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SOUND IMPACT ASSESSMENT

of

PROPOSED MINERAL EXTRACTION, PROCESSING AND RESTORATION SITE

at

CARLTON COLLIERY,
SHAW LANE,
CARLTON,
BARNSLEY S71

Date of measurements:	9th July, 17th July, 3rd August 2021
Date of report:	10th August 2021
Prepared for:	MWP Planning
Prepared by:	David Garritt, BEng, MIOA

Members of the Association of Noise Consultants (ANC) & Institute of Acoustics (IOA)
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1.0 **Summary and Conclusions**

1.1 The existing quarry at the site of the former Carlton Colliery at Shaw Lane, Carlton requires an extension of permitted working to restore the site for residential use, as outlined in the latest Barnsley Local Plan.

This noise assessment quantifies impact from proposed site activities in comparison to the normal assessment criteria for this type of operation contained in the NPPF.

1.2 The guidance of the NPPF is that during daytime hours from 07.00 to 19.00, the sound level at noise-sensitive properties should not exceed the background level by more than 10 dBA. In some circumstances it may not be possible to meet this requirement without unreasonable burden of the mineral operator in which case the upper limit between 0700 to 1900 hours is 55 dB LA_{eq} (1-hour) at noise-sensitive properties.

A limit of 70 dB LA_{eq} (1-hour) is suggested for periods of up to 8 weeks per year for temporary activities such as initial soil stripping.

1.3 The closest dwellings to the site are shown below.

Dwelling	Min Distance (m)	Max Distance (m)	Distance to Processing Area	Grid Reference	Elevation (m)
101 - 111 Shaw Lane	140	400	350	SE 37384 10080	48
Highgrove Court	300	630	460	SE 37059 09961	57
Woodmoor Street	610	900	690	SE 36786 09580	66
Bleachcroft Farm	970	1220	980	SE 38087 08894	40

1.4 The predictions of sound from the overall operation during typical activities when mobile plant is at the closest and furthest points to the dwellings are shown below using two different source data sets:

Specific Sound Pressure Levels, dB LA_{eq}

Dwelling	Close			Far	
	Data Set 1	Data Set 2		Data Set 1	Data Set 2
101 – 111 Shaw Lane	51.5	51.7		47.3	47.8
Highgrove Court	45.9	46.3		43.5	44.1
Woodmoor Street	49.3	50.0		47.5	48.6
Bleachcroft Farm	45.7	46.5		44.7	45.7

These sound level predictions assume that line of sight will be broken entirely from all parts of the sources to all parts of the receptors at dwellings on Shaw Lane and Highgrove Court either by existing landforms, the quarry sides or earth bunds that have been constructed as part of the

operation. It is important that these are maintained to meet this rule of thumb observation. It is assumed that direct line of acoustic sight will exist between the site and dwellings on Woodmoor Street and near Bleachcroft Farm.

1.5 The typical background sound level during times of operation was identified using attended measurements of the existing sound climate:

Dwelling	Background Level
101 – 111 Shaw Lane	37 dB $LA_{90,15mins}$
Highgrove Court	42 dB $LA_{90,15mins}$
Woodmoor Street	43 dB $LA_{90,15mins}$
Bleachcroft Farm	49 dB $LA_{90,15mins}$

1.6 Analyses of the results shows predicted sound levels in compliance with the normal requirements of the NPPF to not exceed background by more than 10 dB at all receptors apart from the closest dwellings on Shaw Lane. The comparisons to background for quarry workings closest to and furthest from the receptors are:

Dwelling	Close			Far	
	Data Set 1	Data Set 2		Data Set 1	Data Set 2
101 – 111 Shaw Lane	14.5	14.7		10.3	10.8
Highgrove Court	3.9	4.3		1.5	2.1
Woodmoor Street	6.3	7.0		4.5	5.6
Bleachcroft Farm	-3.3	-2.5		-4.3	-3.3

1.7 The predicted sound levels at all dwellings fall within the 55 dBA limit at all times during normal operation.

1.8 The predicted sound levels at dwellings during temporary phases when machinery may be visible at the closest dwellings are within the temporary 70 dB LA_{eq} limit.

1.9 The calculation procedures adopted in this report are generally conservative and give a reasonable worst-case, but are based on well recognised principles of acoustics.

It is concluded that the excavation, processing and restoration proposed at the site can be undertaken in compliance with the noise criteria given in the NPPF.

2.0 Introduction

The existing quarry on the site of the former Carlton Colliery requires an extension of permission and variation of conditions to undertake final excavation and processing works, then to restore the site so that it is suitable for residential development identified in the Barnsley Local Plan.

The grid reference of the centre of the site is SE 37514 09856.

As increase of inert materials accepted by the site is proposed from 110,000m^3 to 117,000m^3. All red shale and ash has been excavated.

On site processing and treatment of existing waste is proposed for the purpose of recovery.

- Existing stockpiles of 85,000m^3 of which 70,500m^3 can be treated and reused on site, with the remaining being unsuitable for current proposals and removed off site.
- Excavation of existing made ground 75,000m^3 of which 24,000m^3 can be treated and reused, with remaining being transported off site.
- Importing of 117,000m^3 of suitable material to be treated and used on site.
- This operation will create over 45,000m^3 of aggregate, which will be stored on site for future use.
- 120 HGV movements (ie. 60 in and 60 out) per day.

The quarry operator and their consultant MWP Planning have commissioned this noise impact assessment to accompany the planning application. Noise impact from proposed site activities is quantified in comparison to the normal assessment criteria for this type of operation, which is summarised in the next subsection.

2.1 Noise Assessment Criteria

The Department for Communities and Local Government published the document “Planning Practice Guidance” to the National Planning Policy Framework in March 2014. The section of the document which applies to minerals excavation and surface workings quantifies specific noise standards. These are summarised as:

- During the daytime from 07.00 to 19.00 hours the sound level at noise-sensitive properties should not exceed the background level by more than 10 dBA.

- In some circumstances it may not be possible to meet this requirement without unreasonable burden of the mineral operator in which case the upper limit between 0700 to 1900 hours is 55 dB LA_{eq} (1-hour) at noise-sensitive properties.

- During the evening from 19.00 to 22.00 hours the 55 dB LA_{eq} (1-hour) limit applies even if the background level is greater than 45 dB LA_{90}.

- At night between 22.00 to 07.00 hours the sound level at noise-sensitive properties should not exceed 42 dB LA_{eq} (1-hour).

