	-37.5	-44.9	-12.9	-50.5	39.4	
Unladen HGV Movements (5 per hour)	49.2	5		80	700			-36.9	-44.1	0.0	-44.1	12.1	
Laden HGV Movements (5 per hour)	43.7	5		80	700			-36.9	-44.1	0.0	-44.1	6.6	40.7
Final Restoration Phase 5													
Excavator	75.0	1	100	85	700			-36.9	-44.1	0.0	-44.1	30.9	
Articulated Dump Truck	49.3	20		85	700			-36.9	-44.1	0.0	-44.1	18.2	30.9
HGV Movements at Manor House Farm													
Unladen HGV Movements (5 per hour)	49.2	5		80	400			-32.1	-38.1	0.0	-38.1	18.1	
Laden HGV Movements (5 per hour)	43.7	5		80	400			-32.1	-38.1	0.0	-38.1	12.6	19.2

**The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Calculated Noise Levels**

24-Apr-2007

Receptor: 2 - Wakerley Church
Height 65 m

Uses BS5228:1997

Predicted Freefield Noise Levels

	Ref LAeq @10m	No.	% On Time	Source Ht	Dist S-R	Barrier Ht	Dist S-B	Distance Attenuation		CRTN Barrier Attenuation	Max Attenuation	LAeq [dB]	Total LAeq [dB]
								Hard	Soft				
Soil Strip - Phase 1													
Excavator	75.0	1	100	100	1400			-42.9	-51.7	0.0	-51.7	23.3	
Articulated Dump Truck	49.3	30		100	1400			-42.9	-51.7	0.0	-51.7	12.5	
Dozer	86.9	1	100	100	1400			-42.9	-51.7	0.0	-51.7	35.2	35.5
Extraction - Phase 1													
Dozer	85.0	1	100	95	1400			-42.9	-51.7	0.0	-51.7	33.3	
Loading Shovel (Face)	79.1	1	100	90	1400			-42.9	-51.7	0.0	-51.7	27.4	
Loading Shovel (Stockpiles)	79.1	2	100	80	1450			-43.2	-52.0	0.0	-52.0	30.1	
Crusher and Screens	89.9	1	100	80	1450			-43.2	-52.0	0.0	-52.0	37.9	
Unladen HGV Movements (5 per hour)	49.2	5		75	250			-28.0	-33.0	0.0	-33.0	23.3	
Laden HGV Movements (5 per hour)	43.7	5		75	250			-28.0	-33.0	0.0	-33.0	17.8	40.1
Extraction Phase 2 & Restoration Phase 1													
Excavator	75.0	1	100	85	1400			-42.9	-51.7	0.0	-51.7	23.3	
Articulated Dump Truck	49.3	20		85	1400			-42.9	-51.7	0.0	-51.7	10.7	
Dozer	85.0	1	100	95	1500			-43.5	-52.4	0.0	-52.4	32.6	
Loading Shovel (Face)	79.1	1	100	90	1500			-43.5	-52.4	0.0	-52.4	26.7	
Loading Shovel (Stockpiles)	79.1	2	100	80	1550			-43.8	-52.8	0.0	-52.8	29.4	
Crusher and Screens	89.9	1	100	80	1550			-43.8	-52.8	0.0	-52.8	37.1	
Unladen HGV Movements (5 per hour)	49.2	5		75	250			-28.0	-33.0	0.0	-33.0	23.3	
