

**SOUND IMPACT ASSESSMENT**  
**of**  
**PROPOSED MINERAL EXTRACTION AND PROCESSING SITE**  
**at**  
**BIRKWOOD & SMALLEY BIGHT,**  
**OFF FERRY LANE,**  
**NEAR STANLEY,**  
**WAKEFIELD**

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## 1.0 **Summary and Conclusions**

- 1.1 It is proposed to excavate sand and gravel from a new quarry development on land off Ferry Lane and the A642 near Stanley, Wakefield. The development consists of two adjacent sites that are separated by the river Calder; 'Birkwood' to the southeast and 'Smalley Bight' to the northwest.
- 1.2 The normal requirements of National Planning Policy are that daytime sound levels (07.00 to 19.00 hours) at noise-sensitive properties should not exceed the background level by more than 10 dBA.

In circumstances where it is not possible to meet this requirement without unreasonable burden of the mineral operator, the upper limit between 0700 to 1900 hours is 55 dB LA<sub>eq</sub> (1-hour) at noise-sensitive properties.

- 1.3 Operations at site will involve the digging of raw material using a tracked excavator, transport of the excavated material by dumptruck to the on site processing area and then the finished product will be transported out of the site by river barges, which are loaded by a conveyor discharging through a shroud. Operating hours of the quarry will not extend outside of 07.00 – 19.00 weekdays and 07.00 – 13.00 on Saturday.
- 1.4 The predicted sound levels reaching dwellings are summarised in the table below for the closest and furthest operations on each of the sites, performed using standard data and similar machinery.

**Sound Pressure Levels, dB LA<sub>eq</sub>**

<b>Receptor</b>	<b>Smalley Close</b>	<b>Smalley Far</b>	<b>Birkwood Close</b>	<b>Birkwood Far</b>
Dwelling to NE	49.1	48.7	49.1	48.7
Calder House, SE	51.5	51.2	59.7	51.3
Dwelling to South	49.6	49.4	51.3	49.6
Ferry Lane Estate, SW	43.9	42.7	44.2	42.8
Smalley Bight, West	53.6	45.1	48.9	45
Stanley, NW	44.7	42	42.5	41.7
Dwelling to NW	57.7	45.9	47.3	45.4

It has been subsequently possible to measure the exact items of processing plant that are currently in use at a different quarry site. These measurements are lower than the standard data. Excavation and barge loading predictions remain as before. The overall predicted sound levels with this dataset are given in the table overleaf.

Receptor	Smalley Close	Smalley Far	Birkwood Close	Birkwood Far
Dwelling to NE	45.7	44.7	45.7	44.8
Calder House, SE	44.8	42.7	59.3	47.6
Dwelling to South	48.0	47.7	50.3	48.1
Ferry Lane Estate, SW	41.8	39.8	42.3	39.9
Smalley Bight, West	53.3	42.1	47.9	41.8
Stanley, NW	43.4	39.2	40.1	38.7
Dwelling to NW	57.6	43.0	45.4	41.9

1.5 The typical daytime representative background sound level was measured using a long duration unattended survey as being 40 dB LA<sub>90</sub> during the week and 34 dB LA<sub>90</sub> on Saturday morning.

1.6 The summary of results analysis is:

- The target to not exceed background by more than 10 dBA is likely to be met at the large residential estates of Stanley and off Ferry Lane at all times.
- At the dwelling to the south and the dwelling to the northeast, sound levels are likely to be at or less than 10 dB above background during weekday working, and be above this on a Saturday morning, but always be in compliance with the 55 dBA limit.
- At Calder House, sound levels are predicted at more than 10 dBA above background at all times using standard data, but within the 55 dBA limit except for when workings are within approximately 100m of the dwelling. Using direct measurement predictions, sound levels are likely to be within 10 dBA above background during weekday working, unless excavation is within approximately 100m of the dwelling.
- At Smalley Bight and the dwelling to the northwest, sound levels during weekday working are within 10 dBA above background unless mobile workings are close to the dwellings. On Saturday or when working are close to the dwelling, levels exceed 10 dBA above background. The predictions are within the 55 dBA limit at all times, except at the dwelling to the northwest when workings are within approximately 85m of the receptor.

1.7 It is recommended that care is taken to ensure that the effective height and overall integrity of earth bunds and fences are maximised at positions close to individual dwellings, especially when mobile excavation works are close to them.

1.8 If practicable, it is recommended to provide a barrier around the immediate boundary of the processing plant compound to maximise the attenuation offered by it. The barrier may take the form of an imperforate timber fence (if practicable with sound absorption on the inner face), an earth bund / mound, or combination of each. The barriers should be of sufficient height to break line of site from all parts of all machinery to all parts of all nearby dwellings.

1.9 Sound from the movements of barges on open waterways is also quantified in the report, the summary of predicted levels is given below.

	Dwellin g to NE	Calder House, SE	Dwelling to South	Ferry Lane Estate, SW	Smalley Bight, W	Stanley, NW	Dwelling to NW
LWA	110	110	110	110	110	110	110
Q (movements/hr)	1	1	1	1	1	1	1
V, kmh	6.4	6.4	6.4	6.4	6.4	6.4	6.4
d (distance)	300	35	180	750	740	1000	680
a (angle of view)	90	110	90	90	90	60	90
Shielding	0	5	5	10	0	5	5
LAeq, 1 hour	41.2	46.4	38.4	27.2	37.2	29.2	32.6

## 2.0 **Introduction**

It is proposed to excavate sand and gravel from a new quarry development on land off Ferry Lane and the A642 near Stanley, Wakefield. The development consists of two adjacent sites that are separated by the river Calder; 'Birkwood' to the southeast and 'Smalley Bight' to the northwest.

This noise assessment has been commissioned to quantify impact from proposed site activities 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 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<sub>eq</sub> (1-hour) at noise-sensitive properties.
- During the evening from 19.00 to 22.00 hours the 55 dB LA<sub>eq</sub> (1-hour) limit applies even if the background level is greater than 45 dB LA<sub>90</sub>.
- At night between 22.00 to 07.00 hours the sound level at noise-sensitive properties should not exceed 42 dB LA<sub>eq</sub> (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 beepers, 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. Examples include baffle mound construction, soil stripping, removal of spoil heaps and construction of new permanent landforms. A limit of 70 dB LA<sub>eq</sub> (1-hour) is suggested for periods of up to 8 weeks per year.

### 3.0 **Proposed Site Operations**

It is proposed to excavate sand and gravel from a new quarry development on land off Ferry Lane and the A642 near Stanley, Wakefield. The development consists of two adjacent sites that are separated by the river Calder; 'Birkwood' to the southeast and 'Smalley Bight' to the northwest.

Both sites will be used for mineral extraction with all processing being done in a fixed location on the Birkwood site. Material excavated from the Smalley Bight side will be transported over the river by conveyor.

Prior to the main operations, topsoil and subsoil will be removed and stored as screening bunds. The main operations will then comprise:

- Digging of raw material using a Doosan DX300 tracked excavator
- Transport of the excavated material by 2 no Volvo a25d dumptrucks to the conveyor hopper
- Processing of the raw material using screens, sand plant and crushers in an on-site plant compound
- Loading of processed material by a Case 821g loading shovel onto a conveyor that transports the material down to the canal
- The processed material will be transported out of the site by barges loaded by the conveyor discharging through a shroud.

Operating hours of the quarry will not extend outside of 07.00 – 19.00 weekdays and 07.00 – 13.00 on Saturday.

### 3.1 **Sound Sources**

The sound sources proposed for use at the site and assessed in this report are:

- Case 821g Wheeled Loading Shovel
- Doosan DX300 Tracked Excavator
- Volvo a25d Dumptruck (2no)
- Finlay 683 supertrak wash screen
- Finlay 683 supertrak dry screen
- Finlay c1540 cone crusher
- Evo wash 70 sand plant
- 400 kva generator
- S130 mc closkey screen
- Finlay 430 stockpiler

- Case 821g Loading Shovel
- Loading of barges via conveyor

In addition to the above sources, sound from movements of dump trucks on internal haul roads is quantified. The dump trucks will use the internal routes either side of the river that separates the two sites. The internal roadway up the eastern side of Birkwood will only be used to move equipment and vehicles to the plant compound.

Sound from the movement of barges is also quantified, covered in a separate section of the report (section 7).

Other small items will be used, such as an amenity cabin with integral generator and low noise water pumps. These items have negligible sound output compared to the main sources that form part of the assessment.

The operations and sound sources will generally be located below the quarry rim. The sound emissions anticipated at the surface level of the quarry rim are mainly during the initial soil stripping and early extraction operations, plus movements of the dump trucks on internal routes.

A 3m high soil mound screen is proposed around the boundary of most of the site. There are some areas where the change in natural land profile may mean that an additional fence is required to break line of sight to the nearest dwellings from some sources, especially when the quarry activity is at higher elevations. The earth mound on the eastern boundary of Birkwood will need to be extended northwards to the plant compound, or an imperforate timber fence provided in its place.

The essential properties of the earth mounds and fences combined is that they must break line of sight from all surrounding dwellings to all parts of all items of mobile and static plant, except for barges on the open water and during initial soil stripping exercises. The assessment in this report assumes that noise barriers are provided in this manner.

### 3.2 **Plant Sound Levels**

The data used for source sound levels has been taken from a combination of the information contained in BS 5228 and also from our on site measurements of similar activities and machinery at other sites.

The sound levels measured by us at a variety of previous sites and the data contained in BS 5228 generally agree with each other, limiting the uncertainty caused by plant items not yet being selected.



The summary of source sound levels is shown below; frequency spectra are given in the appendices for those items it is available for:

<b>Machine</b>	<b>Sound Level at 10m</b>
Case 821g Wheeled Loading Shovel	76 dB LA <sub>eq</sub>
Doosan DX300 Tracked Excavator	80 dB LA <sub>eq</sub>
Volvo a25d Dumptruck (2no)	78 dB LA <sub>eq</sub>
Finlay 683 supertrak wash screen	81 dB LA <sub>eq</sub>
Finlay 683 supertrak dry screen 3 way split	81 dB LA <sub>eq</sub>
Finlay c1540 cone crusher	90 dB LA <sub>eq</sub>
Evo wash 70 sand plant	78 dB LA <sub>eq</sub>
400 kva generator	66 dB LA <sub>eq</sub>
S130 mc closkey screen	81 dB LA <sub>eq</sub>
Finlay 430 stockpiler	81 dB LA <sub>eq</sub>
Case 821g Loading Shovel	76 dB LA <sub>eq</sub>
Barge Loading	80 dB LA <sub>eq</sub>
Dump truck on haul road	Sound Power Level L <sub>wa</sub> = 106 dBA
Barge	Sound Power Level L <sub>wa</sub> = 110 dBA

It is assumed that all plant items will operate with 100% utilisation. The assessment of all items of machinery having simultaneous full utilisation over one hour represents the reasonable worst case scenario. It is likely that the real-life situation will involve less utilisation for some sources (eg, barges and dump trucks are unlikely to be loaded constantly for an hour). The most dominant sources of mobile excavation and processing plant are likely to be in fairly continuous use, but this margin of tolerance should be noted.

It is likely that there will be 6 – 8 barge movements per day, so one per hour is used in the assessment of barge sound. The number of dump truck movements on the internal roads is likely to vary. For the purposes of calculation, a total of 20 movements per hour along the full length of either internal road has been allowed for, which is thought to represent the likely scenario.

The elevation of the quarry site before excavation is 17 – 20m. A location plan is given in the appendices of this report

### 3.3 Direct Measurement of Plant & Machinery

Following preparation of our original report it transpired that the processing plant proposed for use at Stanley Ferry is already in use at a similar quarry in Dewsbury. Measurements have been taken directly from the processing plant for use in these predictions to give an additional datapoint and reduce uncertainty. The full measurements are given in Appendix 6 of this report.

The typical sound level from the overall processing plant operation is concluded as being **71 dB LA<sub>eq</sub> at 50m** with direct line of sight. This exactly corresponds to a measurement taken on top an existing bund at a distance of 50m from the processing area. This measurement is used in the calculations of noise impact. It is assumed that all plant items will operate with 100% utilisation as during our site visit.

The predicted measurements for all processing sources combined and described in the original report equate to **76.0 dBA**. This is 5 dBA more than on the site measurements and suggests a comfort /tolerance margin in original predictions.

Predictions are given in this report that use both the standard data and also measurements at the existing quarry. Excavation and sound from barges uses the same predictive methodology for either dataset.

### 4.0 Sound Levels at Dwellings

#### 4.1 Dwelling Positions

The assessment of sound impact from proposed site activities is undertaken for seven sets of the closest dwellings:

Dwelling	Grid reference	Elevation	Distance to Smalley Bight		Distance to Birkwood		Distance to Plant
			minimum	maximum	minimum	maximum	
Dwelling to NE	SE 35992 23640	39	450	1000	450	850	400
Calder House, SE	SE 35565 23171	22	360	700	50	450	300
Dwelling to South	SE 35387 23000	20	500	750	200	470	500
Ferry Estate, SW	SE 34863 22997	22	500	900	450	850	860
Smalley Bight, W	SE 34900 23423	21	100	600	200	650	650
Stanley, NW	SE 34712 23835	23	350	850	650	1050	950
Dwelling to NW	SE 35000 23720	20	60	500	300	750	600

## 4.2 **Sound Predictions**

The distances between the mobile plant and the nearest dwellings will vary massively 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 on each site. This gives a large number of predictions, but it is necessary to demonstrate the range of potential noise impacts at different locations.

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 overleaf for the closest and furthest operations on each of the sites.

**Sound Pressure Levels, dB LA<sub>eq</sub>**

<b>Receptor</b>	<b>Smalley Close</b>	<b>Smalley Far</b>	<b>Birkwood Close</b>	<b>Birkwood Far</b>
Dwelling to NE	49.1	48.7	49.1	48.7
Calder House, SE	51.5	51.2	59.7	51.3
Dwelling to South	49.6	49.4	51.3	49.6
Ferry Lane Estate, SW	43.9	42.7	44.2	42.8
Smalley Bight, West	53.6	45.1	48.9	45.0
Stanley, NW	44.7	42.0	42.5	41.7
Dwelling to NW	57.7	45.9	47.3	45.4

During temporary phases when mobile plant items operate at the rim height of the quarry, values are predicted at up to 10 dBA higher than those shown above at all dwellings, depending on location.