- Where the site noise is tonal in character it may be appropriate to set specific limits for this element of the noise. Peak or impulsive noise, which may include reversing bleepers, may need specific limits and should not occur regularly at night.

- It is often necessary to raise the noise limits to allow temporary phases in a development, for example baffle mound construction, soil stripping, and construction of new permanent landforms. A limit of 70 dB LA_{eq} (1-hour) is suggested for periods of up to 8 weeks per year.

3.0 **Proposed Site Operations**

The proposed site operations include the washing and processing of materials, and mobile plant consisting of a wheeled loader, dump trucks bulldozer/excavator, and HGVs.

The processing plant will consist of washing, crushing and screening operations loaded by mechanical excavator or bucket loader.

Access to the site will be from Shaw Lane using the existing haul road. The quarry operations will remain below ground level where possible. Screening mounds will be maintained along the north and west site boundaries so acoustic line of sight will be broken between the site and the nearest dwellings, either by these screening mounds, natural landforms or the sides of the quarry.

The exact dimensions of bunds etc will vary depending on location of plant and machinery, but should be maintained so that these lines of sight are broken whenever practicable, and line of sight should not exist to the closest dwellings on Shaw Lane for more than eight weeks per year to minimise noise impact and maximise compliance with the NPPF.

Line of sight is likely to exist between the quarry and dwellings to dwellings on Woodmoor Street and near Bleachcroft Farm.

The proposed hours of operation do not extend beyond 07.00 – 18.00 Monday – Friday, 07.00 – 13.00 Saturday.

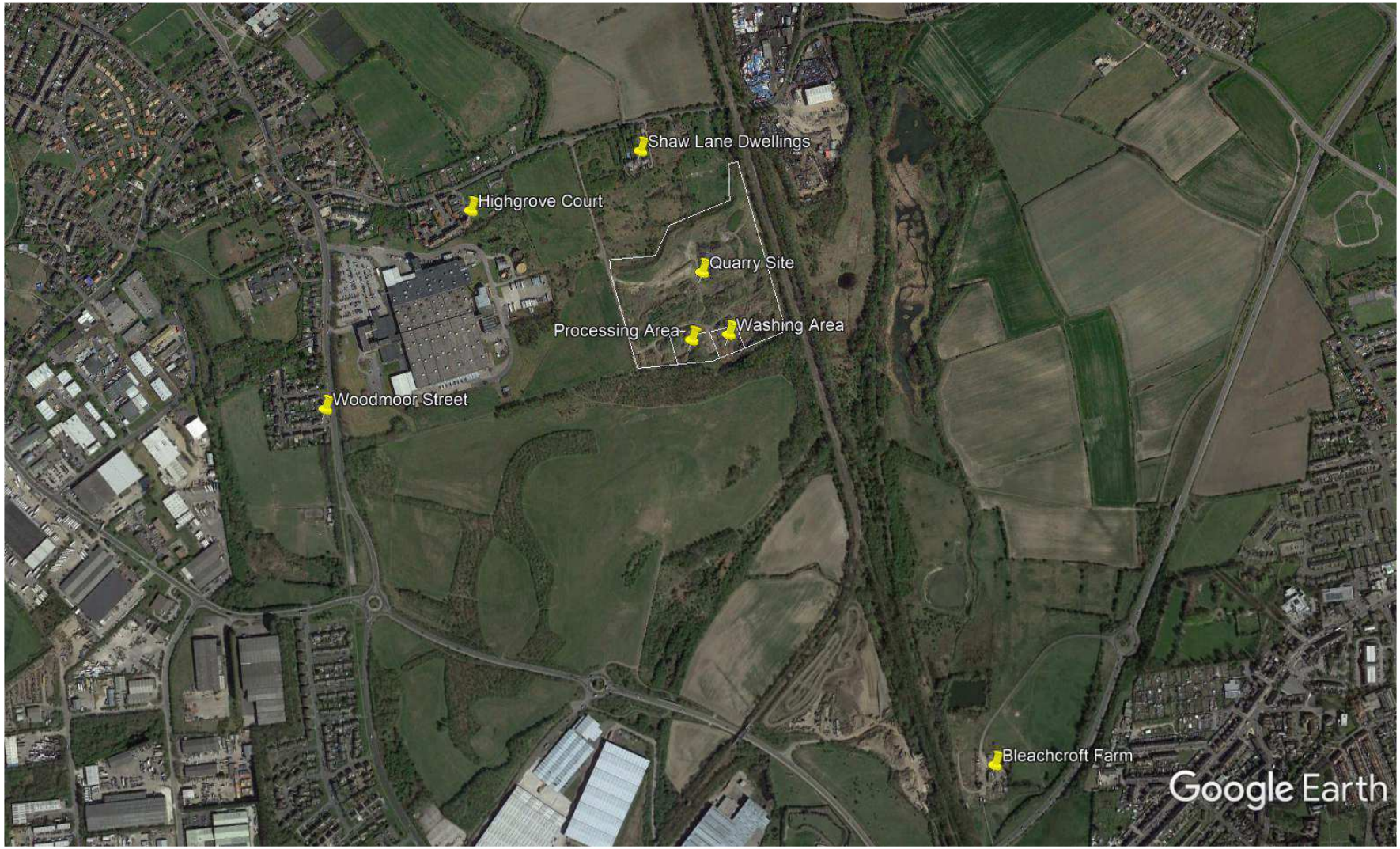
3.1 Noise Sensitive Receptors

The nearest noise sensitive receptors are all dwellings, detailed in the table below along with their grid references and minimum/maximum distances to the proposed quarry site.

Dwelling	Min Distance (m)	Max Distance (m)	Distance to Processing Area	Grid Reference	Elevation (m)
101 - 111 Shaw Lane	140	400	350	SE 37384 10080	48
Highgrove Court	300	630	460	SE 37059 09961	57
Woodmoor Street	610	900	690	SE 36786 09580	66
Bleachcroft Farm	970	1220	980	SE 38087 08894	40

A Google location plan is given overleaf. The elevation of the existing site varies between 47 – 52m according to Google Earth data.

3.2 Site Location, Receptors and Proposals Plans



Site Proposal Plan

3.3 Sound Sources

To quantify sound levels, data collected by us at previous similar sites has been used in this assessment. To reduce uncertainty, two separate data sets have been used for the processing plant.