Laden HGV Movements (5 per hour)	43.7	5		75	250			-28.0	-33.0	0.0	-33.0	17.8	38.4
Extraction Phase 3 & Restoration Phase 2													
Excavator	75.0	1	100	85	1500			-43.5	-52.4	0.0	-52.4	22.6	
Articulated Dump Truck	49.3	20		85	1500			-43.5	-52.4	0.0	-52.4	9.9	
Dozer	85.0	1	100	85	1150			-41.2	-49.5	0.0	-49.5	35.5	
Loading Shovel (Face)	79.1	1	100	85	1150			-41.2	-49.5	0.0	-49.5	29.6	
Loading Shovel (Stockpiles)	79.1	2	100	85	1200			-41.6	-50.0	0.0	-50.0	32.1	
Crusher and Screens	89.9	1	100	85	1200			-41.6	-50.0	0.0	-50.0	39.9	
Unladen HGV Movements (5 per hour)	49.2	5		75	250			-28.0	-33.0	0.0	-33.0	23.3	
Laden HGV Movements (5 per hour)	43.7	5		75	250			-28.0	-33.0	0.0	-33.0	17.8	41.1
Extraction Phase 4 & Restoration Phase 3													
Excavator	75.0	1	100	85	1150	85	450	-41.2	-49.5	-9.6	-50.8	24.2	
Articulated Dump Truck	49.3	20		85	1150	85	450	-41.2	-49.5	-9.6	-50.8	11.6	
Dozer	85.0	1	100	80	900	85	175	-39.1	-46.9	-11.0	-50.1	34.9	
Loading Shovel (Face)	79.1	1	100	80	900	85	175	-39.1	-46.9	-11.0	-50.1	29.0	
Loading Shovel (Stockpiles)	79.1	2	100	80	900	85	175	-39.1	-46.9	-11.0	-50.1	32.0	
Crusher and Screens	89.9	1	100	80	900	85	175	-39.1	-46.9	-11.0	-50.1	39.8	
Unladen HGV Movements (5 per hour)	49.2	5		75	250			-28.0	-33.0	0.0	-33.0	23.3	
Laden HGV Movements (5 per hour)	43.7	5		75	250			-28.0	-33.0	0.0	-33.0	17.8	41.0
Extraction Phase 5 & Restoration Phase 4													
Excavator	75.0	1	100	85	800	85	200	-38.1	-45.6	-9.0	-47.1	27.9	
Articulated Dump Truck	49.3	20		85	800	85	200	-38.1	-45.6	-9.0	-47.1	15.3	
Dozer	85.0	1	100	80	600	85	100	-35.6	-42.5	-12.0	-47.6	37.4	
Loading Shovel (Face)	79.1	1	100	80	600	85	100	-35.6	-42.5	-12.0	-47.6	31.5	
Loading Shovel (Stockpiles)	79.1	2	100	80	600	85	100	-35.6	-42.5	-12.0	-47.6	34.5	
Crusher and Screens	89.9	1	100	80	600	85	100	-35.6	-42.5	-12.0	-47.6	42.3	
Unladen HGV Movements (5 per hour)	49.2	5		75	250			-28.0	-33.0	0.0	-33.0	23.3	
Laden HGV Movements (5 per hour)	43.7	5		75	250			-28.0	-33.0	0.0	-33.0	17.8	43.4
Final Restoration Phase 5													
Excavator	75.0	1	100	85	600			-35.6	-42.5	0.0	-42.5	32.5	
Articulated Dump Truck	49.3	20		85	600			-35.6	-42.5	0.0	-42.5	19.9	32.5