Substituting the direct measurements of processing activities in place of predictions gives sound levels reaching dwellings as being:

<b>Receptor</b>	<b>Smalley Close</b>	<b>Smalley Far</b>	<b>Birkwood Close</b>	<b>Birkwood Far</b>
Dwelling to NE	45.7	44.7	45.7	44.8
Calder House, SE	44.8	42.7	59.3	47.6
Dwelling to South	48.0	47.7	50.3	48.1
Ferry Lane Estate, SW	41.8	39.8	42.3	39.9
Smalley Bight, West	53.3	42.1	47.9	41.8
Stanley, NW	43.4	39.2	40.1	38.7
Dwelling to NW	57.6	43.0	45.4	41.9

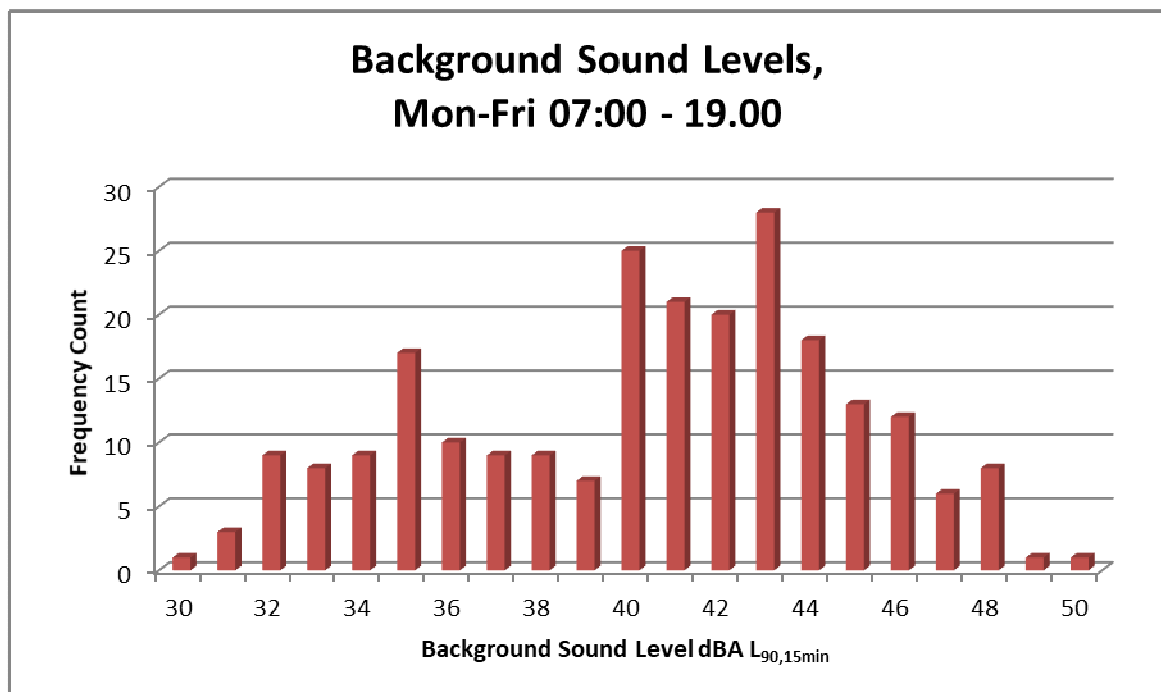
## 5.0 **Background Sound Levels**

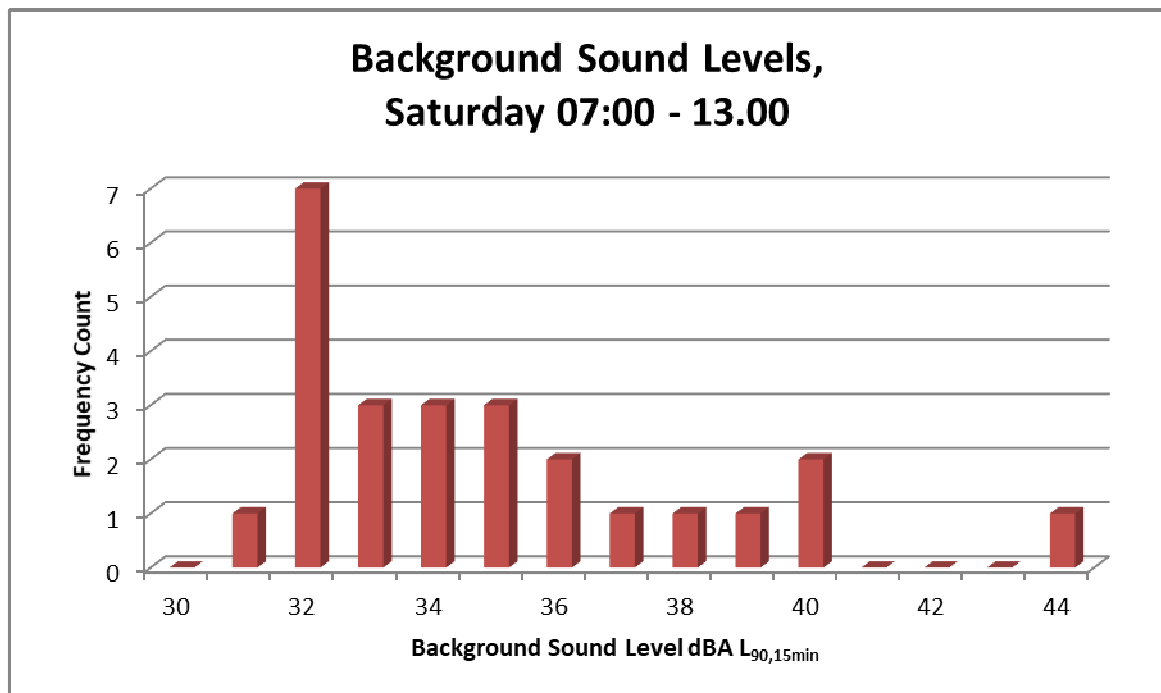
Existing background sound levels were measured in the private garden of one of the closest dwellings, Smalley Farm, which is under the ownership of the applicant. Sound levels were measured using an unattended sound level meter between 11.30 on 20<sup>th</sup> August 2019 and 10.45 on 27<sup>th</sup> August 2019.

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

The background survey included a Saturday morning when the quarry site will be operating. Analysis of the data shows that the background sound level on a Saturday is significantly lower than during normal weekday daytimes, and so separate assessments are made for Saturday morning working.

Full measurement data is included in the appendices of this report; a graphical summary of measured background sound levels during proposed times of quarry operation is shown overleaf.





The typical representative background sound level is identified from the above as being **40 dB  $LA_{90}$**  during the week and **34 dB  $LA_{90}$**  on Saturday morning.

## 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 chief 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 show:

### Weekdays – Using Predicted Sound Levels

Receptor	Smalley Close	Smalley Far	Birkwood Close	Birkwood Far
Dwelling to NE	9.1	8.7	9.1	8.7
Calder House, SE	11.5	11.2	19.7	11.3
Dwelling to South	9.6	9.4	11.3	9.6
Ferry Lane Estate, SW	3.9	2.7	4.2	2.8
Smalley Bight, West	13.6	5.1	8.9	5.0
Stanley, NW	4.7	2.0	2.5	1.7
Dwelling to NW	17.7	5.9	7.3	5.4

### Saturday Morning – Using Predicted Sound Levels

Receptor	Smalley Close	Smalley Far	Birkwood Close	Birkwood Far
<b>Dwelling to NE</b>	15.1	14.7	15.1	14.7
Calder House, SE	17.5	17.2	25.7	17.3
Dwelling to South	15.6	15.4	17.3	15.6
Ferry Lane Estate, SW	9.9	8.7	10.2	8.8
Smalley Bight, West	19.6	11.1	14.9	11.0
Stanley, NW	10.7	8.0	8.5	7.7
Dwelling to NW	23.7	11.9	13.3	11.4

### Weekdays – Using Direct Measurements

Receptor	Smalley Close	Smalley Far	Birkwood Close	Birkwood Far
Dwelling to NE	5.7	4.7	5.7	4.8
Calder House, SE	4.8	7.2	19.3	7.6
Dwelling to South	8	7.7	10.3	8.1
Ferry Lane Estate, SW	1.8	0.2 below	2.3	0.1 below
Smalley Bight, West	13.3	2.1	7.9	1.8
Stanley, NW	3.4	0.8 below	0.1	1.3 below
Dwelling to NW	17.6	3	5.4	1.9

### Saturday Morning – Using Direct Measurements

Receptor	Smalley Close	Smalley Far	Birkwood Close	Birkwood Far
<b>Dwelling to NE</b>	11.7	10.7	11.7	10.8
Calder House, SE	10.8	13.2	25.3	13.6
Dwelling to South	14	13.7	16.3	14.1
Ferry Lane Estate, SW	7.8	5.8	8.3	5.9
Smalley Bight, West	19.3	8.1	13.9	7.8
Stanley, NW	9.4	5.2	6.1	4.7
Dwelling to NW	23.6	9	11.4	7.9

The combination of the varied working distances, potential differences in source sound level and different data sources means that the predicted levels require some interpretation.

### **Stanley & Ferry Lane**

Sound levels at the major residential developments of Stanley and Ferry Lane should comply with the NPPF requirement to not exceed the existing background sound levels by more than 10 dBA at all times using either dataset.

### **Calder House**

At Calder House, sound levels are predicted to exceed 10 dB above background at all times when using standard data. If using data measured directly at the Dewsbury site, the predicted sound levels at Calder House are predicted to exceed the background sound level by less than 10 dBA during weekdays unless excavation is taking place close to the dwelling on the Birkwood site. Saturday morning predictions remain in excess of 10 dBA above background.

### **Individual Dwellings to South & Northeast**

Using standard data the predicted sound levels at the dwelling to the south and the dwelling to the northeast will fluctuate around 10 dB above background during weekday working, and above this on a Saturday morning. When using direct measurement predictions, sound levels are less than 10 dBA above background during the week and slightly more than 10 dBA above background on Saturday morning.

### **Smalley Bight & Dwelling to Northwest**

At Smalley Bight and the dwelling to the northwest, the predicted sound levels are within 10 dB above background during weekday working on areas further away from the dwellings. On a Saturday or when mobile works are close to the dwellings, levels will exceed 10 dB above background.

## **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<sub>eq</sub> (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 with two exceptions. When quarry workings are close to Calder House and the dwelling to the northwest, predicted sound levels are up to 59.7 dBA and 57.7 dBA respectively. The sound levels are slightly lower when using direct measurement predictions, but only by small margin since the overall level is dominated by excavation works during this scenario.

At Calder House, the closest part of the site lies approximately 50m from the dwelling. Once mobile works have reached 100m from the dwelling, sound levels are predicted to comply with the limit of 55 dB LA<sub>eq</sub>.

At the dwelling to the northwest, the predicted sound levels comply with the 55 dBA limit at distances above around 85m. The closest proposed excavation area lies around 60m from the dwelling.

### 6.3 **Phases at Quarry Rim**

During soil stripping activities and initial minerals excavation at ground level of the quarry rim the sound levels reaching dwellings are predicted at up to 10 dBA higher than the values shown in 6.1, depending on location.

The predicted sound levels at dwellings during these phases would be within the temporary 70 dB LA<sub>eq</sub> limit allowable for up to 8 weeks per year for exactly this type of activity.

### 6.4 **Summary of Results Analysis and Recommendations**

The summary of results analysis is:

- **The target to not exceed background by more than 10 dBA is likely to be met at the large residential estates of Stanley and off Ferry Lane at all times.**
- **At the dwelling to the south and the dwelling to the northeast, sound levels are likely to be at or less than 10 dB above background during weekday working, and be above this on a Saturday morning, but always be in compliance with the 55 dBA limit.**
- **At Calder House, sound levels are predicted at more than 10 dBA above background at all times using standard data, but within the 55 dBA limit except for when workings are within approximately 100m of the dwelling. Using direct measurement predictions, sound levels are likely to be within 10 dBA above**



**background during weekday working, unless excavation is within approximately 100m of the dwelling.**

- **At Smalley Bight and the dwelling to the northwest, sound levels during weekday working are within 10 dBA above background unless mobile workings are close to the dwellings. On Saturday or when working are close to the dwelling, levels exceed 10 dBA above background. The predictions are within the 55 dBA limit at all times, except at the dwelling to the northwest when workings are within approximately 85m of the receptor.**

When mobile plant items are at positions close to dwellings, they will also be close to the earth / timber sound barriers, so the attenuation they provide *may* be better than the approximation given in BS 8233. It is essential that any noise barriers are of adequate dimensions and in particular, the effective height of them should be maximised when mobile sources are close to the dwellings. The higher a barrier is, the greater attenuation is offered by it.

The processing plant will be located in a fixed compound. If practicable, it is recommended to provide a barrier around the immediate boundary of this compound to maximise the attenuation offered by it. The barrier may take the form of an imperforate timber fence (if practicable with sound absorption on the inner face), an earth bund / mound, or combination of each. The barriers should be of sufficient height to break line of site from all parts of all machinery to all parts of all nearby dwellings.

## **7.0 Barge Movement**

It may be argued that the movement of barges on the open waterways should not form part of the impact assessment since they are not strictly on the quarry site, in a similar manner to HGVs not being assessed once they are on the public highway.

Despite this, the operation of the quarry does introduce barge movements in close proximity to the site and existing dwellings, so levels from them have been quantified for the areas of river closest to each dwelling set.

There are very few resources for environmental sound levels from barge movements, but a suitable method has been determined. Research found by us suggests that the sound power level of a barge on an open waterway is around 110 dBA.

The most extensive research found by us on sound levels from passing

barges was undertaken by Dr Charles Thornton Ph. D. for Southern Illinois University in 1975. The conclusion of this research was that the typical sound pressure level from a passing barge was 76 – 79 dBA at 50 feet (15m).

The sound power level (SWL) equivalent to this requires the addition of 8 dB for the directivity of the environment and 23 dB for distance attenuation. The sound power level is calculated as 107 – 110 dBA SWL, so the higher of these levels is used in the assessment of sound from barges. Other, less detailed information on sound levels from barges found by us during internet searches generally agreed with these sound levels.

This sound power data has been used with the calculation procedure contained in BS 5228 for the movement of wagons on haul roads. The sources are of course different, but the engineering principles behind the formula are the same; a moving transportation source along a pre defined route with constant speed and measurable distance & angle of view. Based on this, the accuracy of the formula should hold true for the source of barge movement. The speed of the barges has been set at 6.4 km/h, which is the normal speed limit on UK canals. Some rivers are subject to a higher speed limit of 10 km/h, but the lower limit has been used in these calculations to represent the more likely scenario.

The calculation table for sound from barge movements is shown below.

	<b>Dwellin g to NE</b>	<b>Calder House, SE</b>	<b>Dwelling to South</b>	<b>Ferry Lane Estate, SW</b>	<b>Smalley Bight, West</b>	<b>Stanley, NW</b>	<b>Dwelling to NW</b>
LWA	110	110	110	110	110	110	110
Q (movements/hr)	1	1	1	1	1	1	1
V, kmh	6.4	6.4	6.4	6.4	6.4	6.4	6.4
d (distance)	300	35	180	750	740	1000	680
a (angle of view)	90	110	90	90	90	60	90
Shielding	0	5	5	10	0	5	5
LAeq, 1 hour	41.2	46.4	38.4	27.2	37.2	29.2	32.6

As discussed, sound levels from these barge movements may be taken as a separate entity from other on site activities,

It can be seen that in any case, the movements of barges do not make a fundamental difference to the overall impact assessment. At many locations, the sound levels from passing barges are predicted at least 6 – 10 dBA less than the sound levels from site operations, depending on the area being excavated.

The highest predicted sound levels from barge movement is at Calder House Farm, which lies in close proximity to the waterway and Stanley Ferry moorings where sound associated with the canal may be expected

(see Google Earth image below). The prediction at this location is 46.4 dB LA<sub>eq</sub>. There are no quantitative criteria directly applicable to sound levels from barge movement, but the following comments can be made:

- All barge sound falls within the 55 dBA limit for site activities outlined in BS 5228 if it were deemed to apply
- The sound levels from barges would comply with the normal outdoor criteria contained in BS 8233 for dwellings affected by relatively anonymous sources such as road traffic.
- Sound levels inside the nearest dwellings with windows open caused by barge movement would comply with the guidance of BS 8233, though this is generally used for road traffic sources.