Each dataset assumes the use of a tracked excavator, front bucket loader, dumptruck and HGVs on the haul road. The processing plant used in the assessment is shown below.

Data Set 1:

Large scale processing plant consisting of washing, crushing and screening at an existing quarry site at Finningley, Doncaster surveyed on 6th August 2020.

Sound levels were measured at a distance of 50m from the processing plant in two directions. Measurements at this distance enable the accurate calculation of sound decay to the nearest dwellings and also included some movements of bucket loaders. The full use of bucket loaders is also added separately, thereby presenting a reasonable worst-case scenario. It was found that the sound level measurements in each direction were very similar (0.4 dB between them); the higher sound levels have been used in the assessment.

Processing Plant for Data Set 1

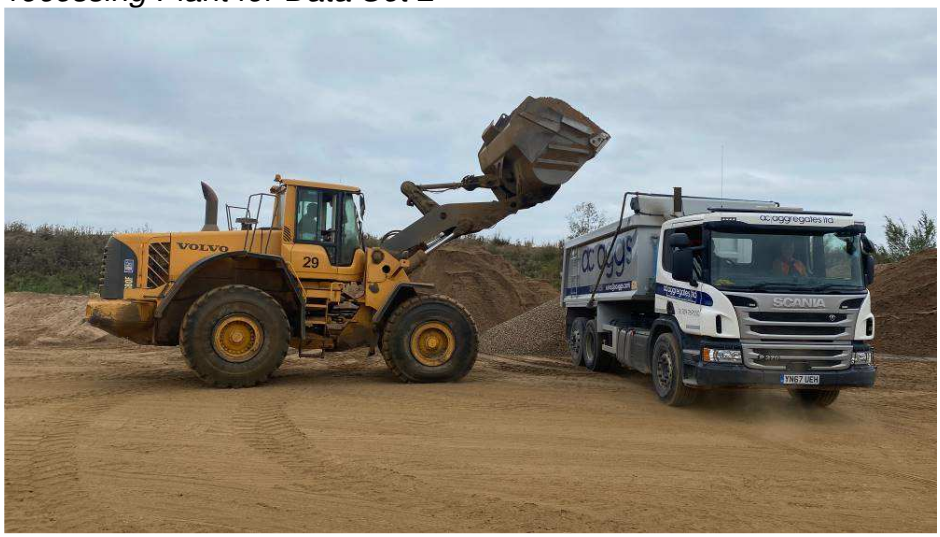
Data Set 2:

Mineral extraction and processing quarry at Hatfield Woodhouse, Doncaster surveyed on 13th August 2020. The sound sources were:

- Volvo L180F Wheeled Loading Shovel
- Warrior 1400X Powerscreen
- Crusher
- M2500 E3X Mobile Washing Plant

Measurements were taken at 10m from individual plant items and also of the whole operation at a distance of 100m, though the screen benefited from some barrier effect caused by other items of plant at this location. The sound levels used in the assessment for this dataset are the sound levels measured at 100m, to which the individual source of the screen has been added to give a reasonable worst-case dataset.

Processing Plant for Data Set 2



3.4 **Plant Sound Levels**

The sound levels measured by us at previous quarry sites are shown in the table below, along with the distances from the sources that the measurements were taken. The sound levels are also shown normalised to a distance of 10 m for easy comparison.

Description	Sound Pressure Level, dBA	Sound Pressure Level at 10m, dBA
Excavator, 10m	80.0	80.0
Front Loader, 10m	74.7	74.7
Dump Truck, 10m	84.0	84.0
Haul Road HGV Sound Power Level	SWL = 107 dBA	
Data Set 1		
Processing Plant, North, 50m	67.5	81.5
Processing Plant, South, 50m	67.9	81.9
Data Set 2		
Warrior 1400X Powerscreen, 10m	83.0	83.0
M2500 E3X Mobile Washing Plant (W), 10m	74.1	74.1
M2500 E3X Mobile Washing Plant (N), 10m	77.7	77.7
M2500 E3X Mobile Washing Plant (E), 10m	73.1	73.1
M2500 E3X Mobile Washing Plant (S),15m	69.4	72.9
All plant exc Screen, (S) 100m	54.9	74.9

It is assumed that all plant items will operate with 100% utilisation, except for movements of the dumptruck. One of the methods normally adopted for calculation of sound from movements of dumptrucks is to use the haul road formula from BS 5228. The routes that the dumptrucks will take from excavation area to processing area will vary, so this method presents an element of uncertainty.

Sound from dumptrucks has been calculated by taking the maximum sound power level drive-by data and assuming that it occurs at the closest point of each excavation area to each dwelling for a total of 15 minutes in any one hour. It is likely that levels realised on site will be lower than this, but the methodology has been used in order to provide a reasonable worst-case assessment and demonstrate the likely compliance of the proposals with the normal requirements.

The number of HGV movements on the access road to the processing area is likely to vary. For the purposes of calculation, a total of 20 movements per hour along the access road from Shaw Lane has been allowed for, which is thought to represent the likely reasonable worst-case scenario.

4.0 Sound Levels at Dwellings

4.1 Dwelling Positions

The assessment of sound impact from proposed site activities is undertaken for four sets of the closest dwellings. Other dwellings are at greater distances from the sites and will be subject to lower noise impact then identified in this report: The table showing details of the closest dwellings is repeated below for ease of reference.

Dwelling	Min Distance (m)	Max Distance (m)	Distance to Processing Area	Grid Reference	Elevation (m)
101 - 111 Shaw Lane	140	400	350	SE 37384 10080	48
Highgrove Court	300	630	460	SE 37059 09961	57
Woodmoor Street	610	900	690	SE 36786 09580	66
Bleachcroft Farm	970	1220	980	SE 38087 08894	40

4.2 Sound Predictions

The distances between the mobile excavation plant and the nearest dwellings will vary depending on the area being excavated, as shown in the table above. For this reason, predictions have been undertaken at each set of dwellings for the closest and furthest excavation operations, giving a range of values that normal operations will fall within.

The calculations of sound levels at the nearest dwellings are given in the appendices to this report for conciseness, the results being summarised in this section.

The predicted sound levels reaching dwellings are summarised in the table below from all activities combined, including movements of HGVs within the site.