**The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Calculated Noise Levels**

24-Apr-2007

Receptor: 3 - Laxton Hall
Height 65 m

Uses BS5228:1997

Predicted Freefield Noise Levels

	Ref LAeq @10m	No.	% On Time	Source Ht	Dist S-R	Barrier Ht	Dist S-B	Distance Attenuation		CRTN Barrier Attenuation	Max Attenuation	LAeq [dB]	Total LAeq [dB]
								Hard	Soft				
Soil Strip - Phase 1													
Excavator	75.0	1	100	100	1200			-41.6	-50.0	0.0	-50.0	25.0	
Articulated Dump Truck	49.3	30		100	1200			-41.6	-50.0	0.0	-50.0	14.1	
Dozer	86.9	1	100	100	1200			-41.6	-50.0	0.0	-50.0	36.9	37.2
Extraction - Phase 1													
Dozer	85.0	1	100	95	1200			-41.6	-50.0	0.0	-50.0	35.0	
Loading Shovel (Face)	79.1	1	100	90	1200			-41.6	-50.0	0.0	-50.0	29.1	
Loading Shovel (Stockpiles)	79.1	2	100	80	1250			-41.9	-50.4	0.0	-50.4	31.7	
Crusher and Screens	89.9	1	100	80	1250			-41.9	-50.4	0.0	-50.4	39.5	
Unladen HGV Movements (5 per hour)	49.2	5		80	1500			-43.5	-52.4	0.0	-52.4	3.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1500			-43.5	-52.4	0.0	-52.4	0.0	41.6
Extraction Phase 2 & Restoration Phase 1													
Excavator	75.0	1	100	85	1200			-41.6	-50.0	0.0	-50.0	25.0	
Articulated Dump Truck	49.3	20		85	1200			-41.6	-50.0	0.0	-50.0	12.4	
Dozer	85.0	1	100	95	1500			-43.5	-52.4	0.0	-52.4	32.6	
Loading Shovel (Face)	79.1	1	100	90	1500			-43.5	-52.4	0.0	-52.4	26.7	
Loading Shovel (Stockpiles)	79.1	2	100	80	1500			-43.5	-52.4	0.0	-52.4	29.7	
Crusher and Screens	89.9	1	100	80	1500			-43.5	-52.4	0.0	-52.4	37.5	
Unladen HGV Movements (5 per hour)	49.2	5		80	1500			-43.5	-52.4	0.0	-52.4	3.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1500			-43.5	-52.4	0.0	-52.4	0.0	38.7
Extraction Phase 3 & Restoration Phase 2													
Excavator	75.0	1	100	85	1500			-43.5	-52.4	0.0	-52.4	22.6	
Articulated Dump Truck	49.3	20		85	1500			-43.5	-52.4	0.0	-52.4	9.9	
Dozer	85.0	1	100	85	1600			-44.1	-53.1	0.0	-53.1	31.9	
Loading Shovel (Face)	79.1	1	100	85	1600			-44.1	-53.1	0.0	-53.1	26.0	
Loading Shovel (Stockpiles)	79.1	2	100	85	1600			-44.1	-53.1	0.0	-53.1	29.0	
Crusher and Screens	89.9	1	100	85	1600			-44.1	-53.1	0.0	-53.1	36.8	
Unladen HGV Movements (5 per hour)	49.2	5		80	1500			-43.5	-52.4	0.0	-52.4	3.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1500			-43.5	-52.4	0.0	-52.4	0.0	37.9
Extraction Phase 4 & Restoration Phase 3													
Excavator	75.0	1	100	85	1600			-44.1	-53.1	0.0	-53.1	21.9	
Articulated Dump Truck	49.3	20		85	1600			-44.1	-53.1	0.0	-53.1	9.2	
Dozer	85.0	1	100	80	1500			-43.5	-52.4	0.0	-52.4	32.6	
Loading Shovel (Face)	79.1	1	100	80	1500			-43.5	-52.4	0.0	-52.4	26.7	
Loading Shovel (Stockpiles)	79.1	2	100	80	1500			-43.5	-52.4	0.0	-52.4	29.7	
Crusher and Screens	89.9	1	100	80	1500			-43.5	-52.4	0.0	-52.4	37.5	
Unladen HGV Movements (5 per hour)	49.2	5		80	1500			-43.5	-52.4	0.0	-52.4	3.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1500			-43.5	-52.4	0.0	-52.4	0.0	38.6
Extraction Phase 5 & Restoration Phase 4													
Excavator	75.0	1	100	85	1500			-43.5	-52.4	0.0	-52.4	22.6	
Articulated Dump Truck	49.3	20		85	1500			-43.5	-52.4	0.0	-52.4	9.9	
Dozer	85.0	1	100	80	1500			-43.5	-52.4	0.0	-52.4	32.6	
Loading Shovel (Face)	79.1	1	100	80	1500			-43.5	-52.4	0.0	-52.4	26.7	
Loading Shovel (Stockpiles)	79.1	2	100	80	1500			-43.5	-52.4	0.0	-52.4	29.7	
Crusher and Screens	89.9	1	100	80	1500			-43.5	-52.4	0.0	-52.4	37.5	
Unladen HGV Movements (5 per hour)	49.2	5		80	1500			-43.5	-52.4	0.0	-52.4	3.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1500			-43.5	-52.4	0.0	-52.4	0.0	38.6
Final Restoration Phase 5													
Excavator	75.0	1	100	85	1500			-43.5	-52.4	0.0	-52.4	22.6	
Articulated Dump Truck	49.3	20		85	1500			-43.5	-52.4	0.0	-52.4	9.9	22.6