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## APPENDIX 1

### BACKGROUND SOUND LEVEL MEASUREMENTS

Start Date	Start Time	LAeq	LAFmax	LAFmin	LAF10%	LAF90%	LAF1%
[YYYY-MM-DD]	[hh:mm:ss]	[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
20/08/2019	11:22:54	52.7	68.7	42.6	58.3	45.1	60.9
20/08/2019	11:30:00	48.4	67	43.8	49.7	45.8	52.7
20/08/2019	11:45:00	48.9	57.1	43.3	50.8	46	52.6
20/08/2019	12:00:00	58.9	86.7	43.2	50.6	45.9	70.3
20/08/2019	12:15:00	47.6	60.3	42.7	49.5	44.7	53.6
20/08/2019	12:30:00	50	61.5	42.1	53.9	44.2	58
20/08/2019	12:45:00	46.9	63	42.1	47.5	43.6	56.6
20/08/2019	13:00:00	50.1	59.6	43.2	52.6	45.3	55.7
20/08/2019	13:15:00	51.7	70.1	43.4	54	46	62.1
20/08/2019	13:30:00	50.3	64.1	44.4	52.5	46.7	57.9
20/08/2019	13:45:00	52.1	73.7	43.7	51.6	45.7	63.7
20/08/2019	14:00:00	53	72.8	45.7	53.3	47.7	63.9
20/08/2019	14:15:00	50.5	67.4	45.3	51.7	47.2	58.4
20/08/2019	14:30:00	49	60.8	44.3	50.7	46.4	54.2
20/08/2019	14:45:00	49.1	64.6	44	50.7	46.7	53.5
20/08/2019	15:00:00	58.8	76.2	44.7	64.1	46.8	68.9
20/08/2019	15:15:00	61.5	81.1	46.2	64.1	51	74.7
20/08/2019	15:30:00	52.9	70.3	44.4	52.4	46.7	66.3
20/08/2019	15:45:00	71.5	85.7	44.7	74.8	50.2	83.1
20/08/2019	16:00:00	64.9	86.7	45.9	56.7	47.9	80.9
20/08/2019	16:15:00	61	85.3	44.4	63.9	47.5	74.6
20/08/2019	16:30:00	61.7	85.8	44.8	61.2	48	74
20/08/2019	16:45:00	59.1	81.4	44.8	58.4	47.7	72
20/08/2019	17:00:00	69	89.5	44.7	71.3	47.6	82.1
20/08/2019	17:15:00	57.7	91.2	44.4	50.2	46.1	64.3
20/08/2019	17:30:00	56.4	79.6	43.9	50.5	46.2	70
20/08/2019	17:45:00	50.3	68.6	43.3	51.1	45.6	60.8
20/08/2019	18:00:00	50.5	69.5	42.9	49.6	45.2	62.9
20/08/2019	18:15:00	48.1	65.6	42.6	48.8	44.6	55.6
20/08/2019	18:30:00	47.1	57.9	41.6	48.6	44.4	53.6
20/08/2019	18:45:00	46.4	53.8	42	48	44.1	50.3
20/08/2019	19:00:00	53.1	75.6	41.7	49.6	43.5	66.2
20/08/2019	19:15:00	46.5	61.2	39	47.9	42.7	55.6
20/08/2019	19:30:00	50.1	65.1	39.5	52.1	43.6	61
20/08/2019	19:45:00	44.6	53.7	37.6	46.5	41.7	48.1

20/08/2019	20:00:00	47	63.8	39	47.1	41.4	59.1
20/08/2019	20:15:00	42.2	50.7	37	44.2	39.6	48
20/08/2019	20:30:00	41.3	51.2	34.6	43.5	37.7	47.1
20/08/2019	20:45:00	44.4	67.8	32.3	45.7	34.3	57.6
20/08/2019	21:00:00	39.3	56.5	31	42.7	33.4	48.7
20/08/2019	21:15:00	36.4	50.5	29.8	39.1	32.3	43
20/08/2019	21:30:00	35.3	44.7	30.6	37.4	32.3	40.2
20/08/2019	21:45:00	38.9	50.9	30	42.4	31.9	44
20/08/2019	22:00:00	41.2	56.4	32.2	44	34.4	49.3
20/08/2019	22:15:00	40.7	54.7	33.6	42.9	36.8	49.3
20/08/2019	22:30:00	37.5	52.1	33.4	39.2	34.8	43.3
20/08/2019	22:45:00	40.4	58.7	32.2	44.4	34.1	49.5
20/08/2019	23:00:00	36.8	52.9	31.2	39.2	33.4	43.7
20/08/2019	23:15:00	41.2	61.5	29.2	46.3	31.1	48.3
20/08/2019	23:30:00	34.3	55.3	29.4	37	31	40.7
20/08/2019	23:45:00	35.7	49.5	29.1	39.2	31.4	40.7
21/08/2019	00:00:00	36.2	43.7	32.8	38.3	34	39.9
21/08/2019	00:15:00	36.4	52.2	31.5	36	32.9	47.2
21/08/2019	00:30:00	37.3	53.8	31.7	37.5	33.2	47.8
21/08/2019	00:45:00	35.1	41.2	32.3	36.5	33.5	38.8
21/08/2019	01:00:00	34.7	39.2	31.5	36	32.8	37.6
21/08/2019	01:15:00	39.1	63	31.7	37.6	33.3	50.3
21/08/2019	01:30:00	35.8	47.1	32.7	37.2	34.1	39.3
21/08/2019	01:45:00	36.9	40.7	33.7	37.9	35.3	38.9
21/08/2019	02:00:00	46.8	66.3	32.8	43.5	34.9	60.5
21/08/2019	02:15:00	37.2	50	30.7	40.6	33.3	44
21/08/2019	02:30:00	35.1	39.8	32	36.6	33.4	38.4
21/08/2019	02:45:00	37.8	50.3	33.5	39.6	35.2	43.3
21/08/2019	03:00:00	38.6	51.7	34.8	39.3	36.5	46.3
21/08/2019	03:15:00	37.9	42.9	34.4	39.3	36.1	40.8
21/08/2019	03:30:00	40	49.2	36.7	41.2	38.4	43.2
21/08/2019	03:45:00	39.3	43	36.8	40.1	38.1	41.3
21/08/2019	04:00:00	39.1	44.6	35.7	40.1	37.6	41.7
21/08/2019	04:15:00	39.7	48.2	36.5	40.8	38.2	42.8
21/08/2019	04:30:00	40.8	49.3	37.5	42.3	39	45.1
21/08/2019	04:45:00	40.7	49.1	37	41.9	38.5	45.3
21/08/2019	05:00:00	40.6	54.6	36.7	42.1	38.2	48.1
21/08/2019	05:15:00	41.9	51.3	37.4	44	39	46.6
21/08/2019	05:30:00	43.8	51.7	40.4	45.1	42.2	46.9
21/08/2019	05:45:00	43.6	53.5	40.5	45.1	41.9	47.3
21/08/2019	06:00:00	45	65.9	40.2	46.2	42	50.7
21/08/2019	06:15:00	44.4	56.5	40.2	45.8	42.4	48.2
21/08/2019	06:30:00	46.4	56.4	42.2	48	44.2	51.2

21/08/2019	06:45:00	48.2	63.5	42.8	47.7	44.2	59.2
21/08/2019	07:00:00	46.3	53.8	44	47.2	45.1	49.2
21/08/2019	07:15:00	46.4	62.7	42.8	47.1	44	53.1
21/08/2019	07:30:00	44.1	51.6	41.7	45	42.9	46.7
21/08/2019	07:45:00	46.5	62.5	41	47.9	43.2	54.9
21/08/2019	08:00:00	45.8	58.2	41.1	47.1	42.7	53.9
21/08/2019	08:15:00	58.1	80.9	40.6	61.1	42	68.9
21/08/2019	08:30:00	55.5	74.6	39.9	60.9	41.5	65.3
21/08/2019	08:45:00	42.1	54.1	38.2	43.6	40	47.4
21/08/2019	09:00:00	42	55.6	38.2	42.9	39.7	49.4
21/08/2019	09:15:00	43.9	57	38.4	45.5	40.9	50.6
21/08/2019	09:30:00	44.3	58.1	38.8	46.6	41	52.3
21/08/2019	09:45:00	43.8	56.8	38	45.9	40.1	50.3
21/08/2019	10:00:00	44.2	59.5	37.7	46.2	40	52.8
21/08/2019	10:15:00	44.3	61.7	37.4	47	39.6	52.8
21/08/2019	10:30:00	44.4	61.3	37.8	47.3	39.6	52.2
21/08/2019	10:45:00	48.6	66.6	38.3	50.7	41.7	59.4
21/08/2019	11:00:00	44.3	60.5	37.7	46.3	39.9	52.3
21/08/2019	11:15:00	47.1	61.8	38.7	49.9	41.1	55.8
21/08/2019	11:30:00	46.4	64.4	37.6	48.7	39.8	56.5
21/08/2019	11:45:00	47	70.8	38	47.1	40	58.9
21/08/2019	12:00:00	50.2	71	38.2	45.6	40.2	64.7
21/08/2019	12:15:00	48.1	75.1	38.1	46.4	40.7	55.4
21/08/2019	12:30:00	62.4	83.7	38.2	52	41.2	78.1
21/08/2019	12:45:00	46.8	72.7	40.1	47.2	42.4	52.9
21/08/2019	13:00:00	64.8	76.2	40.7	70.6	44.2	73.8
21/08/2019	13:15:00	63	79.2	39.7	61.3	42.5	75
21/08/2019	13:30:00	45.6	69.7	37.5	47.9	39.8	54.1
21/08/2019	13:45:00	48.5	66.2	37.6	51.2	41.8	58.4
21/08/2019	14:00:00	49.9	70.9	36.6	50	40.2	62.8
21/08/2019	14:15:00	46.2	60.5	39.7	48.3	42.4	54.4
21/08/2019	14:30:00	43.6	56.8	38.5	45.8	40.6	49.8
21/08/2019	14:45:00	43.7	58	38.2	46.2	40.3	49.5
21/08/2019	15:00:00	43.2	58.4	37.9	44.7	39.6	52.4
21/08/2019	15:15:00	54.7	82.5	38.9	57.5	41.9	64.7
21/08/2019	15:30:00	57.9	80.7	39.1	56.3	40.8	71.6
21/08/2019	15:45:00	51.4	68.6	40.2	55.8	43.2	60.1
21/08/2019	16:00:00	45.2	57.7	40.2	47.6	41.6	53.4
21/08/2019	16:15:00	46.5	64.8	37.9	45.6	39.6	59.7
21/08/2019	16:30:00	48.5	76.4	38.5	47.8	39.8	59.8
21/08/2019	16:45:00	46.7	74.5	38.8	45.4	40.5	57.3
21/08/2019	17:00:00	43.3	70.7	38.8	43.4	40.2	46.5
21/08/2019	17:15:00	46.7	68.5	39.5	48	42	56.2

21/08/2019	17:30:00	45.6	58	41	47.2	42.8	52.4
21/08/2019	17:45:00	44.5	62.1	40.4	45.8	42.1	50.9
21/08/2019	18:00:00	44.4	57	40.8	45.6	42.6	48.8
21/08/2019	18:15:00	45.8	67.6	39.8	45.5	41.3	56.6
21/08/2019	18:30:00	44.4	58.9	39.6	46.3	41.3	52.1
21/08/2019	18:45:00	43.2	61.8	37.6	44.1	39.6	53.7
21/08/2019	19:00:00	43.7	55.7	38.2	45.6	40.7	49.9
21/08/2019	19:15:00	43.5	55.3	38.6	45.4	40.5	50.2
21/08/2019	19:30:00	41.7	51.9	38.3	43.1	39.8	45.6
21/08/2019	19:45:00	42.5	60	37	44.3	39.1	48.9
21/08/2019	20:00:00	43.4	61.1	35.9	43.5	37.9	54.7
21/08/2019	20:15:00	50.2	70.9	35.8	43.8	37.3	64.7
21/08/2019	20:30:00	41.4	60.2	35.6	41.5	37	53.2
21/08/2019	20:45:00	42	63.3	36.4	43.3	38.1	51.3
21/08/2019	21:00:00	45.7	79	35.7	46	37.6	53.4
21/08/2019	21:15:00	48.4	73	35.2	42.7	37.6	61
21/08/2019	21:30:00	39.8	45.9	34.3	42.4	36.7	43.8
21/08/2019	21:45:00	48.3	66.4	36.3	49.7	38.1	60.7
21/08/2019	22:00:00	44.7	59.7	36.1	46.3	38.5	56.2
21/08/2019	22:15:00	41.2	49.4	35.9	43.6	37.7	46.8
21/08/2019	22:30:00	40.3	48.2	34.9	42.7	37.1	45.7
21/08/2019	22:45:00	45.3	66.2	34.2	44.8	36.3	58.7
21/08/2019	23:00:00	40.9	54.3	34.2	43.5	36.6	48.2
21/08/2019	23:15:00	45.8	69	34.7	43.3	36.6	58.3
21/08/2019	23:30:00	39.9	54.5	34.1	42.3	35.8	47.4
21/08/2019	23:45:00	40.3	54.2	33.4	43.3	35.5	46.7
22/08/2019	00:00:00	42.6	56.9	34.2	46	36.5	51.5
22/08/2019	00:15:00	42.3	54.3	33.1	45.7	36.3	50.4
22/08/2019	00:30:00	41.1	52.6	33.3	44.8	35.5	48.7
22/08/2019	00:45:00	44.5	56.8	35	48.1	37.8	53.3
22/08/2019	01:00:00	44.9	67.4	33.6	46.3	36.9	55.2
22/08/2019	01:15:00	41.8	56.7	33.9	45.1	36.5	49.6
22/08/2019	01:30:00	42.8	55	33.7	45.9	36.9	50.4
22/08/2019	01:45:00	43.3	57.9	34.4	46.2	37.9	51.5
22/08/2019	02:00:00	45.2	58.3	35.3	49.2	37.9	54
22/08/2019	02:15:00	47.1	64.1	36.3	49.2	40.2	57.7
22/08/2019	02:30:00	44.3	56.9	35.4	47.2	38.1	52.5
22/08/2019	02:45:00	43.8	56.9	35.2	46.5	38.4	52.3
22/08/2019	03:00:00	41.1	52.7	34.2	44	36.8	48.5
22/08/2019	03:15:00	42.3	55.7	34.3	44.8	36.6	51
22/08/2019	03:30:00	41.6	56.2	34.8	43.8	36.6	49.7
22/08/2019	03:45:00	40.7	53.3	34.4	43.7	35.8	49.6
22/08/2019	04:00:00	39.5	51.1	34.2	41.9	35.9	46.2

22/08/2019	04:15:00	39.5	48.5	34.7	41.4	36.8	44.2
22/08/2019	04:30:00	41.7	55.6	36.2	44.3	37.9	50.1
22/08/2019	04:45:00	42.1	56.6	35.6	45	37.8	49.4
22/08/2019	05:00:00	41.7	56.5	36.6	43.8	38.2	49.3
22/08/2019	05:15:00	42.6	54.9	37.3	44.1	39.4	49.5
22/08/2019	05:30:00	43.2	53	39.1	44.9	40.8	47.9
22/08/2019	05:45:00	42.2	49.5	38	43.7	40.1	46.2
22/08/2019	06:00:00	43.1	58	38.2	44.6	40.8	49.8
22/08/2019	06:15:00	44.9	59.9	40.8	46	42.4	52.2
22/08/2019	06:30:00	45.3	58.9	41	47	42.6	51
22/08/2019	06:45:00	50.4	83	41.2	47	43.4	53
22/08/2019	07:00:00	45.7	53.3	42	47.3	43.7	49.8
22/08/2019	07:15:00	49.9	66.7	42.8	51.1	44.9	60.6
22/08/2019	07:30:00	47.6	56	43.7	49.3	45.3	52.1
22/08/2019	07:45:00	52.4	73	43.7	51.2	45.2	65.9
22/08/2019	08:00:00	47.3	63.8	43.5	49.1	45	53.1
22/08/2019	08:15:00	45.8	59.2	42.7	47.1	44.2	50
22/08/2019	08:30:00	48.5	67.7	43.2	49.2	44.9	58.1
22/08/2019	08:45:00	48.5	65.6	43	50	45	55.7
22/08/2019	09:00:00	47.2	59.2	42.8	49.2	44.3	53.7
22/08/2019	09:15:00	46.8	62	41.3	47.6	43.2	56.7
22/08/2019	09:30:00	50.7	71.5	41.3	49.8	42.7	63.6
22/08/2019	09:45:00	49.6	70.1	39.8	50.3	41.9	61.9
22/08/2019	10:00:00	44.6	58.5	40.5	46	42	51.6
22/08/2019	10:15:00	49.4	68.8	41.2	49.8	43.1	62.1
22/08/2019	10:30:00	45.9	55.4	41	48	43	50.9
22/08/2019	10:45:00	47.9	67.5	40.6	49.4	42.7	58.5
22/08/2019	11:00:00	45.3	58.7	40.1	47.3	42.4	51.6
22/08/2019	11:15:00	45.7	64.5	40.5	48	42.3	51.6
22/08/2019	11:30:00	47.1	63.4	40.3	49.5	42.3	56.1
22/08/2019	11:45:00	50.8	71.6	40.3	51.6	42.7	63.1
22/08/2019	12:00:00	45.8	57.7	39.5	48	41.3	53.3
22/08/2019	12:15:00	46.3	60	41.4	47.7	43.4	54
22/08/2019	12:30:00	44.1	70.1	40	44.5	41.5	47.8
22/08/2019	12:45:00	42.4	48.1	39.9	43.4	41.1	45
22/08/2019	13:00:00	50.1	70.7	39.8	49.4	41.2	63.4
22/08/2019	13:15:00	45.1	58.4	40.1	46.8	42.3	51.6
22/08/2019	13:30:00	47.1	64.6	39.2	49.7	41	57.5
22/08/2019	13:45:00	47.5	66.5	39.9	48.7	41.6	58.8
22/08/2019	14:00:00	44.8	64.2	38.1	46	40.1	55.2
22/08/2019	14:15:00	48.7	68.7	40.3	50.4	42.9	59
22/08/2019	14:30:00	46.5	55.3	40.6	48.8	43.4	52.2
22/08/2019	14:45:00	47.4	61.3	40.7	49.7	43.3	56.3