Specific Sound Pressure Levels, dB LA_{eq}

Dwelling	Close			Far	
	Data Set 1	Data Set 2		Data Set 1	Data Set 2
101 – 111 Shaw Lane	51.5	51.7		47.3	47.8
Highgrove Court	45.9	46.3		43.5	44.1
Woodmoor Street	49.3	50.0		47.5	48.6
Bleachcroft Farm	45.7	46.5		44.7	45.7

For barrier effect, section D.3.2.2.1 of BS 5228 states that *'In the absence of spectral data, as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation. Subtract the attenuation from the value of LAeq calculated at the point of interest.'*

Shaw Lane, Highgrove Court / Dwellings to North

Quarry workings, including excavation and processing, will be completely hidden from view to dwellings to the north and north west (Shaw Lane and Highgrove Court) by the quarry rim and boundary earth bunds. The above approximation of 10 dBA barrier effect has been included in the predictions of specific sound level to take account of this.

During temporary phases when mobile excavation plant items operate at the rim height of the quarry and/or perimeter bunds are being formed, sound levels from the machinery are predicted at up to 10 dBA higher

Dwellings to South, East & Woodmoor Street

Dwellings to the south and east are not protected by earth bunds. It is likely that intervening land features may provide some beneficial screening effect, but this cannot be guaranteed and so no noise barrier effect is assumed in the calculations.

Dwellings at Woodmoor Street are located at the opposite side of a factory building to the quarry site, but the change in land elevation means that many of the dwellings will not benefit from any barrier effect, so again none is assumed in the calculation process.

Sound Levels of Activity at Quarry Rim, No Barrier Effect

The predictions of sound levels at times when workings are near the quarry rim and visible to all surrounding dwellings are shown in the table overleaf. These sound levels assume that all machinery including excavation and processing plant are visible to all dwellings, so represents the worst case scenario under temporary conditions.

Sound Pressure Levels with Operations at Rim, dB LA_{eq}

Dwelling	Close			Far	
	Data Set 1	Data Set 2		Data Set 1	Data Set 2
101 – 111 Shaw Lane	60.6	60.8		54.4	55.3
Highgrove Court	54.7	55.2		51.2	52.2
Woodmoor Street	49.3	50.0		47.5	48.6
Bleachcroft Farm	45.7	46.5		44.7	45.7

HGVS on Haul Road

Calculations of sound from HGVs on the Haul / Access road are given in the appendices of this report, but are included in the overall sound levels reported in the main body of this report.

These HGVs will be hidden from view at receptors on Woodmoor Street and Bleachcroft Farm, so a 10 dBA barrier effect is assumed. At dwellings on Shaw Lane and Highgrove Court, there is a possibility that the wagons may be visible, or partially visible for some of the time, so the BS 5228 approximation of 5 dBA attenuation is used.

5.0 Background Sound Levels

Existing background sound levels were taken at four separate locations using attended measurements, deemed to be a more appropriate and accurate methodology at this site instead of leaving equipment on the proposed site for longer duration unattended monitoring. The background sound levels vary considerably between receptors and there are no representative secure locations available, so more accurate background measurements are obtained by undertaking attended measurements.

Measurements were taken using type 1 sound level meters with current traceable calibration certification. Full details of the equipment used are given in the appendices to this report.

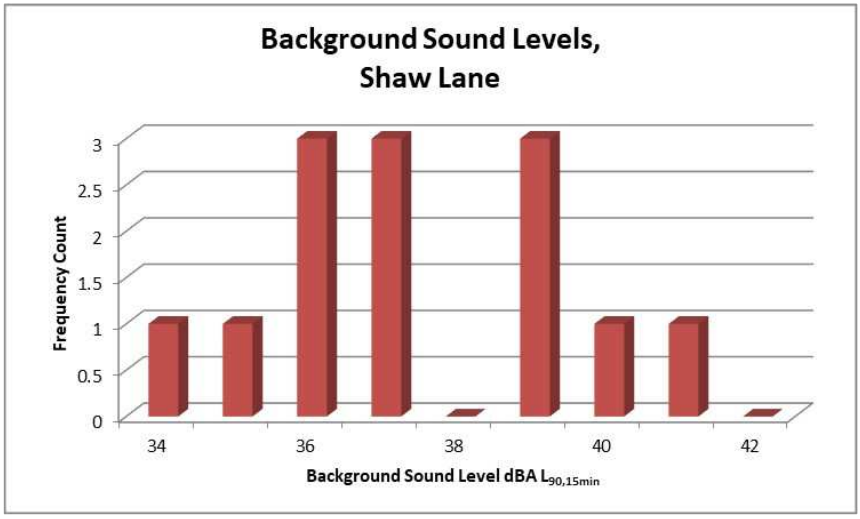
Weather conditions remained ideal for the outdoor measurement of sound, being warm and dry with wind speeds under 5 ms^{-1}, detailed below

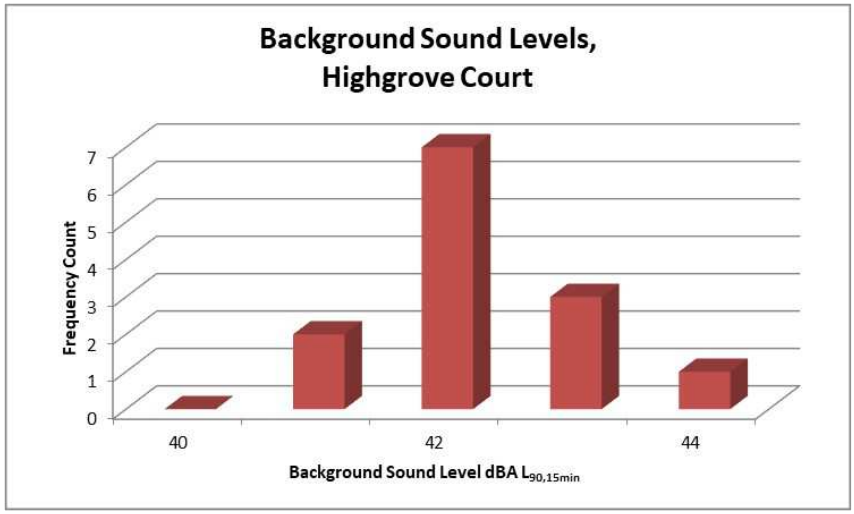
Date	Wind Speed	Temperature	Cloud Cover
9th July	0 – 2m/s	18 – 22°C	0 - 25%
17th July	1 – 2m/s	23 – 27°C	0 - 25%
3rd August	0 – 2m/s	18 - 21°C	0 - 25%