The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Calculated Noise Levels

24-Apr-2007

Receptor: 4 - Town Wood Farm
 Height 100 m

Uses BS5228:1997

Predicted Freefield Noise Levels

	Ref LAeq @10m	No.	% On Time	Source Ht	Dist S-R	Barrier Ht	Dist S-B	Distance Attenuation		CRTN Barrier Attenuation	Max Attenuation	LAeq [dB]	Total LAeq [dB]
								Hard	Soft				
Soil Strip - Phase 1													
Excavator	75.0	1	100	100	800			-38.1	-45.6	0.0	-45.6	29.4	
Articulated Dump Truck	49.3	30		100	800			-38.1	-45.6	0.0	-45.6	18.5	
Dozer	86.9	1	100	100	800			-38.1	-45.6	0.0	-45.6	41.3	41.6
Extraction - Phase 1													
Dozer	85.0	1	100	95	800	102	50	-38.1	-45.6	-13.0	-51.1	33.9	
Loading Shovel (Face)	79.1	1	100	95	800	102	50	-38.1	-45.6	-13.0	-51.1	28.0	
Loading Shovel (Stockpiles)	79.1	2	100	90	850	102	100	-38.6	-46.2	-14.0	-52.6	29.5	
Crusher and Screens	89.9	1	100	90	850	102	100	-38.6	-46.2	-14.0	-52.6	37.3	
Unladen HGV Movements (5 per hour)	49.2	5		90	850	102	100	-38.6	-46.2	-14.0	-52.6	3.6	
Laden HGV Movements (5 per hour)	43.7	5		90	850	102	100	-38.6	-46.2	-14.0	-52.6	0.0	39.7
Extraction Phase 2 & Restoration Phase 1													
Excavator	75.0	1	100	85	800	102	50	-38.1	-45.6	-15.0	-53.1	21.9	
Articulated Dump Truck	49.3	20		85	800	102	50	-38.1	-45.6	-15.0	-53.1	9.3	
Dozer	85.0	1	100	95	900	100	50	-39.1	-46.9	-11.1	-50.2	34.8	
Loading Shovel (Face)	79.1	1	100	90	900	100	50	-39.1	-46.9	-15.2	-54.2	24.9	
Loading Shovel (Stockpiles)	79.1	2	100	85	950	100	100	-39.6	-47.4	-15.4	-55.0	27.2	
Crusher and Screens	89.9	1	100	85	950	100	100	-39.6	-47.4	-15.4	-55.0	34.9	
Unladen HGV Movements (5 per hour)	49.2	5		85	950	100	100	-39.6	-47.4	-15.4	-55.0	1.3	
Laden HGV Movements (5 per hour)	43.7	5		85	950	100	100	-39.6	-47.4	-15.4	-55.0	0.0	36.1
Extraction Phase 3 & Restoration Phase 2													
Excavator	75.0	1	100	85	950			-39.6	-47.4	0.0	-47.4	27.6	
Articulated Dump Truck	49.3	20		85	950			-39.6	-47.4	0.0	-47.4	14.9	
Dozer	85.0	1	100	85	1500			-43.5	-52.4	0.0	-52.4	32.6	
Loading Shovel (Face)	79.1	1	100	85	1500			-43.5	-52.4	0.0	-52.4	26.7	
Loading Shovel (Stockpiles)	79.1	2	100	85	1500			-43.5	-52.4	0.0	-52.4	29.7	
Crusher and Screens	89.9	1	100	85	1500			-43.5	-52.4	0.0	-52.4	37.5	
Unladen HGV Movements (5 per hour)	49.2	5		80	1500			-43.5	-52.4	0.0	-52.4	3.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1500			-43.5	-52.4	0.0	-52.4	0.0	38.8
Extraction Phase 4 & Restoration Phase 3													
Excavator	75.0	1	100	85	1500			-43.5	-52.4	0.0	-52.4	22.6	
Articulated Dump Truck	49.3	20		85	1500			-43.5	-52.4	0.0	-52.4	9.9	
Dozer	85.0	1	100	80	1600			-44.1	-53.1	0.0	-53.1	31.9	
Loading Shovel (Face)	79.1	1	100	80	1600			-44.1	-53.1	0.0	-53.1	26.0	
Loading Shovel (Stockpiles)	79.1	2	100	80	1600			-44.1	-53.1	0.0	-53.1	29.0	
Crusher and Screens	89.9	1	100	80	1600			-44.1	-53.1	0.0	-53.1	36.8	
Unladen HGV Movements (5 per hour)	49.2	5		80	1600			-44.1	-53.1	0.0	-53.1	3.1	
Laden HGV Movements (5 per hour)	43.7	5		80	1600			-44.1	-53.1	0.0	-53.1	0.0	37.9
Extraction Phase 5 & Restoration Phase 4													
Excavator	75.0	1	100	85	1600			-44.1	-53.1	0.0	-53.1	21.9	
Articulated Dump Truck	49.3	20		85	1600			-44.1	-53.1	0.0	-53.1	9.2	
Dozer	85.0	1	100	80	1900			-45.6	-55.0	0.0	-55.0	30.0	
Loading Shovel (Face)	79.1	1	100	80	1900			-45.6	-55.0	0.0	-55.0	24.1	
Loading Shovel (Stockpiles)	79.1	2	100	80	1900			-45.6	-55.0	0.0	-55.0	27.1	
Crusher and Screens	89.9	1	100	80	1900			-45.6	-55.0	0.0	-55.0	34.9	
Unladen HGV Movements (5 per hour)	49.2	5		80	1900			-45.6	-55.0	0.0	-55.0	1.3	
Laden HGV Movements (5 per hour)	43.7	5		80	1900			-45.6	-55.0	0.0	-55.0	0.0	36.1
Final Restoration Phase 5													
Excavator	75.0	1	100	85	1900			-45.6	-55.0	0.0	-55.0	20.0	
Articulated Dump Truck	49.3	20		85	1900			-45.6	-55.0	0.0	-55.0	7.4	20.0