22/08/2019	15:00:00	50.4	69.6	42.7	52.4	44.5	61
22/08/2019	15:15:00	45.8	55.5	41.4	48.2	42.8	51.3
22/08/2019	15:30:00	47.2	60.8	41.5	49.9	43.4	54.4
22/08/2019	15:45:00	45.9	57.3	42.4	47.3	43.6	53.2
22/08/2019	16:00:00	47.1	59.7	41.9	49.1	44.2	53.5
22/08/2019	16:15:00	46.5	58	42.2	48.1	44.2	52.3
22/08/2019	16:30:00	47.8	62.8	42.5	49.9	44.3	55.2
22/08/2019	16:45:00	47.8	68.4	41.9	48.2	43.8	57.4
22/08/2019	17:00:00	47	63.1	42.2	48.5	43.9	54.8
22/08/2019	17:15:00	47.7	63.6	41.5	49.6	43.2	56.7
22/08/2019	17:30:00	49.2	61.5	43.4	51.8	45	55.7
22/08/2019	17:45:00	47.5	60.9	42.2	49.8	43.9	54.6
22/08/2019	18:00:00	47.9	62.9	41.7	49.7	43.7	57.1
22/08/2019	18:15:00	44.9	54.2	40.6	46.7	42.5	50.3
22/08/2019	18:30:00	48.5	67.2	41.2	51	43.6	57.1
22/08/2019	18:45:00	45.9	62.1	40.7	47.8	42.7	52.2
22/08/2019	19:00:00	45.6	58.9	39.5	47.7	42.2	51.6
22/08/2019	19:15:00	46	60.7	39.8	48.4	41.7	53.5
22/08/2019	19:30:00	47.2	61.8	41.1	49.6	42.8	54.8
22/08/2019	19:45:00	46.8	61.6	40.6	48.8	42.6	55.8
22/08/2019	20:00:00	45.3	62.9	39.7	47.5	41.3	52.5
22/08/2019	20:15:00	44.5	59.8	38.7	46.3	40.9	51.7
22/08/2019	20:30:00	42.9	53.2	39.1	44.7	40.4	49
22/08/2019	20:45:00	41.7	57.9	38.1	42.9	39.9	45.2
22/08/2019	21:00:00	43.4	56.5	37.8	45.7	39.9	50.2
22/08/2019	21:15:00	42.5	49.9	38.5	44.2	40.3	47.3
22/08/2019	21:30:00	41.2	54.5	37.3	43	39	46
22/08/2019	21:45:00	41.7	56	36.5	43	38.7	49
22/08/2019	22:00:00	44.5	62.1	36.7	45.2	39	55.7
22/08/2019	22:15:00	42.2	55.6	36.6	44.7	38.9	50
22/08/2019	22:30:00	39.8	47.5	36.8	41	38.1	43.7
22/08/2019	22:45:00	39.2	47.8	35.7	40.4	37.2	43.8
22/08/2019	23:00:00	42.8	64.6	35.4	41	37	55.4
22/08/2019	23:15:00	49.7	66.2	35	54.1	36.7	61.7
22/08/2019	23:30:00	37.8	43.8	34.9	39.1	36.2	40.9
22/08/2019	23:45:00	38.3	47.7	35	39.6	36.3	43.5
23/08/2019	00:00:00	39.4	51.4	34.7	40.8	36.6	46.3
23/08/2019	00:15:00	37.6	51.6	33.6	39.3	35.1	44.9
23/08/2019	00:30:00	38.2	50.5	33.8	40.3	35.3	43.7
23/08/2019	00:45:00	38.3	52.9	33.8	40.4	35.1	46.2
23/08/2019	01:00:00	37.4	52.1	33.5	38.1	34.7	46
23/08/2019	01:15:00	37.4	50.5	33.6	38.2	34.9	45.9
23/08/2019	01:30:00	42.7	62.1	34.1	39.6	35.4	56.6

23/08/2019	01:45:00	40.9	58.1	33.9	41	35.4	53.3
23/08/2019	02:00:00	39.4	54.4	34.1	41.1	35.6	49
23/08/2019	02:15:00	38.2	50.3	33.4	39.6	35.3	45.3
23/08/2019	02:30:00	36.3	42.5	33.6	37.3	35.1	39
23/08/2019	02:45:00	39.5	53.7	34.3	42.2	35.9	45.1
23/08/2019	03:00:00	38.5	48.6	34.8	41.1	36.3	42.6
23/08/2019	03:15:00	37.8	49.1	34.6	38.9	36.1	42.4
23/08/2019	03:30:00	38.7	47.4	34.8	39.8	37	41.8
23/08/2019	03:45:00	37.7	47.2	33	39.9	35.1	43.2
23/08/2019	04:00:00	37.7	49.9	33.5	39.4	35.2	42.4
23/08/2019	04:15:00	38.5	46.3	34	39.7	36.7	42.6
23/08/2019	04:30:00	39.4	48.3	36.2	40.7	37.8	42.8
23/08/2019	04:45:00	40.8	65.5	36.2	40.5	37.7	44.9
23/08/2019	05:00:00	39	47.7	36	40.2	37.4	42.7
23/08/2019	05:15:00	41.1	58.1	35.8	42.4	37.9	49
23/08/2019	05:30:00	42.2	50.5	38.8	43.7	40.2	46.6
23/08/2019	05:45:00	42.7	56.3	38.4	44.3	40.1	49.2
23/08/2019	06:00:00	43.5	56.3	39.7	44.8	41.6	48.5
23/08/2019	06:15:00	43.5	54.2	40.2	45	41.8	47.1
23/08/2019	06:30:00	44.6	53.3	41.5	45.9	43	48.4
23/08/2019	06:45:00	45.8	61.2	41.1	47.2	42.8	54.3
23/08/2019	07:00:00	47.1	59.9	41	49.8	42.5	57.2
23/08/2019	07:15:00	43.9	48.8	41.1	45	42.7	46.6
23/08/2019	07:30:00	44.2	54.4	41.5	45.3	42.6	48.2
23/08/2019	07:45:00	45.6	57.1	41.6	47.3	43	51.1
23/08/2019	08:00:00	44	55.3	39.3	45.4	41.6	50
23/08/2019	08:15:00	44.4	63	37.7	44.9	39.4	55.5
23/08/2019	08:30:00	46.7	67.1	35.8	44.2	38	61.5
23/08/2019	08:45:00	40.2	55.1	34.3	41.4	36	50.2
23/08/2019	09:00:00	47.9	69.1	35.6	47.7	37.1	61.5
23/08/2019	09:15:00	42.7	58.2	34.4	45.1	36.5	52.5
23/08/2019	09:30:00	69	85.1	36.9	71.8	42.9	81
23/08/2019	09:45:00	65.9	78.8	41.1	69.8	51.1	76.3
23/08/2019	10:00:00	52.4	65.6	37.1	52.3	40.8	64.2
23/08/2019	10:15:00	43.6	60.4	35.4	43.5	37.4	55.7
23/08/2019	10:30:00	42.7	61.8	33.9	43.4	35.9	54.9
23/08/2019	10:45:00	59.1	79	34.7	50.9	38.4	71.5
23/08/2019	11:00:00	43.4	55.9	38.5	44.6	41	51.2
23/08/2019	11:15:00	48.4	70.8	34.6	45.9	36.7	61.6
23/08/2019	11:30:00	43	69.6	32.6	42.6	34.5	52
23/08/2019	11:45:00	36	48	32.2	37.7	33.5	41.9
23/08/2019	12:00:00	41.5	66.3	33.3	40.3	34.8	51.1
23/08/2019	12:15:00	40.5	58.5	33.4	41.9	35.1	50.8

23/08/2019	12:30:00	43.5	61.6	33.6	44.4	35.3	56.6
23/08/2019	12:45:00	43.3	62.7	33.4	43.3	35.3	56.3
23/08/2019	13:00:00	39.6	57.6	35.7	40.9	37.3	44.4
23/08/2019	13:15:00	44.5	61.3	36.1	45.4	38.2	56.3
23/08/2019	13:30:00	44.6	63.5	35.2	43.3	37.2	57.9
23/08/2019	13:45:00	46.7	62.2	35.2	50	38.3	56.8
23/08/2019	14:00:00	47.7	69.1	36.2	45.2	38.2	62.1
23/08/2019	14:15:00	51.6	71.1	37.9	52.6	40.6	64.4
23/08/2019	14:30:00	50.1	70.7	37.5	50.9	39.8	63.4
23/08/2019	14:45:00	50.8	71.9	37.4	50.1	40.2	63.1
23/08/2019	15:00:00	52.5	77.9	35.3	49.2	38.4	62.2
23/08/2019	15:15:00	51.4	75.6	35.5	47.8	37.2	62.9
23/08/2019	15:30:00	43.6	57.5	37	46.4	39.6	51
23/08/2019	15:45:00	45.2	62	36.8	46.5	40.7	54.6
23/08/2019	16:00:00	44.7	60.4	35.6	47	38.9	54.4
23/08/2019	16:15:00	47.3	64	37.9	48.1	39.9	59.3
23/08/2019	16:30:00	49.1	68.9	33.5	50.6	36.2	62.4
23/08/2019	16:45:00	42.3	59.3	35	42.2	36.9	53.6
23/08/2019	17:00:00	46.7	68	34.2	47.6	36.2	60.1
23/08/2019	17:15:00	50.6	73.7	32.5	56.1	35	61.3
23/08/2019	17:30:00	45.4	68.9	32.5	43.7	34.3	59.7
23/08/2019	17:45:00	37	49.5	32	38.7	34.2	43.8
23/08/2019	18:00:00	37	48.5	32.7	38.8	34.6	40.9
23/08/2019	18:15:00	39.6	70.3	33.8	39.9	35.7	44.3
23/08/2019	18:30:00	38.2	53.5	33.1	40	35.3	44.5
23/08/2019	18:45:00	38	54.6	32.5	39.3	35	45.6
23/08/2019	19:00:00	39.3	60.9	32.3	41	34.7	48.9
23/08/2019	19:15:00	38.3	51.5	32.8	40.4	34.8	43.1
23/08/2019	19:30:00	42.6	64.5	34.9	42.4	36.9	53.8
23/08/2019	19:45:00	38.9	49.2	34.1	40.3	36.8	43.3
23/08/2019	20:00:00	39.5	47.9	35.5	40.9	37.4	44
23/08/2019	20:15:00	39.6	59.5	33.7	41.3	36.2	47
23/08/2019	20:30:00	38.7	52.7	34.2	40.3	36.2	43
23/08/2019	20:45:00	48	72.9	34.7	45.6	36.7	59.7
23/08/2019	21:00:00	38.2	47.5	33.4	39.9	35.4	43.2
23/08/2019	21:15:00	40.7	60.4	33.1	40.6	35.4	50.5
23/08/2019	21:30:00	41.1	49.4	33.3	43.5	36.8	47.1
23/08/2019	21:45:00	41.5	50.4	34	43.9	37.7	48
23/08/2019	22:00:00	43.1	49.9	35.5	45.4	39.7	47.1
23/08/2019	22:15:00	41.4	59.6	34.1	43.8	36.9	46.7
23/08/2019	22:30:00	40.9	50.2	34.7	42.9	36.5	48.2
23/08/2019	22:45:00	39	47.8	33.6	41.2	35.9	45.4
23/08/2019	23:00:00	41.3	48.1	36.8	42.8	38.9	45.3

23/08/2019	23:15:00	37.4	48.5	32.5	39.4	34.6	43.5
23/08/2019	23:30:00	41	52.1	34.6	43.6	36.3	50.3
23/08/2019	23:45:00	39.3	48.8	35.3	41.1	37.1	43.8
24/08/2019	00:00:00	45.4	61.7	33.1	44.6	35.5	58.9
24/08/2019	00:15:00	38.7	54	32.3	40.8	34.7	47.1
24/08/2019	00:30:00	40.9	52.2	34.4	43.2	36.3	47.4
24/08/2019	00:45:00	41.2	49.9	35.5	43.1	37.3	46.3
24/08/2019	01:00:00	42	49.7	35.5	44.4	37.5	47.2
24/08/2019	01:15:00	41.9	49.8	36.1	44	38.1	46.6
24/08/2019	01:30:00	38.6	49.3	32.1	41.4	33.6	44.6
24/08/2019	01:45:00	40.2	62.3	31.7	39.5	33.4	51.6
24/08/2019	02:00:00	38.5	49.7	31.2	41.3	33.4	44.6
24/08/2019	02:15:00	41	51	35.1	42.8	37.9	47.8
24/08/2019	02:30:00	38.8	49.2	33.3	41.1	35.9	44.9
24/08/2019	02:45:00	38.3	53.6	32.7	40.3	34.4	45.4
24/08/2019	03:00:00	38.2	48.9	32.3	40.5	34.1	46.6
24/08/2019	03:15:00	36.9	48.8	31.6	39.2	33.5	43.6
24/08/2019	03:30:00	39.8	59.5	32.7	42.3	34.7	48.1
24/08/2019	03:45:00	38.9	51.7	32.3	41.6	34.1	45.2
24/08/2019	04:00:00	38.1	47.5	33.6	39.7	35.1	43.2
24/08/2019	04:15:00	37.7	56.3	32.5	39.9	33.8	45.5
24/08/2019	04:30:00	47.3	67.6	32.6	44.2	34.8	61.5
24/08/2019	04:45:00	37.4	52	32.5	39	34.2	44.7
24/08/2019	05:00:00	38.6	48.3	32.1	41.3	34.4	45.1
24/08/2019	05:15:00	40.2	49.6	32.2	42.8	35.2	47.4
24/08/2019	05:30:00	40.3	57.6	34	42.1	36.7	47.9
24/08/2019	05:45:00	40.8	57.8	34.6	43	37.1	47.7
24/08/2019	06:00:00	43.5	56.5	36.1	45.9	39.1	51.2
24/08/2019	06:15:00	45.6	60.9	37.5	47.8	41.3	53
24/08/2019	06:30:00	48.1	61.2	37.9	49.9	40.8	58.9
24/08/2019	06:45:00	43.1	54.3	37.6	45.3	39.6	48.3
24/08/2019	07:00:00	45	69	37.5	45.4	39.9	53.3
24/08/2019	07:15:00	42.8	60.3	37	44.8	39.6	48.8
24/08/2019	07:30:00	47.7	71.2	37	44.1	39	60
24/08/2019	07:45:00	46.5	62.4	34.8	46.2	36.7	60
24/08/2019	08:00:00	49	75.1	33.7	47.6	35.6	61.5
24/08/2019	08:15:00	44.5	69.9	33.4	44.4	35.2	56.5
24/08/2019	08:30:00	44.6	61.4	33.6	40.5	35	59.3
24/08/2019	08:45:00	40.6	62.3	32.8	39.7	34.4	53.4
24/08/2019	09:00:00	52.1	76.8	31.7	48.3	33.6	62.9
24/08/2019	09:15:00	45.4	54.4	31.6	48.8	35.1	51.1
24/08/2019	09:30:00	66.9	89.9	34.1	61.5	38.1	79.4
24/08/2019	09:45:00	49.2	76	30.1	44.5	31.8	63.7