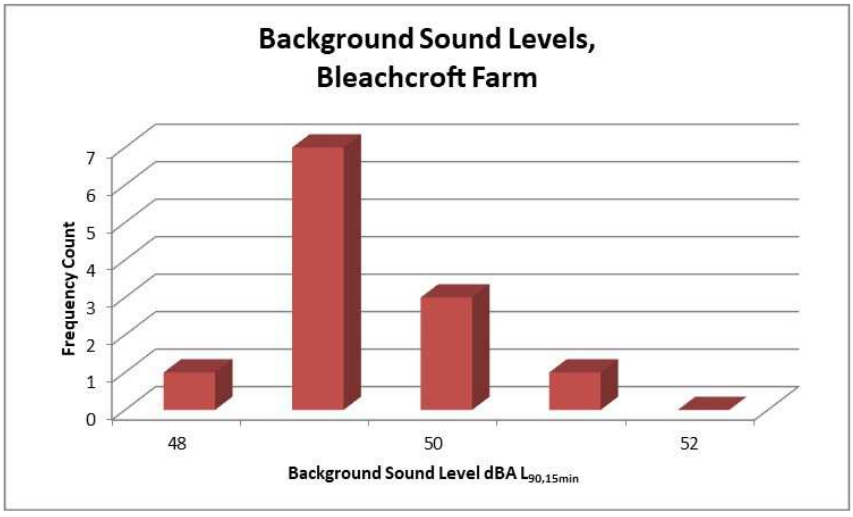
Measurements of the existing sound climate were undertaken towards the end of restrictions that were introduced to combat the Coronavirus pandemic. It is possible that this may have some effect on measured background sound levels, though if any is apparent it is most likely that the effect is to reduce existing sound levels, making the assessment more onerous.

We previously undertook background monitoring for the original planning report in 2013, those levels are included at the end of this section for comparison and were generally slightly higher than measured for this survey. It is reiterated that measurement of lower background sound levels makes the assessment more onerous and in this case is likely to reflect the lower levels of road traffic movements generally observed since the start of the Coronavirus pandemic.

Full measurement data is included in the appendices of this report; a graphical summary of background sound levels is shown below & overleaf:







Background measurements obtained on Saturday morning were of the same order as during weekdays. The typical background sound level measured across the four monitoring days at each position is concluded as being:

Dwelling	Background Level
101 – 111 Shaw Lane	37 dB $LA_{90,15mins}$
Highgrove Court	42 dB $LA_{90,15mins}$
Woodmoor Street	43 dB $LA_{90,15mins}$
Bleachcroft Farm	49 dB $LA_{90,15mins}$

For information and comparison, the background sound levels measured during our original 2013 survey are shown overleaf.

Previous Background Measurements

	Background dB LA_{90}			
Thursday daytime 25th February 1000-1400				
101-111 Shaw Lane	37.6	38.4	38.8	41.6
Highgrove Court	41.4	41.4	41.2	42.6
Woodmoor Street	45.6	46.4	46.4	43.6
Tuesday daytime 8th March 1200-1600				
101-111 Shaw Lane	43.6	43.4	46.0	45.2
Highgrove Court	45.0	44.4	44.4	45.0
Woodmoor Street	49.2	51.2	48.0	47.4
Saturday morning 12th March 0900-1100				
101-111 Shaw Lane	38.0	38.0	39.2	37.4
Highgrove Court	38.4	38.2	37.8	37.6
Woodmoor Street	45.8	42.2	41.4	44.6

6.0 Impact Assessment

6.1 Background Comparison - Normal Activities

The requirements of the NPPF "Planning Practice Guidance" on sound limits from minerals excavation and surface workings are summarised in section 2.0 of this report. The main requirement is that from 07.00 to 19.00 hours the sound level at noise-sensitive properties should not exceed the background level by more than 10 dBA unless this places unreasonable burden on the operator. In these instances a limit of up to 55 dBA can be applied, but exceedances above the 10 dBA comparison to background should be minimised where practicable.

Comparison between the background sound levels measured for this survey and the predicted sound levels from the proposed quarry operation are shown in the table below. Positive numbers show an exceedance above background, negative values show predicted sound from the quarry being below background.

Dwelling	**Close**			**Far**	
	Data Set 1	**Data Set 2**		**Data Set 1**	**Data Set 2**
101 – 111 Shaw Lane	14.5	14.7		10.3	10.8
Highgrove Court	3.9	4.3		1.5	2.1
Woodmoor Street	6.3	7.0		4.5	5.6
Bleachcroft Farm	-3.3	-2.5		-4.3	-3.3

It can be seen that activity from the proposed quarry is predicted to fall within the 10 dBA above background limit at all receptors apart from the closest dwelling on Shaw Lane.

6.2 Comparisons with 55 dBA Limit

BS 5228 notes that in some circumstances it may not be possible to meet the requirement to not exceed the background by more than 10 dBA without placing unreasonable burden of the mineral operator. In these cases, the upper limit between 0700 to 1900 hours can be set at up to 55 dB LA_{eq} (1-hour) at noise-sensitive properties, but exceedances above the 10 dBA comparison to background should be minimised where practicable.

The predicted sound levels at all dwellings fall within this 55 dBA limit at all times. These predictions are reproduced below for ease of reference:

Sound Pressure Levels, dB LA_{eq}

Dwelling	Overall (Close)	Overall (Far)
101 – 111 Shaw Lane	51 - 52	47 - 48
Highgrove Court	46	44
Woodmoor Street	49 - 50	48 - 49
Bleachcroft Farm	46 - 47	45 - 46

Noise barriers in the form of earth bunds are already provided to dwellings on Shaw Lane to minimise noise impact at these receptors.

6.3 Phases at Quarry Rim

When work is being conducted at the quarry rim for the final stages of restoration, plant and machinery may have acoustic line of sight to the nearest dwellings. The predicted sound levels from the overall operation are shown in the table below for this scenario:

Sound Pressure Levels with Operations at Rim, dB LA_{eq}

Dwelling	Overall (Close)	Overall (Far)
101 – 111 Shaw Lane	61	54 - 55
Highgrove Court	55	51 - 52
Woodmoor Street	49 - 50	48 - 49
Bleachcroft Farm	46 - 47	45 - 46

The predicted sound levels at dwellings during these phases would be within the temporary 70 dB LA_{eq} limit allowable for up to 8 weeks per year

for exactly this type of activity, and generally within the 55 dBA limit discussed in previous sections of this report.