**The Burghley Estate Trustees
Wakerley Quarry, Northamptonshire
Calculated Noise Levels**

24-Apr-2007

Receptor: 5 - The Bungalows Uses BS5228:1997
Height 85 m

Predicted Freefield Noise Levels

	Ref LAeq @10m	No.	% On Time	Source Ht	Dist S-R	Barrier Ht	Dist S-B	Distance Attenuation		CRTN Barrier Attenuation	Max Attenuation	LAeq [dB]	Total LAeq [dB]
								Hard	Soft				
Soil Strip - Phase 1													
Excavator	75.0	1	100	100	1800			-45.1	-54.4	0.0	-54.4	20.6	
Articulated Dump Truck	49.3	30		100	1800			-45.1	-54.4	0.0	-54.4	9.7	
Dozer	86.9	1	100	100	1800			-45.1	-54.4	0.0	-54.4	32.5	32.8
Extraction - Phase 1													
Dozer	85.0	1	100	95	1800			-45.1	-54.4	0.0	-54.4	30.6	
Loading Shovel (Face)	79.1	1	100	95	1800			-45.1	-54.4	0.0	-54.4	24.7	
Loading Shovel (Stockpiles)	79.1	2	100	90	1850			-45.3	-54.7	0.0	-54.7	27.4	
Crusher and Screens	89.9	1	100	90	1850			-45.3	-54.7	0.0	-54.7	35.2	
Unladen HGV Movements (5 per hour)	49.2	5		90	1850			-45.3	-54.7	0.0	-54.7	1.5	
Laden HGV Movements (5 per hour)	43.7	5		90	1850			-45.3	-54.7	0.0	-54.7	0.0	37.3
Extraction Phase 2 & Restoration Phase 1													
Excavator	75.0	1	100	85	1800			-45.1	-54.4	-15.0	-60.1	14.9	
Articulated Dump Truck	49.3	20		85	1800			-45.1	-54.4	-15.0	-60.1	2.2	
Dozer	85.0	1	100	95	1300			-42.3	-50.8	0.0	-50.8	34.2	
Loading Shovel (Face)	79.1	1	100	90	1300			-42.3	-50.8	0.0	-50.8	28.3	
Loading Shovel (Stockpiles)	79.1	2	100	85	1350			-42.6	-51.3	0.0	-51.3	30.9	
Crusher and Screens	89.9	1	100	85	1350			-42.6	-51.3	0.0	-51.3	38.6	
Unladen HGV Movements (5 per hour)	49.2	5		85	1350			-42.6	-51.3	0.0	-51.3	5.0	
Laden HGV Movements (5 per hour)	43.7	5		85	1350			-42.6	-51.3	0.0	-51.3	0.0	39.7
Extraction Phase 3 & Restoration Phase 2													
Excavator	75.0	1	100	85	1300			-42.3	-50.8	0.0	-50.8	24.2	
Articulated Dump Truck	49.3	20		85	1300			-42.3	-50.8	0.0	-50.8	11.5	
Dozer	85.0	1	100	85	1800			-45.1	-54.4	0.0	-54.4	30.6	
Loading Shovel (Face)	79.1	1	100	85	1800			-45.1	-54.4	0.0	-54.4	24.7	
Loading Shovel (Stockpiles)	79.1	2	100	85	1800			-45.1	-54.4	0.0	-54.4	27.7	
Crusher and Screens	89.9	1	100	85	1800			-45.1	-54.4	0.0	-54.4	35.5	
Unladen HGV Movements (5 per hour)	49.2	5		80	1800			-45.1	-54.4	0.0	-54.4	1.8	
Laden HGV Movements (5 per hour)	43.7	5		80	1800			-45.1	-54.4	0.0	-54.4	0.0	36.7

Extraction Phase 4 and 5

Extraction Areas Over 2 Kilometres from Dwellings - No Calculations Made