24/08/2019	10:00:00	64.9	85.2	32.7	60.4	35.8	79.4
24/08/2019	10:15:00	63.6	82	31	47.7	32.5	79.6
24/08/2019	10:30:00	35.5	48.2	30.2	37.4	31.8	44.2
24/08/2019	10:45:00	39	62.6	30.8	38.4	32.2	51.1
24/08/2019	11:00:00	36.8	48.5	30.3	39.2	32.5	44.2
24/08/2019	11:15:00	36.3	50.4	30.3	38.3	32.3	44.8
24/08/2019	11:30:00	43.5	64.2	31.2	46.5	32.9	48.4
24/08/2019	11:45:00	70	96.9	30.1	57.4	33.7	83.1
24/08/2019	12:00:00	66.3	82.3	30.2	70.5	32.1	79.1
24/08/2019	12:15:00	72.4	82	31	78.1	43.9	81.1
24/08/2019	12:30:00	69.1	83.3	30.2	50.7	31.8	82.2
24/08/2019	12:45:00	38.4	56.8	29.6	41	31.3	49.7
24/08/2019	13:00:00	37.5	62.1	29.3	35.6	31.5	47.7
24/08/2019	13:15:00	40.2	62.9	30.1	35.7	31.6	54.9
24/08/2019	13:30:00	34.1	48.3	30.2	36	31.6	39.5
24/08/2019	13:45:00	38.2	61	29.6	36.6	31.4	52
24/08/2019	14:00:00	40.2	64.6	30.3	36.4	31.5	49.3
24/08/2019	14:15:00	51.8	74.6	31.3	46.1	33	67.2
24/08/2019	14:30:00	47	72	31	47.9	33.9	58.4
24/08/2019	14:45:00	58.9	81	30.3	47.9	32	72.8
24/08/2019	15:00:00	54.9	76.4	29.7	49.8	31.9	68.5
24/08/2019	15:15:00	44.7	65.7	31	43.5	32.5	58.8
24/08/2019	15:30:00	44.2	73.1	29.4	42.3	31.4	55.8
24/08/2019	15:45:00	39.3	60.2	30.4	39.7	32	51.3
24/08/2019	16:00:00	37.3	51.1	31.2	39.9	33.1	45.2
24/08/2019	16:15:00	37.2	61.6	29.9	37.9	31.8	45.2
24/08/2019	16:30:00	59.3	82.7	29.9	60.2	33.5	72.4
24/08/2019	16:45:00	59.2	82.1	31.1	62.8	33.9	70.2
24/08/2019	17:00:00	44.4	63.1	31.4	46.1	33.7	56.3
24/08/2019	17:15:00	41.8	62.1	30.2	41.5	32	54.9
24/08/2019	17:30:00	36.4	55.5	31.3	38.1	33.4	43.4
24/08/2019	17:45:00	39.4	58.2	29.7	37.7	32.1	52.2
24/08/2019	18:00:00	38.8	56.3	30.4	39.2	32.4	51.2
24/08/2019	18:15:00	37.8	57.9	30.2	38.4	32.1	48.7
24/08/2019	18:30:00	35	52.1	30	36.7	31.9	41.9
24/08/2019	18:45:00	34.1	53.1	29.9	35.3	31.5	42.1
24/08/2019	19:00:00	36.9	53.5	31.5	39	33.7	44.1
24/08/2019	19:15:00	42.8	60.7	33.1	41.5	35.6	55.4
24/08/2019	19:30:00	40.2	54.1	35.6	42.1	37.4	45.8
24/08/2019	19:45:00	41.5	62.4	35.4	42.8	38.5	45.4
24/08/2019	20:00:00	42.3	49.9	37.2	43.9	40	46.1
24/08/2019	20:15:00	44.3	53.8	39.4	45.9	41.9	48.6
24/08/2019	20:30:00	42.9	48.5	37	45.1	39.8	46.9

24/08/2019	20:45:00	43.8	59.4	36.8	45.3	40.3	49.6
24/08/2019	21:00:00	43.7	56.5	38.4	45.3	40.7	48.9
24/08/2019	21:15:00	43	50.2	37.5	45	40	47.1
24/08/2019	21:30:00	40.4	47.6	35.1	42.2	37.4	44.7
24/08/2019	21:45:00	39.6	57	33.3	40.8	36.3	44
24/08/2019	22:00:00	39	43.4	33.9	40.5	36.5	42
24/08/2019	22:15:00	43.6	72.4	35.1	41.9	37	52.2
24/08/2019	22:30:00	40	46.9	35.6	41.4	38.1	42.7
24/08/2019	22:45:00	40.2	53.3	35	42.4	36.9	46.8
24/08/2019	23:00:00	41.1	50.1	35.1	43	38.1	45.5
24/08/2019	23:15:00	40.1	49.8	34.3	42.5	36	45.8
24/08/2019	23:30:00	39.9	54.5	32.9	42.8	34.8	47.6
24/08/2019	23:45:00	40.3	48.4	34.3	42.4	37.9	44.7
25/08/2019	00:00:00	40	46.5	36	41.7	37.8	43.9
25/08/2019	00:15:00	39.7	49.8	33.9	41.9	35.7	45.8
25/08/2019	00:30:00	39.5	50.4	33.6	42.1	35.2	45.9
25/08/2019	00:45:00	40.5	52.5	35.8	42.4	37.7	46.5
25/08/2019	01:00:00	42	53.3	36.1	44.3	37.7	49.6
25/08/2019	01:15:00	46.9	64.2	37.4	45.3	39.4	60.8
25/08/2019	01:30:00	42.6	67	36.9	43.7	39.7	48.9
25/08/2019	01:45:00	41	50.8	36.1	42.6	37.8	46.4
25/08/2019	02:00:00	41.9	52	36.3	43.6	38.5	49.3
25/08/2019	02:15:00	40.6	50.1	35.7	42.8	37.3	47.2
25/08/2019	02:30:00	42.8	67.5	32	44.2	35.1	52.2
25/08/2019	02:45:00	40.3	54.3	33.1	42.6	35.4	47
25/08/2019	03:00:00	39.6	49.9	31.1	43	33.2	47.4
25/08/2019	03:15:00	40.3	50.6	31.7	43.8	34.4	48.3
25/08/2019	03:30:00	38.7	46.5	33.8	40.9	35.3	44
25/08/2019	03:45:00	39.6	51.9	30.3	43.3	32.5	47
25/08/2019	04:00:00	40.7	59	30.2	43.3	33.8	48.5
25/08/2019	04:15:00	37.5	51.1	30.5	40	31.9	45.9
25/08/2019	04:30:00	41.5	58.1	32.2	43.8	35.6	49.2
25/08/2019	04:45:00	40.1	54.9	32.4	43.2	34.2	48.9
25/08/2019	05:00:00	37.7	47.8	30.3	40.8	32.6	44.2
25/08/2019	05:15:00	38.4	51	31.4	41.3	33.4	46.5
25/08/2019	05:30:00	40.3	55.2	33.2	43.1	35.2	48.2
25/08/2019	05:45:00	42.1	53.6	34.5	44.3	37.7	48.3
25/08/2019	06:00:00	45.1	60.1	34.8	48.1	38.3	54.4
25/08/2019	06:15:00	41.5	54.7	35.6	43.4	38.3	47.6
25/08/2019	06:30:00	45.8	61	37.5	47.1	39.7	56.7
25/08/2019	06:45:00	50.6	71.6	37.1	53.4	40.6	62
25/08/2019	07:00:00	43.7	53.1	38	46.2	40.1	48.7
25/08/2019	07:15:00	47.4	63.3	38	46.6	39.5	60.7

25/08/2019	07:30:00	45.5	57.7	37.4	46.7	41.2	55.4
25/08/2019	07:45:00	46.8	60.4	37.7	49.2	40	57.1
25/08/2019	08:00:00	43.6	54.3	36.7	46.9	38.8	50.2
25/08/2019	08:15:00	37.9	55.1	33.9	39.5	35.5	42.8
25/08/2019	08:30:00	42.5	56.6	33.3	41.9	35.3	54.7
25/08/2019	08:45:00	42.8	59.3	33.6	41.8	35.5	56.3
25/08/2019	09:00:00	45	60.8	33.8	44.1	35.4	58.3
25/08/2019	09:15:00	41.2	58.3	33	43.7	35.1	52.4
25/08/2019	09:30:00	41.1	60.3	32.4	42	34.8	54.1
25/08/2019	09:45:00	44	65.6	32	39.3	34.1	57.1
25/08/2019	10:00:00	42.5	60.9	32.3	42.5	33.6	55.2
25/08/2019	10:15:00	43.5	63.8	31.4	41.3	33.3	57.3
25/08/2019	10:30:00	38.6	54.2	31.4	41.2	33.2	49
25/08/2019	10:45:00	40.6	56.9	31.2	43.9	32.9	49.4
25/08/2019	11:00:00	38.8	53.3	30.1	41.9	31.6	49.1
25/08/2019	11:15:00	45.6	72.2	29.9	41.8	31.5	56
25/08/2019	11:30:00	34.3	55.9	29.4	36.6	31	40.8
25/08/2019	11:45:00	46.5	69.8	30	37.1	31.1	61.8
25/08/2019	12:00:00	47.4	68	29.3	46	30.8	62.7
25/08/2019	12:15:00	33.1	44.1	29.5	35.1	30.6	39.6
25/08/2019	12:30:00	39.1	60.9	29.5	40.6	31	50.6
25/08/2019	12:45:00	34.6	49.7	29.1	36.9	30.7	43.2
25/08/2019	13:00:00	40.8	59.6	29.4	43.9	30.7	52.9
25/08/2019	13:15:00	39.1	55.5	29.5	42.9	31.5	48.7
25/08/2019	13:30:00	34.5	49.8	28.9	36.8	30.4	43.8
25/08/2019	13:45:00	38.2	68.3	29.2	38.6	30.4	45.9
25/08/2019	14:00:00	43.2	67.5	29	39.7	30.6	54.9
25/08/2019	14:15:00	39.1	71.3	29.2	38.4	30.8	46.7
25/08/2019	14:30:00	33.7	48.2	27.7	35.3	30.2	42.6
25/08/2019	14:45:00	43.7	62.2	28.7	45	30.4	57.1
25/08/2019	15:00:00	48.9	73.3	28.9	41.7	30.1	60.9
25/08/2019	15:15:00	39.5	58	28.8	42.4	30.3	50.5
25/08/2019	15:30:00	41.8	63.4	28.5	38.5	29.8	55.8
25/08/2019	15:45:00	45.5	63	29.2	49.6	30.7	57.3
25/08/2019	16:00:00	32.6	41.7	28.3	34.7	29.9	37.5
25/08/2019	16:15:00	32.6	48.5	28.1	33.9	29.5	40.2
25/08/2019	16:30:00	37.9	64.5	28.2	39.1	29.9	47.2
25/08/2019	16:45:00	42.8	63.4	28.8	43.8	30.6	55.4
25/08/2019	17:00:00	44	65.7	28.4	44	30.2	57.5
25/08/2019	17:15:00	34	53.2	27.8	35.9	29.5	42.9
25/08/2019	17:30:00	42.5	61.8	29	45.8	30.8	54.3
25/08/2019	17:45:00	35.7	52.9	27.9	38.2	29.6	46.4
25/08/2019	18:00:00	34.2	55.2	28.7	36.2	30.1	43.4

25/08/2019	18:15:00	33.8	52.3	28.5	35.5	30.5	42.1
25/08/2019	18:30:00	41.9	64.9	30.2	38.4	31.6	56.2
25/08/2019	18:45:00	43.1	65.2	33	41.3	34.9	56.3
25/08/2019	19:00:00	39.3	54	35.1	40.7	37	44.3
25/08/2019	19:15:00	56.2	82.9	35.9	46	38.3	67
25/08/2019	19:30:00	55.2	81.5	36.4	43.8	38.4	64.1
25/08/2019	19:45:00	41	61.2	36	42.1	38.1	47
25/08/2019	20:00:00	39.8	55.8	35.9	41	37.9	45.3
25/08/2019	20:15:00	40	48.9	36.6	41.2	38.1	45.7
25/08/2019	20:30:00	45.3	64.8	36.2	43.7	38.1	58.2
25/08/2019	20:45:00	38	57.2	34.6	39.1	36.2	41.6
25/08/2019	21:00:00	38.4	53.1	34.2	39.6	36	45.2
25/08/2019	21:15:00	37.4	59.3	32.8	38.9	34.4	44.3
25/08/2019	21:30:00	37.5	44	32.7	39.4	35.2	41.1
25/08/2019	21:45:00	40.1	46.2	34.8	41.6	37.6	43.6
25/08/2019	22:00:00	42.1	56.2	34.5	44.6	37.7	49.8
25/08/2019	22:15:00	42.6	51.5	35.6	45	38.9	48.4
25/08/2019	22:30:00	42.8	56.1	36.3	45.1	39	49.8
25/08/2019	22:45:00	46.2	62.7	36.3	45.2	38.4	59.7
25/08/2019	23:00:00	43.3	52.4	36	45.7	38.5	49.9
25/08/2019	23:15:00	48.1	65.6	37.3	46.6	40.3	62.4
25/08/2019	23:30:00	42.8	50.9	34.4	45.3	39.2	48
25/08/2019	23:45:00	42.7	51.7	33.1	45.7	38.3	48.9
26/08/2019	00:00:00	42.5	51.8	36.4	44.7	39.5	46.8
26/08/2019	00:15:00	45.2	59.6	36.6	47.6	38.9	55.2
26/08/2019	00:30:00	44	59.5	36.7	45.7	39.4	52.5
26/08/2019	00:45:00	41.1	51.3	36.9	43.1	38.6	45.8
26/08/2019	01:00:00	40.2	59	33.3	42.2	35.5	49.1
26/08/2019	01:15:00	38.7	50.9	33.8	40.6	35.6	43.4
26/08/2019	01:30:00	40.5	49.8	34.9	42.7	37.1	47.3
26/08/2019	01:45:00	38.7	47.3	33.9	40.5	35.9	43.9
26/08/2019	02:00:00	40.4	49.1	34	42.3	36.6	44.4
26/08/2019	02:15:00	40.3	54.7	34.3	42.3	36.5	45.9
26/08/2019	02:30:00	40	46.2	35.5	41.7	37.5	43.6
26/08/2019	02:45:00	38.8	44.3	34.8	40.1	36.6	41.6
26/08/2019	03:00:00	39.3	46.5	35.1	41	37	44.7
26/08/2019	03:15:00	40.4	50.7	35.2	42.6	36.9	47.9
26/08/2019	03:30:00	40.2	47.7	34.8	42.6	36.8	45.2
26/08/2019	03:45:00	41.8	72.2	34.8	41.3	36.7	44
26/08/2019	04:00:00	44.8	73.9	34.7	42.1	36.2	50.2
26/08/2019	04:15:00	40.7	52	34.6	42.7	36.9	48.6
26/08/2019	04:30:00	39.8	47.6	35.1	42	37.1	44.6
26/08/2019	04:45:00	40.2	51.2	36.6	41.7	38.3	43.3