7.0 **Assessment Conclusions**

It is concluded that the operations at Shaw Lane quarry will continue to be:

- Generally be within (ie. in compliance with) the first requirement to not exceed background by more than 10 dBA, apart from at the closest dwellings to the site on Shaw Lane.

- Comply with the requirement to not exceed 55 dBA at all dwellings

- Comply with the temporary 70 dBA limit permitted for temporary operations when machinery will be in view at all dwellings.

The predictions contained in this report are based on well recognised fundamental principles of acoustics, including the widely used approximation that a barrier breaking line of sight between source and receiver gives an attenuation of approximately 10 dBA.

APPENDIX 1

BACKGROUND SOUND LEVEL MEASUREMENTS

The background sound levels measured during our most recent attended survey at the nearest dwellings to the site are shown in the table below, logged every 15 minutes.

Date and Position	**Background dB LA_{90}**					Comments
Friday 9th July 2021						
101-111 Shaw Lane	39.4	41.2	39.6	38.8	38.8	Road noise, birdsong, tree rustle. Model aircraft at end of measurement period
Highgrove Court	43.6	43.2	41.6	41.8	41.2	Road noise, background hum from nearby industry
Woodmoor Street	44.2	43.2	43.0	42.2	40.2	Road noise, some audible industry
Bleachcroft Farm	49.4	48.8	48.6	48.4		Road noise
Saturday 17th July 2021						
101-111 Shaw Lane	36.2	37.1	36.4	36.7		Road noise, birdsong,
Highgrove Court	42.1	41.8	41.0	42.3		Road noise, background hum from nearby industry
Woodmoor Street	43.0	43.3	42.8	44.1		Road noise, some audible industry
Bleachcroft Farm	48.6	50.6	50.2	49.6		Road noise
Tuesday 3rd August 2021						
101-111 Shaw Lane	35.4	34.4	36.2	36.8		Road noise, birdsong,
Highgrove Court	42.4	43.2	42.2	42.8		Road noise, nearby industry audible
Woodmoor Street	44.6	42.0	43.0	42.4		Road noise, some audible industry
Bleachcroft Farm	50.0	49.0	48.8	49.4		Road noise

APPENDIX 2

EQUIPMENT AND QUALIFICATIONS

S & D Garritt Ltd are members of the Association of Noise Consultants (ANC). All work related to this report was undertaken by David Garritt and Elizabeth Garritt.

David Garritt has been a full member of the Institute of Acoustics since 2005 and holds an honours degree in Electronic and Computer Systems Engineering. David teaches acoustics at post graduate level on a part time basis and sits on the ANC Communications and PR Committee. Elizabeth holds a degree in Biomedical Science, post graduate qualification in acoustics and is an associate member of the Institute of Acoustics. Elizabeth also has accreditation to undertake audiometric tests.

The equipment used during the site visits is shown in the table below. The sound level meter was calibrated before and after use; no drift was apparent.

Equipment Description	Type number	Manufacturer	Date of expiration of Calibration	Calibration Certificate Number
Sound Level Meter	2260 s/n 2409281	Bruel & Kjaer	07.10.2022	147227
Preamplifier	ZC 0026	Bruel & Kjaer	07.10.2022	147227
Sound Level Meter	XL2 TA s/n A2A-10019-EO	NTi Audio	25.08.2022	145408
Microphone	MK 224 s/n 210762A	Cirrus Research	20.08.2022	145404
Microphone	MK:224 s/n 212421D	Cirrus Research Plc	06.10.2022	147221
Calibrator	4231 s/n 2402706	Bruel & Kjaer	26.08.2021	145403

APPENDIX 3

UNCERTAINTY

Any uncertainties in calculations and/or methodology and how they have been minimised are considered in this section.

Sound data on machinery has been based on measurements taken of similar machinery at other premises and also using standard data contained in BS 5228. Two sets of data have been used to quantify sound levels from the processing plant, to reduce uncertainty. Where any assumptions have been made, they have been stated and chosen to represent the reasonable worst case scenario. All machinery is assumed to operate at full utilisation for 100% of the time apart from movement of the dumptruck since it will be stationary while loaded.

Sound levels from the processing operation were also taken at a greater distance for comparison with calculations based on close proximity measurements. These agree with each other and confirm the low levels of uncertainty in the source measurements.

Background sound levels were taken as attended measurements at the nearest dwellings. During the times of our background survey, some of the restrictions were still in place that were introduced to combat the coronavirus pandemic, but much of the work was undertaken during less restrictive measures. Subjectively road traffic appeared to be of a similar level to normally experienced in the area and the motorways were flowing with continual traffic. If the restrictions had indeed caused any reduction in traffic flow numbers, this would serve to slightly lower background sound levels and make the assessment slightly more onerous.

The procedures used for the calculation of specific sound levels at the nearest noise-sensitive receptors are based on basic, fundamental principles of acoustics. Sound decay with distance from the sources has been calculated using the principles and methods recommended in BS 5228. The addition and subtraction of sound levels was done logarithmically on an energy basis, which is the correct method for decibel calculations. Attenuation from barriers and bunds has been taken from guidance in BS 5228, which is often conservative in its estimation.

It is anticipated that these methods would be considered by other suitably qualified acousticians to be relevant, correct and appropriate for this survey and is a method examined by the Institute of Acoustics on their post graduate diploma course.

The variances in working distances between dwellings and excavation means that in many cases, predicted sound levels vary depending on work

area. For this reason, sound levels have been predicted for each dwelling with quarry working at the closest and furthest points.

All sound level measurements were taken with calibrated type 1 sound level meters, which represents the most accurate type of SLM available. Sound levels were measured to the nearest 0.1 dB, time periods were measured and recorded to the nearest second. No rounding was done in any calculations, the only rounding being done on final results.

The sound level meters were calibrated before and after each survey period and no drift was apparent.

It is concluded that the uncertainty in this survey has been minimised as far as possible and is believed to be below the level at which it would have an impact on the assessment conclusions contained in this report.

APPENDIX 4 – SOUND LEVEL CALCULATIONS

HGVs on Access Road

Sound levels from lorry movements along the access road are predicted by the haul road equation given in BS 5228:

$LA_{eq} = L_{WA} - 33 + 10 \log Q - 10 \log V - 10 \log d + 10 \log (a/180)$ dB

where V= average speed in km/h
Q = hourly vehicle rate
d = distance from haul road to receiver
a = the angle of view of the haul road from the dwelling.
The other parameters have been determined using online mapping data.