26/08/2019	05:00:00	41.3	47.3	37	43	38.9	45.1
26/08/2019	05:15:00	41.9	48.6	37.7	43.8	39.6	45.7
26/08/2019	05:30:00	55.1	84.3	37.5	45.5	39.3	61.2
26/08/2019	05:45:00	42.2	55.2	37.2	44.3	39.2	48.1
26/08/2019	06:00:00	45.2	59.2	38.3	47.3	40.4	54.1
26/08/2019	06:15:00	44.7	55.8	39	46.1	41.2	53.8
26/08/2019	06:30:00	43.8	64.4	38.7	44.6	40.9	50.6
26/08/2019	06:45:00	44.5	54.3	39.7	46.1	41.3	52
26/08/2019	07:00:00	46.7	62.5	39	49.8	41.3	55.2
26/08/2019	07:15:00	47.6	60.6	40.5	50.6	42.9	56.1
26/08/2019	07:30:00	47.5	75.3	40.2	48.7	42	53.5
26/08/2019	07:45:00	44.2	57.9	37.1	45.6	39.7	54.1
26/08/2019	08:00:00	42.6	56.9	35.9	43.9	38.7	52.5
26/08/2019	08:15:00	47.9	71.6	36.6	48	38.4	58.5
26/08/2019	08:30:00	47.9	69	36.4	52.1	38.4	58.3
26/08/2019	08:45:00	45.9	63	34.4	45.6	36.5	58.4
26/08/2019	09:00:00	38.1	57.6	33.4	38.8	35.3	46.2
26/08/2019	09:15:00	45.8	69.6	32.9	44.4	34.5	60.2
26/08/2019	09:30:00	52	69.1	32.8	47.4	35	65.4
26/08/2019	09:45:00	54.3	80.2	31.7	52.8	33.6	67.4
26/08/2019	10:00:00	57.1	82.1	31.6	56.2	34.4	69.9
26/08/2019	10:15:00	56.6	74.8	31.6	60.2	33.5	68.4
26/08/2019	10:30:00	47.3	69.8	31.9	48.6	33.8	58.3
26/08/2019	10:45:00	41.6	66.3	29.8	37	31.6	52.6
26/08/2019	11:00:00	42.3	60.7	31.7	45.1	34.4	50.3
26/08/2019	11:15:00	65.4	80.1	30	59.9	32.1	78.6
26/08/2019	11:30:00	64.8	80.6	30.2	59.9	31.7	77.6
26/08/2019	11:45:00	62.3	85.2	31	61.4	32.6	75.8
26/08/2019	12:00:00	58.2	85.3	30.8	46.1	32.2	68.5
26/08/2019	12:15:00	35.1	51.4	29.4	37.5	31.1	43.5
26/08/2019	12:30:00	44.9	65.4	30.2	41.3	31.9	59.2
26/08/2019	12:45:00	37.1	58.4	30.4	38.9	31.9	46.9
26/08/2019	13:00:00	41.3	63.3	28.9	43.2	31.9	52.3
26/08/2019	13:15:00	39	59.3	29.5	41.8	30.9	50.5
26/08/2019	13:30:00	38.9	58.2	28.9	39.3	30.4	51.5
26/08/2019	13:45:00	35.6	58.7	29	38.1	30.9	41.5
26/08/2019	14:00:00	54.1	68.8	29.9	60.1	32.4	65.4
26/08/2019	14:15:00	58.5	84.2	29.5	58.6	32.7	70.6
26/08/2019	14:30:00	66.6	78.3	29.6	73.6	33.1	76.5
26/08/2019	14:45:00	58.3	81.2	30.4	60.2	32.3	71.5
26/08/2019	15:00:00	55.4	79.1	30.5	57.5	33	67.8
26/08/2019	15:15:00	52.4	82.2	32	48.9	34.6	61.5
26/08/2019	15:30:00	43.4	71.6	31.4	44.6	33.1	54.2

26/08/2019	15:45:00	53.9	76.1	30.3	46.1	33	69.2
26/08/2019	16:00:00	51.4	74.6	31.2	52.9	34.9	62.7
26/08/2019	16:15:00	54.8	78.4	33.9	49.1	36.1	69.3
26/08/2019	16:30:00	58.1	80.7	33.4	53.9	35.9	72.9
26/08/2019	16:45:00	54.4	85.2	32.8	40.4	34.8	67.9
26/08/2019	17:00:00	50.9	70.1	33.4	57.5	35.5	62.5
26/08/2019	17:15:00	50.5	71.5	34.3	48.9	36.2	60.9
26/08/2019	17:30:00	41.5	66.1	34.1	43.6	35.8	50.4
26/08/2019	17:45:00	42.9	62.5	32.5	42.5	34.9	56.3
26/08/2019	18:00:00	42.5	54.7	35.6	44.9	38.2	48.4
26/08/2019	18:15:00	42.1	51.6	36	44	38.9	47.5
26/08/2019	18:30:00	43.2	57.2	36.1	45.4	39	50
26/08/2019	18:45:00	46.3	68.5	37	46.9	40.5	55.8
26/08/2019	19:00:00	43.2	60.9	37.2	44.5	40.2	47.7
26/08/2019	19:15:00	43.3	54.4	37.9	45.1	40.2	48.4
26/08/2019	19:30:00	43.7	56.6	38.3	45.5	40.4	49.4
26/08/2019	19:45:00	43.7	55.8	39.1	45.4	41	49.3
26/08/2019	20:00:00	48.2	75.5	38.6	48.9	40.7	59.8
26/08/2019	20:15:00	43.8	60.7	37.6	44.9	40.7	51.7
26/08/2019	20:30:00	44	65.1	37.8	45.5	40	52.2
26/08/2019	20:45:00	50.8	76.2	38.9	49.5	40.7	62.6
26/08/2019	21:00:00	41.7	50.9	38.1	43.1	39.9	45.7
26/08/2019	21:15:00	41.4	50.6	36.4	43.1	38.9	45.4
26/08/2019	21:30:00	42.6	54.9	37.6	44.4	39.5	49.8
26/08/2019	21:45:00	43.4	55.6	37.1	45.1	39.9	51.4
26/08/2019	22:00:00	41.9	53.2	37.6	43.3	39.9	45.3
26/08/2019	22:15:00	42	51.4	36.9	44.1	39	48
26/08/2019	22:30:00	42	55.2	36.4	44.5	38.8	47.8
26/08/2019	22:45:00	41.2	51.3	35.7	43	38.5	46
26/08/2019	23:00:00	40.4	48.9	37.1	42.1	38.5	44.5
26/08/2019	23:15:00	47.5	66.6	36.3	43.6	38.6	63
26/08/2019	23:30:00	45.2	61.2	36.4	45.9	38.6	57.1
26/08/2019	23:45:00	41.1	51.9	35.5	43.4	37.5	46.5
27/08/2019	00:00:00	41	50.1	35	43.5	37.4	47
27/08/2019	00:15:00	40.7	49.7	35.6	42.9	37.8	46
27/08/2019	00:30:00	39.5	52.6	34.7	40.9	36.4	48
27/08/2019	00:45:00	40.9	56	35.4	42.1	37.3	51.2
27/08/2019	01:00:00	39	47.5	34.7	40.9	36.6	43.8
27/08/2019	01:15:00	38.2	46.5	34.7	39.5	36.4	43
27/08/2019	01:30:00	39.5	53.7	30.8	41.3	34	48.3
27/08/2019	01:45:00	39.3	51.6	33.4	41.2	35.8	45.3
27/08/2019	02:00:00	39.3	51.5	34.6	41.2	36.3	45.6
27/08/2019	02:15:00	37.9	48.4	31.9	40.4	33.2	44.7

27/08/2019	02:30:00	40.5	54.9	34.2	41.8	35.9	51
27/08/2019	02:45:00	39.7	53.2	32.3	40.6	34.1	50.8
27/08/2019	03:00:00	39.9	52.6	33.4	42.5	35.5	46
27/08/2019	03:15:00	40.1	53.4	34.8	41.5	37.5	46.5
27/08/2019	03:30:00	39.8	50.7	35.9	41.2	37.6	44.6
27/08/2019	03:45:00	40.8	56.2	34.7	42.6	37.4	47.6
27/08/2019	04:00:00	40.7	48.7	34.1	42.7	36.7	45.4
27/08/2019	04:15:00	41.1	51.3	33.8	43.4	36.5	46.9
27/08/2019	04:30:00	41.2	53.3	36.1	43.7	37.7	48.3
27/08/2019	04:45:00	43	59.8	36.8	44.7	38.4	50.5
27/08/2019	05:00:00	42.5	49.4	37.4	44.4	39.6	46.2
27/08/2019	05:15:00	45.7	59	38.3	46.8	40.4	55.6
27/08/2019	05:30:00	43.9	55.4	39.5	45.7	41.6	47.6
27/08/2019	05:45:00	46	58.6	41.7	47.4	43.5	49.2
27/08/2019	06:00:00	46.1	64	42.2	47.4	43.4	50.7
27/08/2019	06:15:00	47.8	61.3	41.5	49.5	45.5	51.4
27/08/2019	06:30:00	49.6	60.7	44.9	51.6	46.9	54.5
27/08/2019	06:45:00	47.6	55.1	44.4	49	45.8	50.8
27/08/2019	07:00:00	47.4	52.9	44.4	48.9	45.5	49.9
27/08/2019	07:15:00	49.4	60.5	46.6	50.2	47.8	54.9
27/08/2019	07:30:00	49	62.9	45.8	49.5	47.2	55.9
27/08/2019	07:45:00	47.3	52	45	48.1	46.2	49.9
27/08/2019	08:00:00	48.3	70.9	45	49.2	46.2	54.3
27/08/2019	08:15:00	50.1	74	47.2	50.1	48.4	53.1
27/08/2019	08:30:00	45.8	53.9	39.1	48.5	41	50.9
27/08/2019	08:45:00	49.9	75	37.3	49	38.5	58.5
27/08/2019	09:00:00	55.4	69.5	36.2	51.7	39.4	68.1
27/08/2019	09:15:00	56.1	65	34.8	61.4	39.9	62.9
27/08/2019	09:30:00	74.5	93	31.9	70.5	33.6	89.8
27/08/2019	09:45:00	45.7	64.9	32.5	46.3	35.1	59.8
27/08/2019	10:00:00	37.1	54.3	31.5	37.8	33.4	47.2
27/08/2019	10:15:00	55.6	85.5	31.1	57.9	33.2	66.4
27/08/2019	10:30:00	77	102.5	37.7	72.4	48.7	88.9

## 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.

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. David sits on the ANC Communications and PR Committee.

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	02.10.2020	264205
Preamplifier	ZC 0026	Bruel & Kjaer	02.10.2020	264205
Microphone	4189 s/n 2395266	Bruel & Kjaer	25.09.2020	122565
Sound Level Meter	XL2 TA s/n A2A-10019-EO	NTi Audio	30.08.2020	263215
Microphone	MK 224 s/n 210762A	Cirrus Research	29.08.2020	121665
Calibrator	4231 s/n 2402706	Bruel & Kjaer	05.09.2020	132193

## **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. 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, but it is likely that the utilisation of some items will be less in reality.

A second set of data is used in the calculations that is based on measurements taken of the exact processing plant proposed at this site, currently in operation at an existing quarry in Dewsbury. The predicted noise impact based on these measurements is either the same, or slightly better than using standard data.

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 sound transmission paths are relatively simple, the site being open soft land. 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 large 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 a calibrated type 1 sound level meter, 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 meter was 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 – SITE LOCATION AND LAYOUT**









## **APPENDIX 5 – SOUND LEVEL CALCULATIONS**

### **HGVs on Haul Road**

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

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

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.

	Dwelling to NE	Calder House, SE	Calder House, SE, Far	Dwelling South	Ferry Lane, SW	Smalley Bight, West	Stanley, NW	Dwelling to NW
LWA	106	106	106	106	106	106	106	106
Q (no. movements per hour)	20	20	20	20	20	20	20	20
V, kmh	16	16	16	16	16	16	16	16
d (distance)	380	50	360	200	650	300	600	250
a (angle of view)	38	140	50	20	35	20	25	50
Shielding	10	10	10	10	10	10	10	10
LAeq	31.4	45.9	32.8	31.4	28.7	29.7	27.6	34.4

### **Sound Levels from Barge Movement**

The same method of calculation as above but with the data for barge movement gives predicted sound levels of:

	Dwelling to NE	Calder House, SE	Dwelling to South	Ferry Lane Estate, SW	Smalley Bight, West	Stanley, NW	Dwelling to NW
LWA	110	110	110	110	110	110	110
Q (no. movements per hour)	1	1	1	1	1	1	1
V, kmh	6.4	6.4	6.4	6.4	6.4	6.4	6.4
d (distance)	360	130	110	350	70	400	280
a (angle of view)	30	110	80	60	80	40	80
Shielding	0	0	0	0	0	0	10
LAeq	35.6	45.7	45.0	38.7	47.0	36.4	30.9

## Source Levels

Band [Hz]	LAeq		31.5	63	125	250	500	1000	2000	4000	8000
Case 821g Wheeled Loading Shovel	76		85	83.0	75.0	68.0	69.0	68.0	68.0	67.0	68.0
Doosan DX300 Tracked Excavator	80			82.0	87.0	82.0	77.0	72.0	70.0	66.0	59.0
Volvo a25d Dumptruck (2no)	78			85.0	73.0	76.0	72.0	72.0	73.0	68.0	65.0
Finlay 683 supertrak wash screen	81			84.0	82.0	79.0	79.0	74.0	74.0	71.0	64.0
Finlay 683 supertrak dry screen 3 way split	81			84.0	82.0	79.0	79.0	74.0	74.0	71.0	64.0
Finlay c1540 cone crusher	86		79.8	94.9	84.7	83.3	82.9	82.5	78.2	72.5	66.3
Evo wash 70 sand plant	78										
400 kva generator	66										
S130 mc closkey screen	81			84.0	82.0	79.0	79.0	74.0	74.0	71.0	64.0
Finlay 430 stockpiler	81			84.0	82.0	79.0	79.0	74.0	74.0	71.0	64.0
Case 821g Loading Shovel	76										
Barge Loading	80										

## Calculations at Dwellings

Time and distance calculations. Predictions are shown for the closest and furthest areas of working for Smalley Bight and Birkwood.