	101 - 111 Shaw Lane	**Highgrove Court**	**Woodmoor Street**	**Bleachcroft Farm**
LWA	107	107	107	107
Q (no. movements per hour)	20	20	20	20
V, kmh	30	30	30	30
d (distance)	100	230	610	1100
a (angle of view)	100	80	40	6
Shielding	5	5	10	10
LAeq	44.7	40.1	27.9	17.1

Source Levels

Third Octaves

Band [Hz]	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
Excavation Machinery																											
Excavator, 10m	67.3	67.9	81	70.7	65.1	66.6	71.2	72.1	69.3	71.1	69.4	71.6	66.3	66.2	66.5	67.4	64.5	61.6	59.7	57.9	60.6	59.9	58.2	56.8	53.8	53	46.1
Front Loader, 10m	65.8	67.2	82.2	70.5	67.7	68.3	74.7	74.5	66.6	71.2	71.7	78.7	70.4	68.9	68.8	68	65.7	63.5	61.5	61	62.6	61	60.9	58.6	55.1	54.5	46.7
Dump Truck																											
Data Set 1																											
Processing Plant, North, 50m	58.1	58.3	66.4	70.1	61.9	62.2	70.8	65.3	65	68	62.9	59.6	67.3	64.3	63.4	62.1	61.1	60.5	59	57.7	56.3	54.9	52.4	50.2	48.9	48	46.4
Processing Plant, South, 50m	68.2	66.8	70.1	79.3	77.2	72.1	69.6	70.8	73.5	68.3	67.2	64.6	62.8	63.5	62.2	61.4	60.4	68.4	59.4	58.5	56.6	55	55.9	57.1	54.4	54.4	52.4
Data Set 2																											
Warrior 1400X Powerscreen																											
M2500 E3X Mobile Washing Plant (W)	77	69	73.7	76.3	68.7	75.3	66	63.5	62.1	63.1	65.4	65.3	64.7	61.1	62.2	62.4	62.9	63.7	62.9	61.7	62.5	61	61	61.4	61.7	61.9	60.7
M2500 E3X Mobile Washing Plant (N)	84.4	74.9	85.7	84.9	78.1	73.6	71.1	71.5	69.2	69.6	69.3	68.1	74.8	70.7	67.7	66.8	67.4	67.1	66	64.6	63.7	63.2	60.7	59.5	57.6	61	54.1
M2500 E3X Mobile Washing Plant (E)	76.3	72	78.7	81.8	78.4	71.6	73.1	68.8	68.9	66.8	67.6	66.1	65.3	63.5	62.7	61.6	61.6	61.9	62.4	59.5	60.5	59.8	59.9	59.3	58.5	56.2	53.2
M2500 E3X Mobile Washing Plant (S),15m	87.5	71.3	83.8	80.9	73.2	69.6	66.5	65.6	62.5	60.5	60.2	59	60.8	61.3	59.1	58.4	60.4	59.1	58.2	57.1	56.4	56.1	55.7	53.8	51.4	49.5	46.2
All plant exc Screen, (S) 100m	70.6	58.3	69.8	71.4	58.9	62.9	47.5	47.5	46.4	47.4	46.3	44	49.1	47	42.4	42.6	43.8	42.2	41.6	40.5	40.1	39.9	40.1	39	37.2	34.5	29.6

Octaves & dBA Source Levels

Band [Hz]	31.5	63	125	250	500	1000	2000	4000	8000		dBA
Excavation Machinery											
Excavator, 10m	81.4	72.9	75.8	75.6	71.1	69.9	64.3	63.3	56.8		80
Front Loader, 10m	82.4	73.8	77.9	80.1	74.2	70.9	66.5	65.1	58.1		74.7
Dump Truck											84
Data Set 1											
Processing Plant, North, 50m	67.5	71.3	72.7	69.6	70.1	66.1	62.6	57.7	52.7		67.5
Processing Plant, South, 50m	73.3	81.9	76.4	71.7	67.6	69.7	63.1	60.9	58.6		67.9
Data Set 2											
Warrior 1400X Powerscreen											83
M2500 E3X Mobile Washing Plant (W)	79.1	79.2	68.9	69.5	67.7	67.8	67.2	65.9	66.2		74.1
M2500 E3X Mobile Washing Plant (N)	88.3	86	75.5	73.8	76.8	71.9	69.6	66.2	63.2		77.7
M2500 E3X Mobile Washing Plant (E)	81.2	83.7	75.5	71.6	68.7	66.5	65.7	64.4	61.3		73.1
M2500 E3X Mobile Washing Plant (S),15m	89.1	81.8	69.9	64.7	65.3	64.2	62.1	60.1	54.3		69.4
All plant exc Screen, (S) 100m	71.4	68	70.2	66.6	63.5	62.9	60.8	55.4	50.3		54.9

Calculations at Dwellings

Dwelling	Min Distance (m)	Max Distance (m)	Distance to Processing Area	Grid Reference	Elevation (m)
101 – 111 Shaw Lane	140	400	350	SE 37384 10080	48
Highgrove Court	300	630	460	SE 37059 09961	57
Woodmoor Street	610	900	690	SE 36786 09580	66
Bleachcroft Farm	970	1220	980	SE 38087 08894	40

Calculations are undertaken for specific levels of each item of equipment at each dwelling and then added together on a logarithmic basis.

Measurement of the overall processing area was also taken at 100 m distance to provide another data point and reduce uncertainty in the source measurements. If the close proximity measurements of the wheeled loader and Mobile washing plant to the south are added together and translated to a 100 m distance, the resulting sound level is 55.7 dB LA_{eq}. The overall sound level measured by us at 100 m was 54.9 dB LA_{eq}, which agrees within 0.8 dBA of the predicted method.

The predictions at each dwelling are shown in the tables overleaf for when operations are at their closest or furthest point from each dwelling.

Shaw Lane Close

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		10		50	350	16.90		40.6
Processing Plant, South, 50m	67.9	0		60	0		10		50	350	16.90		41
Excavator, 10m	80	0		60	0		10		10	140	22.92		47.1
Front Loader, 10m	74.7	0		60	0		10		10	140	22.92		41.8
Dump Truck	84	0		15	6.02		10		10	140	22.92		45.1
Warrior 1400X Powerscreen	83	0		60	0		10		10	350	30.88		42.1
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		10		10	350	30.88		33.2
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		10		10	350	30.88		36.8
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		10		10	350	30.88		32.2
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		10		15	350	27.36		32
All plant exc Screen, (S) 100m	54.9	0		60	0		10		100	350	10.88		34
Haul Road HGV													44.7

Highgrove Court Close

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		10		50	460	19.28		38.2
Processing Plant, South, 50m	67.9	0		60	0		10		50	460	19.28		38.6
Excavator, 10m	80	0		60	0		10		10	300	29.54		40.5
Front Loader, 10m	74.7	0		60	0		10		10	300	29.54		35.2
Dump Truck	84	0		15	6.02		10		10	300	29.54		38.4
Warrior 1400X Powerscreen	83	0		60	0		10		10	460	33.26		39.7
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		10		10	460	33.26		30.8
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		10		10	460	33.26		34.4
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		10		10	460	33.26		29.8
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		10		15	460	29.73		29.7
All plant exc Screen, (S) 100m	54.9	0		60	0		10		100	460	13.26		31.6
Haul Road HGV													40.1

Woodmoor Street Close

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		0		50	690	22.80		44.7
Processing Plant, South, 50m	67.9	0		60	0		0		50	690	22.80		45.1
Excavator, 10m	80	0		60	0		0		10	610	35.71		44.3
Front Loader, 10m	74.7	0		60	0		0		10	610	35.71		39
Dump Truck	84	0		15	6.02		0		10	610	35.71		42.3
Warrior 1400X Powerscreen	83	0		60	0		0		10	690	36.78		46.2
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		0		10	690	36.78		37.3
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		0		10	690	36.78		40.9
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		0		10	690	36.78		36.3
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		0		15	690	33.26		36.1
All plant exc Screen, (S) 100m	54.9	0		60	0		0		100	690	16.78		38.1
Haul Road HGV													27.9

Bleachcroft Close

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		0		50	980	25.85		41.7
Processing Plant, South, 50m	67.9	0		60	0		0		50	980	25.85		42.1
Excavator, 10m	80	0		60	0		0		10	970	39.74		40.3
Front Loader, 10m	74.7	0		60	0		0		10	970	39.74		35
Dump Truck	84	0		15	6.02		0		10	970	39.74		38.2
Warrior 1400X Powerscreen	83	0		60	0		0		10	980	39.82		43.2
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		0		10	980	39.82		34.3
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		0		10	980	39.82		37.9
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		0		10	980	39.82		33.3
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		0		15	980	36.30		33.1
All plant exc Screen, (S) 100m	54.9	0		60	0		0		100	980	19.82		35.1
Haul Road HGV													17.1

Shaw Lane Far

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		10		50	350	16.90		40.6
Processing Plant, South, 50m	67.9	0		60	0		10		50	350	16.90		41
Excavator, 10m	80	0		60	0		10		10	400	32.04		38
Front Loader, 10m	74.7	0		60	0		10		10	400	32.04		32.7
Dump Truck	84	0		15	6.02		10		10	400	32.04		35.9
Warrior 1400X Powerscreen	83	0		60	0		10		10	350	30.88		42.1
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		10		10	350	30.88		33.2
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		10		10	350	30.88		36.8
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		10		10	350	30.88		32.2
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		10		15	350	27.36		32
All plant exc Screen, (S) 100m	54.9	0		60	0		10		100	350	10.88		34
Haul Road HGV													44.7

Highgrove Court Far

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		10		50	460	19.28		38.2
Processing Plant, South, 50m	67.9	0		60	0		10		50	460	19.28		38.6
Excavator, 10m	80	0		60	0		10		10	630	35.99		34
Front Loader, 10m	74.7	0		60	0		10		10	630	35.99		28.7
Dump Truck	84	0		15	6.02		10		10	630	35.99		32
Warrior 1400X Powerscreen	83	0		60	0		10		10	460	33.26		39.7
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		10		10	460	33.26		30.8
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		10		10	460	33.26		34.4
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		10		10	460	33.26		29.8
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		10		15	460	29.73		29.7
All plant exc Screen, (S) 100m	54.9	0		60	0		10		100	460	13.26		31.6
Haul Road HGV													40.1

Woodmoor Street Far

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		0		50	690	22.80		44.7
Processing Plant, South, 50m	67.9	0		60	0		0		50	690	22.80		45.1
Excavator, 10m	80	0		60	0		0		10	900	39.08		40.9
Front Loader, 10m	74.7	0		60	0		0		10	900	39.08		35.6
Dump Truck	84	0		15	6.02		0		10	900	39.08		38.9
Warrior 1400X Powerscreen	83	0		60	0		0		10	690	36.78		46.2
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		0		10	690	36.78		37.3
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		0		10	690	36.78		40.9
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		0		10	690	36.78		36.3
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		0		15	690	33.26		36.1
All plant exc Screen, (S) 100m	54.9	0		60	0		0		100	690	16.78		38.1
Haul Road HGV													27.9

Bleachcroft, Far

Description	LAeq	LAFmax		Mins used in 1 hr	Time Correction		Barrier Effect		Meas. distance	Receptor distance	Decay		Specific Level at receptor
Processing Plant, North, 50m	67.5	0		60	0		0		50	980	25.85		41.7
Processing Plant, South, 50m	67.9	0		60	0		0		50	980	25.85		42.1
Excavator, 10m	80	0		60	0		0		10	1220	41.73		38.3
Front Loader, 10m	74.7	0		60	0		0		10	1220	41.73		33
Dump Truck	84	0		15	6.02		0		10	1220	41.73		36.3
Warrior 1400X Powerscreen	83	0		60	0		0		10	980	39.82		43.2
M2500 E3X Mobile Washing Plant (W)	74.1	0		60	0		0		10	980	39.82		34.3
M2500 E3X Mobile Washing Plant (N)	77.7	0		60	0		0		10	980	39.82		37.9
M2500 E3X Mobile Washing Plant (E)	73.1	0		60	0		0		10	980	39.82		33.3
M2500 E3X Mobile Washing Plant (S),15m	69.4	0		60	0		0		15	980	36.30		33.1
All plant exc Screen, (S) 100m	54.9	0		60	0		0		100	980	19.82		35.1
Haul Road HGV													17.1