### Dwelling to NE

#### Smalley Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	450	33.1	32.9
Doosan DX300 Tracked Excavator	80	60	0	10	10	450	33.1	36.9
Volvo a25d Dumptruck (2no)	78	60	0	10	10	450	33.1	34.9
Finlay 683 supertrak wash screen	81	60	0	10	10	400	32.0	39.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	400	32.0	39.0
Finlay c1540 cone crusher	86	60	0	10	10	400	32.0	44.0
Evo wash 70 sand plant	78	60	0	10	10	400	32.0	36.0
400 kva generator	66	60	0	10	10	400	32.0	24.0
S130 mc closkey screen	81	60	0	10	10	400	32.0	39.0
Finlay 430 stockpiler	81	60	0	10	10	400	32.0	39.0
Case 821g Loading Shovel	76	60	0	10	10	400	32.0	34.0
Barge Loading	80	60	0	10	10	400	32.0	38.0
Haul Road								31.4
<b>Overall</b>	<b>49.1</b>							

### Smalley Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	1000	40.0	26.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	1000	40.0	30.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	1000	40.0	28.0
Finlay 683 supertrak wash screen	81	60	0	10	10	400	32.0	39.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	400	32.0	39.0
Finlay c1540 cone crusher	86	60	0	10	10	400	32.0	44.0
Evo wash 70 sand plant	78	60	0	10	10	400	32.0	36.0
400 kva generator	66	60	0	10	10	400	32.0	24.0
S130 mc closkey screen	81	60	0	10	10	400	32.0	39.0
Finlay 430 stockpiler	81	60	0	10	10	400	32.0	39.0
Case 821g Loading Shovel	76	60	0	10	10	400	32.0	34.0
Barge Loading	80	60	0	10	10	400	32.0	38.0
Haul Road								31.4
<b>Overall</b>	<b>48.7</b>							

### Birkwood Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	450	33.1	32.9
Doosan DX300 Tracked Excavator	80	60	0	10	10	450	33.1	36.9
Volvo a25d Dumptruck (2no)	78	60	0	10	10	450	33.1	34.9
Finlay 683 supertrak wash screen	81	60	0	10	10	400	32.0	39.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	400	32.0	39.0
Finlay c1540 cone crusher	86	60	0	10	10	400	32.0	44.0
Evo wash 70 sand plant	78	60	0	10	10	400	32.0	36.0
400 kva generator	66	60	0	10	10	400	32.0	24.0
S130 mc closkey screen	81	60	0	10	10	400	32.0	39.0
Finlay 430 stockpiler	81	60	0	10	10	400	32.0	39.0
Case 821g Loading Shovel	76	60	0	10	10	400	32.0	34.0
Barge Loading	80	60	0	10	10	400	32.0	38.0
Haul Road								31.4
<b>Overall</b>	<b>49.1</b>							

# **Birkwood Far**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	850	38.6	27.4
Doosan DX300 Tracked Excavator	80	60	0	10	10	850	38.6	31.4
Volvo a25d Dumptruck (2no)	78	60	0	10	10	850	38.6	29.4
Finlay 683 supertrak wash screen	81	60	0	10	10	400	32.0	39.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	400	32.0	39.0
Finlay c1540 cone crusher	86	60	0	10	10	400	32.0	44.0
Evo wash 70 sand plant	78	60	0	10	10	400	32.0	36.0
400 kva generator	66	60	0	10	10	400	32.0	24.0
S130 mc closkey screen	81	60	0	10	10	400	32.0	39.0
Finlay 430 stockpiler	81	60	0	10	10	400	32.0	39.0
Case 821g Loading Shovel	76	60	0	10	10	400	32.0	34.0
Barge Loading	80	60	0	10	10	400	32.0	38.0
Haul Road								31.4
<b>Overall</b>	<b>48.7</b>							

# **Calder House, SE**

## **Smalley Close**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	360	31.1	34.9
Doosan DX300 Tracked Excavator	80	60	0	10	10	360	31.1	38.9
Volvo a25d Dumptruck (2no)	78	60	0	10	10	360	31.1	36.9
Finlay 683 supertrak wash screen	81	60	0	10	10	300	29.5	41.5
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	300	29.5	41.5
Finlay c1540 cone crusher	86	60	0	10	10	300	29.5	46.5
Evo wash 70 sand plant	78	60	0	10	10	300	29.5	38.5
400 kva generator	66	60	0	10	10	300	29.5	26.5
S130 mc closkey screen	81	60	0	10	10	300	29.5	41.5
Finlay 430 stockpiler	81	60	0	10	10	300	29.5	41.5
Case 821g Loading Shovel	76	60	0	10	10	300	29.5	36.5
Barge Loading	80	60	0	10	10	300	29.5	40.5
Haul Road								32.8
<b>Overall</b>	<b>51.5</b>							

**Smalley Far**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	700	36.9	29.1
Doosan DX300 Tracked Excavator	80	60	0	10	10	700	36.9	33.1
Volvo a25d Dumptruck (2no)	78	60	0	10	10	700	36.9	31.1
Finlay 683 supertrak wash screen	81	60	0	10	10	300	29.5	41.5
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	300	29.5	41.5
Finlay c1540 cone crusher	86	60	0	10	10	300	29.5	46.5
Evo wash 70 sand plant	78	60	0	10	10	300	29.5	38.5
400 kva generator	66	60	0	10	10	300	29.5	26.5
S130 mc closkey screen	81	60	0	10	10	300	29.5	41.5
Finlay 430 stockpiler	81	60	0	10	10	300	29.5	41.5
Case 821g Loading Shovel	76	60	0	10	10	300	29.5	36.5
Barge Loading	80	60	0	10	10	300	29.5	40.5
Haul Road								32.8
<b>Overall</b>	<b>51.2</b>							

**Birkwood Close**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	50	14.0	52.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	50	14.0	56.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	50	14.0	54.0
Finlay 683 supertrak wash screen	81	60	0	10	10	300	29.5	41.5
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	300	29.5	41.5
Finlay c1540 cone crusher	86	60	0	10	10	300	29.5	46.5
Evo wash 70 sand plant	78	60	0	10	10	300	29.5	38.5
400 kva generator	66	60	0	10	10	300	29.5	26.5
S130 mc closkey screen	81	60	0	10	10	300	29.5	41.5
Finlay 430 stockpiler	81	60	0	10	10	300	29.5	41.5
Case 821g Loading Shovel	76	60	0	10	10	300	29.5	36.5
Barge Loading	80	60	0	10	10	300	29.5	40.5
Haul Road								32.8
<b>Overall</b>	<b>59.7</b>							

**Birkwood Far**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	450	33.1	32.9
Doosan DX300 Tracked Excavator	80	60	0	10	10	450	33.1	36.9
Volvo a25d Dumptruck (2no)	78	60	0	10	10	450	33.1	34.9
Finlay 683 supertrak wash screen	81	60	0	10	10	300	29.5	41.5
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	300	29.5	41.5
Finlay c1540 cone crusher	86	60	0	10	10	300	29.5	46.5
Evo wash 70 sand plant	78	60	0	10	10	300	29.5	38.5
400 kva generator	66	60	0	10	10	300	29.5	26.5
S130 mc closkey screen	81	60	0	10	10	300	29.5	41.5
Finlay 430 stockpiler	81	60	0	10	10	300	29.5	41.5
Case 821g Loading Shovel	76	60	0	10	10	300	29.5	36.5
Barge Loading	80	60	0	10	10	300	29.5	40.5
Haul Road								32.8
Overall	51.3							

**Dwelling South**

**Smalley Close**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	500	34.0	32.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	500	34.0	36.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	500	34.0	34.0
Finlay 683 supertrak wash screen	81	60	0	10	10	500	34.0	37.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	500	34.0	37.0
Finlay c1540 cone crusher	86	60	0	10	10	500	34.0	42.0
Evo wash 70 sand plant	78	60	0	10	10	500	34.0	34.0
400 kva generator	66	60	0	10	10	500	34.0	22.0
S130 mc closkey screen	81	60	0	10	10	500	34.0	37.0
Finlay 430 stockpiler	81	60	0	10	10	500	34.0	37.0
Case 821g Loading Shovel	76	60	0	10	10	500	34.0	32.0
Barge Loading	80	60	0	10	10	500	34.0	36.0
Haul Road								45.9
Overall	49.6							

### Smalley Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	750	37.5	28.5
Doosan DX300 Tracked Excavator	80	60	0	10	10	750	37.5	32.5
Volvo a25d Dumptruck (2no)	78	60	0	10	10	750	37.5	30.5
Finlay 683 supertrak wash screen	81	60	0	10	10	500	34.0	37.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	500	34.0	37.0
Finlay c1540 cone crusher	86	60	0	10	10	500	34.0	42.0
Evo wash 70 sand plant	78	60	0	10	10	500	34.0	34.0
400 kva generator	66	60	0	10	10	500	34.0	22.0
S130 mc closkey screen	81	60	0	10	10	500	34.0	37.0
Finlay 430 stockpiler	81	60	0	10	10	500	34.0	37.0
Case 821g Loading Shovel	76	60	0	10	10	500	34.0	32.0
Barge Loading	80	60	0	10	10	500	34.0	36.0
Haul Road								45.9
<b>Overall</b>	<b>49.4</b>							

### Birkwood Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	200	26.0	40.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	200	26.0	44.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	200	26.0	42.0
Finlay 683 supertrak wash screen	81	60	0	10	10	500	34.0	37.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	500	34.0	37.0
Finlay c1540 cone crusher	86	60	0	10	10	500	34.0	42.0
Evo wash 70 sand plant	78	60	0	10	10	500	34.0	34.0
400 kva generator	66	60	0	10	10	500	34.0	22.0
S130 mc closkey screen	81	60	0	10	10	500	34.0	37.0
Finlay 430 stockpiler	81	60	0	10	10	500	34.0	37.0
Case 821g Loading Shovel	76	60	0	10	10	500	34.0	32.0
Barge Loading	80	60	0	10	10	500	34.0	36.0
Haul Road								45.9
<b>Overall</b>	<b>51.3</b>							

# Birkwood Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	470	33.4	32.6
Doosan DX300 Tracked Excavator	80	60	0	10	10	470	33.4	36.6
Volvo a25d Dumptruck (2no)	78	60	0	10	10	470	33.4	34.6
Finlay 683 supertrak wash screen	81	60	0	10	10	500	34.0	37.0
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	500	34.0	37.0
Finlay c1540 cone crusher	86	60	0	10	10	500	34.0	42.0
Evo wash 70 sand plant	78	60	0	10	10	500	34.0	34.0
400 kva generator	66	60	0	10	10	500	34.0	22.0
S130 mc closkey screen	81	60	0	10	10	500	34.0	37.0
Finlay 430 stockpiler	81	60	0	10	10	500	34.0	37.0
Case 821g Loading Shovel	76	60	0	10	10	500	34.0	32.0
Barge Loading	80	60	0	10	10	500	34.0	36.0
Haul Road								45.9
<b>Overall</b>	<b>49.6</b>							

# Ferry Lane, SW

## Smalley Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	500	34.0	32.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	500	34.0	36.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	500	34.0	34.0
Finlay 683 supertrak wash screen	81	60	0	10	10	860	38.7	32.3
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	860	38.7	32.3
Finlay c1540 cone crusher	86	60	0	10	10	860	38.7	37.3
Evo wash 70 sand plant	78	60	0	10	10	860	38.7	29.3
400 kva generator	66	60	0	10	10	860	38.7	17.3
S130 mc closkey screen	81	60	0	10	10	860	38.7	32.3
Finlay 430 stockpiler	81	60	0	10	10	860	38.7	32.3
Case 821g Loading Shovel	76	60	0	10	10	860	38.7	27.3
Barge Loading	80	60	0	10	10	860	38.7	31.3
Haul Road								31.4
<b>Overall</b>	<b>43.9</b>							



### Smalley Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	900	39.1	26.9
Doosan DX300 Tracked Excavator	80	60	0	10	10	900	39.1	30.9
Volvo a25d Dumptruck (2no)	78	60	0	10	10	900	39.1	28.9
Finlay 683 supertrak wash screen	81	60	0	10	10	860	38.7	32.3
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	860	38.7	32.3
Finlay c1540 cone crusher	86	60	0	10	10	860	38.7	37.3
Evo wash 70 sand plant	78	60	0	10	10	860	38.7	29.3
400 kva generator	66	60	0	10	10	860	38.7	17.3
S130 mc closkey screen	81	60	0	10	10	860	38.7	32.3
Finlay 430 stockpiler	81	60	0	10	10	860	38.7	32.3
Case 821g Loading Shovel	76	60	0	10	10	860	38.7	27.3
Barge Loading	80	60	0	10	10	860	38.7	31.3
Haul Road								31.4
<b>Overall</b>	<b>42.7</b>							

### Birkwood Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	450	33.1	32.9
Doosan DX300 Tracked Excavator	80	60	0	10	10	450	33.1	36.9
Volvo a25d Dumptruck (2no)	78	60	0	10	10	450	33.1	34.9
Finlay 683 supertrak wash screen	81	60	0	10	10	860	38.7	32.3
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	860	38.7	32.3
Finlay c1540 cone crusher	86	60	0	10	10	860	38.7	37.3
Evo wash 70 sand plant	78	60	0	10	10	860	38.7	29.3
400 kva generator	66	60	0	10	10	860	38.7	17.3
S130 mc closkey screen	81	60	0	10	10	860	38.7	32.3
Finlay 430 stockpiler	81	60	0	10	10	860	38.7	32.3
Case 821g Loading Shovel	76	60	0	10	10	860	38.7	27.3
Barge Loading	80	60	0	10	10	860	38.7	31.3
Haul Road								31.4
<b>Overall</b>	<b>44.2</b>							

## Birkwood Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	850	38.6	27.4
Doosan DX300 Tracked Excavator	80	60	0	10	10	850	38.6	31.4
Volvo a25d Dumptruck (2no)	78	60	0	10	10	850	38.6	29.4
Finlay 683 supertrak wash screen	81	60	0	10	10	860	38.7	32.3
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	860	38.7	32.3
Finlay c1540 cone crusher	86	60	0	10	10	860	38.7	37.3
Evo wash 70 sand plant	78	60	0	10	10	860	38.7	29.3
400 kva generator	66	60	0	10	10	860	38.7	17.3
S130 mc closkey screen	81	60	0	10	10	860	38.7	32.3
Finlay 430 stockpiler	81	60	0	10	10	860	38.7	32.3
Case 821g Loading Shovel	76	60	0	10	10	860	38.7	27.3
Barge Loading	80	60	0	10	10	860	38.7	31.3
Haul Road								31.4
<b>Overall</b>	<b>42.8</b>							

## Smalley Bight, West

### Smalley Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	100	20.0	46.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	100	20.0	50.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	100	20.0	48.0
Finlay 683 supertrak wash screen	81	60	0	10	10	650	36.3	34.7
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	650	36.3	34.7
Finlay c1540 cone crusher	86	60	0	10	10	650	36.3	39.7
Evo wash 70 sand plant	78	60	0	10	10	650	36.3	31.7
400 kva generator	66	60	0	10	10	650	36.3	19.7
S130 mc closkey screen	81	60	0	10	10	650	36.3	34.7
Finlay 430 stockpiler	81	60	0	10	10	650	36.3	34.7
Case 821g Loading Shovel	76	60	0	10	10	650	36.3	29.7
Barge Loading	80	60	0	10	10	650	36.3	33.7
Haul Road								28.7
<b>Overall</b>	<b>53.6</b>							

### Smalley Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	600	35.6	30.4
Doosan DX300 Tracked Excavator	80	60	0	10	10	600	35.6	34.4
Volvo a25d Dumptruck (2no)	78	60	0	10	10	600	35.6	32.4
Finlay 683 supertrak wash screen	81	60	0	10	10	650	36.3	34.7
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	650	36.3	34.7
Finlay c1540 cone crusher	86	60	0	10	10	650	36.3	39.7
Evo wash 70 sand plant	78	60	0	10	10	650	36.3	31.7
400 kva generator	66	60	0	10	10	650	36.3	19.7
S130 mc closkey screen	81	60	0	10	10	650	36.3	34.7
Finlay 430 stockpiler	81	60	0	10	10	650	36.3	34.7
Case 821g Loading Shovel	76	60	0	10	10	650	36.3	29.7
Barge Loading	80	60	0	10	10	650	36.3	33.7
Haul Road								28.7
<b>Overall</b>	<b>45.1</b>							

### Birkwood Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	200	26.0	40.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	200	26.0	44.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	200	26.0	42.0
Finlay 683 supertrak wash screen	81	60	0	10	10	650	36.3	34.7
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	650	36.3	34.7
Finlay c1540 cone crusher	86	60	0	10	10	650	36.3	39.7
Evo wash 70 sand plant	78	60	0	10	10	650	36.3	31.7
400 kva generator	66	60	0	10	10	650	36.3	19.7
S130 mc closkey screen	81	60	0	10	10	650	36.3	34.7
Finlay 430 stockpiler	81	60	0	10	10	650	36.3	34.7
Case 821g Loading Shovel	76	60	0	10	10	650	36.3	29.7
Barge Loading	80	60	0	10	10	650	36.3	33.7
Haul Road								28.7
<b>Overall</b>	<b>48.9</b>							

# **Birkwood Far**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	650	36.3	29.7
Doosan DX300 Tracked Excavator	80	60	0	10	10	650	36.3	33.7
Volvo a25d Dumptruck (2no)	78	60	0	10	10	650	36.3	31.7
Finlay 683 supertrak wash screen	81	60	0	10	10	650	36.3	34.7
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	650	36.3	34.7
Finlay c1540 cone crusher	86	60	0	10	10	650	36.3	39.7
Evo wash 70 sand plant	78	60	0	10	10	650	36.3	31.7
400 kva generator	66	60	0	10	10	650	36.3	19.7
S130 mc closkey screen	81	60	0	10	10	650	36.3	34.7
Finlay 430 stockpiler	81	60	0	10	10	650	36.3	34.7
Case 821g Loading Shovel	76	60	0	10	10	650	36.3	29.7
Barge Loading	80	60	0	10	10	650	36.3	33.7
Haul Road								28.7
<b>Overall</b>	<b>45</b>							

# **Stanley, NW** **Smalley Close**

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	350	30.9	35.1
Doosan DX300 Tracked Excavator	80	60	0	10	10	350	30.9	39.1
Volvo a25d Dumptruck (2no)	78	60	0	10	10	350	30.9	37.1
Finlay 683 supertrak wash screen	81	60	0	10	10	950	39.6	31.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	950	39.6	31.4
Finlay c1540 cone crusher	86	60	0	10	10	950	39.6	36.4
Evo wash 70 sand plant	78	60	0	10	10	950	39.6	28.4
400 kva generator	66	60	0	10	10	950	39.6	16.4
S130 mc closkey screen	81	60	0	10	10	950	39.6	31.4
Finlay 430 stockpiler	81	60	0	10	10	950	39.6	31.4
Case 821g Loading Shovel	76	60	0	10	10	950	39.6	26.4
Barge Loading	80	60	0	10	10	950	39.6	30.4
Haul Road								29.7
<b>Overall</b>	<b>44.7</b>							

### Smalley Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	850	38.6	27.4
Doosan DX300 Tracked Excavator	80	60	0	10	10	850	38.6	31.4
Volvo a25d Dumptruck (2no)	78	60	0	10	10	850	38.6	29.4
Finlay 683 supertrak wash screen	81	60	0	10	10	950	39.6	31.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	950	39.6	31.4
Finlay c1540 cone crusher	86	60	0	10	10	950	39.6	36.4
Evo wash 70 sand plant	78	60	0	10	10	950	39.6	28.4
400 kva generator	66	60	0	10	10	950	39.6	16.4
S130 mc closkey screen	81	60	0	10	10	950	39.6	31.4
Finlay 430 stockpiler	81	60	0	10	10	950	39.6	31.4
Case 821g Loading Shovel	76	60	0	10	10	950	39.6	26.4
Barge Loading	80	60	0	10	10	950	39.6	30.4
Haul Road								29.7
<b>Overall</b>	<b>42</b>							

### Birkwood Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	650	36.3	29.7
Doosan DX300 Tracked Excavator	80	60	0	10	10	650	36.3	33.7
Volvo a25d Dumptruck (2no)	78	60	0	10	10	650	36.3	31.7
Finlay 683 supertrak wash screen	81	60	0	10	10	950	39.6	31.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	950	39.6	31.4
Finlay c1540 cone crusher	86	60	0	10	10	950	39.6	36.4
Evo wash 70 sand plant	78	60	0	10	10	950	39.6	28.4
400 kva generator	66	60	0	10	10	950	39.6	16.4
S130 mc closkey screen	81	60	0	10	10	950	39.6	31.4
Finlay 430 stockpiler	81	60	0	10	10	950	39.6	31.4
Case 821g Loading Shovel	76	60	0	10	10	950	39.6	26.4
Barge Loading	80	60	0	10	10	950	39.6	30.4
Haul Road								29.7
<b>Overall</b>	<b>42.5</b>							

## Birkwood Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	1050	40.4	25.6
Doosan DX300 Tracked Excavator	80	60	0	10	10	1050	40.4	29.6
Volvo a25d Dumptruck (2no)	78	60	0	10	10	1050	40.4	27.6
Finlay 683 supertrak wash screen	81	60	0	10	10	950	39.6	31.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	950	39.6	31.4
Finlay c1540 cone crusher	86	60	0	10	10	950	39.6	36.4
Evo wash 70 sand plant	78	60	0	10	10	950	39.6	28.4
400 kva generator	66	60	0	10	10	950	39.6	16.4
S130 mc closkey screen	81	60	0	10	10	950	39.6	31.4
Finlay 430 stockpiler	81	60	0	10	10	950	39.6	31.4
Case 821g Loading Shovel	76	60	0	10	10	950	39.6	26.4
Barge Loading	80	60	0	10	10	950	39.6	30.4
Haul Road								29.7
<b>Overall</b>	<b>41.7</b>							

## Dwelling to NW

### Smalley Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	60	15.6	50.4
Doosan DX300 Tracked Excavator	80	60	0	10	10	60	15.6	54.4
Volvo a25d Dumptruck (2no)	78	60	0	10	10	60	15.6	52.4
Finlay 683 supertrak wash screen	81	60	0	10	10	600	35.6	35.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	600	35.6	35.4
Finlay c1540 cone crusher	86	60	0	10	10	600	35.6	40.4
Evo wash 70 sand plant	78	60	0	10	10	600	35.6	32.4
400 kva generator	66	60	0	10	10	600	35.6	20.4
S130 mc closkey screen	81	60	0	10	10	600	35.6	35.4
Finlay 430 stockpiler	81	60	0	10	10	600	35.6	35.4
Case 821g Loading Shovel	76	60	0	10	10	600	35.6	30.4
Barge Loading	80	60	0	10	10	600	35.6	34.4
Haul Road								27.6
<b>Overall</b>	<b>57.7</b>							

### Smalley Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	500	34.0	32.0
Doosan DX300 Tracked Excavator	80	60	0	10	10	500	34.0	36.0
Volvo a25d Dumptruck (2no)	78	60	0	10	10	500	34.0	34.0
Finlay 683 supertrak wash screen	81	60	0	10	10	600	35.6	35.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	600	35.6	35.4
Finlay c1540 cone crusher	86	60	0	10	10	600	35.6	40.4
Evo wash 70 sand plant	78	60	0	10	10	600	35.6	32.4
400 kva generator	66	60	0	10	10	600	35.6	20.4
S130 mc closkey screen	81	60	0	10	10	600	35.6	35.4
Finlay 430 stockpiler	81	60	0	10	10	600	35.6	35.4
Case 821g Loading Shovel	76	60	0	10	10	600	35.6	30.4
Barge Loading	80	60	0	10	10	600	35.6	34.4
Haul Road								27.6
<b>Overall</b>	<b>45.9</b>							

### Birkwood Close

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	300	29.5	36.5
Doosan DX300 Tracked Excavator	80	60	0	10	10	300	29.5	40.5
Volvo a25d Dumptruck (2no)	78	60	0	10	10	300	29.5	38.5
Finlay 683 supertrak wash screen	81	60	0	10	10	600	35.6	35.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	600	35.6	35.4
Finlay c1540 cone crusher	86	60	0	10	10	600	35.6	40.4
Evo wash 70 sand plant	78	60	0	10	10	600	35.6	32.4
400 kva generator	66	60	0	10	10	600	35.6	20.4
S130 mc closkey screen	81	60	0	10	10	600	35.6	35.4
Finlay 430 stockpiler	81	60	0	10	10	600	35.6	35.4
Case 821g Loading Shovel	76	60	0	10	10	600	35.6	30.4
Barge Loading	80	60	0	10	10	600	35.6	34.4
Haul Road								27.6
<b>Overall</b>	<b>47.3</b>							

Birkwood Far

Description	LAeq	Mins used in 1 hr	Time Correction	Barrier Effect	Meas. distance	Receptor distance	Decay	Specific Level at receptor
Case 821g Wheeled Loading Shovel	76	60	0	10	10	750	37.5	28.5
Doosan DX300 Tracked Excavator	80	60	0	10	10	750	37.5	32.5
Volvo a25d Dumptruck (2no)	78	60	0	10	10	750	37.5	30.5
Finlay 683 supertrak wash screen	81	60	0	10	10	600	35.6	35.4
Finlay 683 supertrak dry screen 3 way split	81	60	0	10	10	600	35.6	35.4
Finlay c1540 cone crusher	86	60	0	10	10	600	35.6	40.4
Evo wash 70 sand plant	78	60	0	10	10	600	35.6	32.4
400 kva generator	66	60	0	10	10	600	35.6	20.4
S130 mc closkey screen	81	60	0	10	10	600	35.6	35.4
Finlay 430 stockpiler	81	60	0	10	10	600	35.6	35.4
Case 821g Loading Shovel	76	60	0	10	10	600	35.6	30.4
Barge Loading	80	60	0	10	10	600	35.6	34.4
Haul Road								27.6
Overall	45.4							



## APPENDIX 6 – DEWSBURY QUARRY DIRECT MEASUREMENTS

Description	LAeq	Normalise dist	Meas dist	Level @ normalised
	[dB]			
Terex 683 Supertrak, 5m	88.8	50	5	68.8
Terex 683 Supertrak, 10m	83.7	50	10	69.7
Terrex C1540, engine side, 10m	85.9	50	10	71.9
Terrex C1540, engine side, 14m	82.0	50	14	70.9
Terrex C1540, engine side, 5m	93.0	50	5	73
Terrex C1540, engine side, 5m	91.0	50	5	71
McCloskey S130, 10m	79.9	50	10	65.9
Generator, doors closed, 2m	78.8	50	2	50.8
Generator, doors closed, 5m	73.2	50	5	53.2
Generator, doors open, 2m	91.3	50	2	63.3
<b>Total</b>	<b>74.6</b>			

Measured range                      68 - 74                      50 m  
 Typical operating range            70 - 72                      50 m  
 Single figure                          71                              50 m

Description	20	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	12500	16000	20000
Terex 683 Supertrak, 5m	84.6	78.3	71.6	75.2	85.5	81.8	80.7	75.4	77.1	81.5	80.6	81.5	79.7	79.4	81.3	83.5	81.4	78.9	78.5	77	74.7	73.8	72.4	70.2	68.2	67.1	65.7	64.8	62	57.1	49.7
Terex 683 Supertrak, 10m	79.9	77.7	71.7	77.8	84.7	76.1	79.3	74.1	74.7	78.7	75.2	72.5	73.5	76	78.1	76.3	77.3	73.8	73	71.4	70.1	68.7	66.6	64.3	63	61	59.3	58.4	55.5	51.3	44.4
Terrex C1540, engine side, 10m	83.6	75.5	69.3	68.7	81.2	78.6	81.3	75.8	75.8	75.7	76.9	79.9	74.4	74.7	77.3	75	74.5	74.8	74.4	74	73.4	74.6	74.8	74.1	73.2	71.2	69.8	67.7	64	59.6	53.1
Terrex C1540, engine side, 14m	81.2	72	67.8	69.2	82.4	79.1	79.3	70.2	70	71.2	72	80.8	73.6	69.3	70.3	71.9	73.3	70	70	69.8	70.1	70.6	70.4	69.1	68.1	66.1	64.2	61.9	57.6	52.7	45.6
Terrex C1540, engine side, 5m	86.6	83.7	75.7	75.2	83.2	80.2	81.6	79.1	80.3	83.9	88.1	93.4	84.7	83.1	83.4	84.3	83.2	83.1	81.3	80.7	79.5	80.2	79	78.1	76.5	74.4	72.7	70.3	66.4	61.3	54.2
Terrex C1540, engine side, 5m	86.4	84.7	74.5	72.8	76.5	81	80.5	76.5	78.8	82.5	86.6	90.9	81.6	81.6	81.7	81.3	83.2	80.2	79.6	78.9	77.7	78.1	77.6	75.7	74.5	72.7	70.7	67.9	63	56.1	47.2
McCloskey S130, 10m	84.3	78.2	71.5	75.7	81.3	75	79.3	69.2	66.9	71.8	70	70.8	76.2	72.4	72.8	72.4	70.5	68.9	69.4	68.3	67	66.4	65	64.1	62.1	60.5	58.6	55.9	52.1	47.3	40
Generator, doors closed, 2m	80.5	75.8	73.5	84.4	81	75.5	87.8	75.2	74.7	79.8	78.4	74.8	71.2	69.8	69.6	70.3	71.7	67.7	66.3	67.2	66.7	62.9	60.1	59.9	56.1	54.5	51.6	48.3	42.9	38.1	31.7
Generator, doors closed, 5m	80.5	72.6	67.5	78.4	77.8	72.2	82.3	71.1	70	75.2	73.7	68.3	65.4	65.4	62.8	65	64.6	63.4	61.5	61.1	59.8	57.2	54	53.5	50.1	49.4	47.3	44.6	39.6	33.1	25
Generator, doors open, 2m	78.9	73.5	73.7	83.8	79.7	78.8	89.9	80.3	79	81.8	82.5	81	81.7	81	81.2	81.9	82	84	83.4	81.1	79.3	77.1	75.3	73.4	71.5	69.3	65.8	63	59.9	56	50.7
<b>Total</b>	<b>88.5</b>	<b>82.5</b>	<b>76.3</b>	<b>82.4</b>	<b>87.9</b>	<b>82.1</b>	<b>86.8</b>	<b>79.3</b>	<b>79.2</b>	<b>82</b>	<b>80.6</b>	<b>81.3</b>	<b>79.8</b>	<b>79.6</b>	<b>81.4</b>	<b>79.8</b>	<b>79.8</b>	<b>78.1</b>	<b>77.6</b>	<b>76.7</b>	<b>75.8</b>	<b>76.1</b>	<b>75.8</b>	<b>74.9</b>	<b>73.9</b>	<b>71.9</b>	<b>70.5</b>	<b>68.4</b>	<b>64.8</b>	<b>60.4</b>	<b>53.8</b>

Description	20	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	12500	16000	20000
Overall operation, facing C1540 engine, 20m	80.6	68.6	65.8	68.2	82.7	74.6	77.7	72.4	73.7	76.1	75.2	78.2	71.7	69.2	69.1	69.9	73.1	70.8	69.5	69.7	67.5	69.1	68.4	68.3	67.6	65.6	64	62	58	53.1	46.2
Overall operation, facing C1540 engine, 40m	77.6	64.7	63.1	65.8	77.7	70.6	74.4	67	68.2	70.1	69.3	74.7	66.9	65.3	62.8	60.9	63.2	62.5	63.5	61.9	60.8	62.2	62.2	62.1	59.8	57.3	54.8	51.8	46.4	39.5	30.6
Overall operation, away from C1540 engine, 20m	85	73.3	66.7	73.5	76.8	74.8	79.4	73.4	72.8	74.2	70.6	65.8	67.4	68.1	68.2	66.2	66.1	65.2	64.4	63.8	63.7	64.8	62.1	60.9	59.5	56.1	53.4	49.5	44.4	38	28.2
Overall operation, away from C1540 engine, 40m	81.5	72	65.9	71.6	75	71	74	66.6	65.7	65.4	64.5	60.8	66.2	65.7	65.5	62.9	62.5	60.7	60.4	60.1	58.9	58.2	57.5	55.5	53.4	50.3	46.8	41.6	35.5	27.6	17.6
Overall operation, loading side, 10m	84.5	80.6	66.9	77.1	87.2	82.8	81.2	75.3	76.2	78.5	77.5	76.5	77	75.6	75.3	75.8	75.7	76.5	75.8	75	74.4	74.6	73.6	72.5	71	68.4	66.5	63.7	58.7	52.2	43.5
Overall operation, loading side, 25m	77.2	74.9	69.2	75.9	75.4	72.2	75.3	69.6	69.3	73.2	72	68.8	66.6	67.5	67.2	69.8	72.3	68.2	66.7	65.5	63	62.4	61.6	59.6	57.5	55	51.9	47.7	40.9	31.3	20.4
Overall operation, on bund, average 50m	81.1	75.3	68	69.6	72.9	68.1	70.3	63.2	61.1	65.1	62.7	59.8	60.5	62.2	63.5	62	61.2	61.1	60.3	59.9	59.3	57.6	56.6	54.9	55.5	49.7	46.6	42.5	37.1	31.6	23.2

Calculations of revised noise impact have been performed by substituting processing plant sound levels in the Appendix 5 calculations with the direct measurement data outlined in this section. The barge movements and excavation calculation remain the same as previously.



Photographs of existing plant

