REPORT TITLE:

The Seam Barnsley Sculptures

Noise Impact Assessment

CLIENT DETAILS:

Willmott Dixon Construction Limited

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REPORT REFERENCE:

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1. Non-Technical Summary

A noise assessment was commissioned by Willmott Dixon Construction Limited in support of the planning application for the proposed The Seam Barnsley Sculptures to be erected on a public car park (Lower seam) adjacent to Digital Media Centre 01 (Barnsley S70 2JW).

The calculated noise impact from the proposed Sculptures has been assessed based on the most relevant policies, acoustic guidelines and standards such as; World Health Organisation (WHO), BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*, Guidelines for environmental noise impact assessment (IEMA), and the Noise policy statement for England 2010.

The noise assessment shows evidence that the noise levels from the proposed sculptures are of negligible impact at the nearest residential dwellings.

This is an indication that the proposed Sculptures during the short period of music events are compliant with the core aims of the Noise Policy Statement for England.

2. Introduction

This report provides a noise impact assessment from the proposed The Seam Barnsley Sculptures to be located at the Lower Seam car park to the nearest noise sensitive receptors.

The figure below includes the location of the proposed Sculptures.

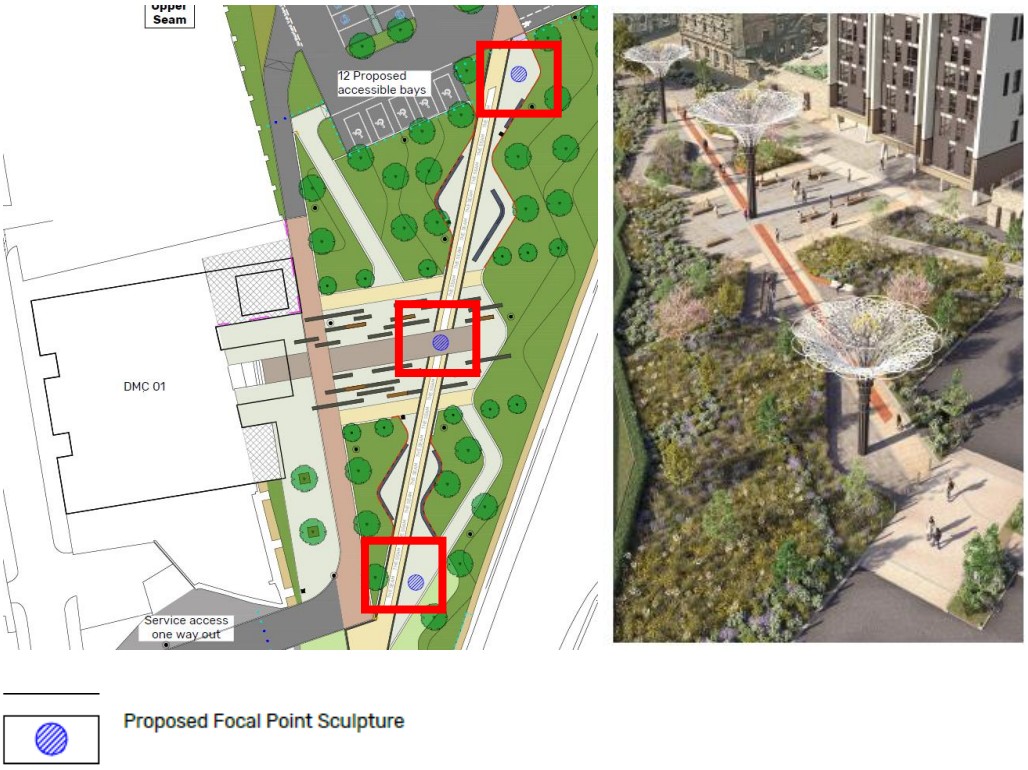

Figure 1. Proposed sculpture location (Left), and View aerial (Right).

2.1 Site Description

The noise climate affecting the area comprises constant traffic noise from the car park vehicle movements, noise from the adjacent road networks (Eldon St), Barnsley Interchange, train noise, and sporadic aircraft noise. The recorded noise levels confirmed that the noise levels at the areas adjacent to the proposed sculptures is already very high.

3. Environmental Methodology

3.1 Perception

Noise is defined as unwanted sound. Human ears can respond to sound over the frequency range of about 20 Hz to 20 kHz and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude and is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates to the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear. To help understand the range of noise levels which may be encountered, an indication of the level of some common sounds on the dB(A) scale is given in the table below.

Table 1. Common Sounds on the dB(A) Scale

dB(A)	Description
140	Threshold of pain
120	Jet take off at 50 metres
100	Maximum noise levels on an underground platform
80	Kerbside of a busy urban street
60	Busy general office
40	Residential area at night
20	Background in a TV and recording studio
0	Threshold of hearing

Furthermore, the perception of noise may be determined by several other factors, both acoustic and non-acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time.

In addition, the time of day and other acoustic features such as tonality may be important, as may the disposition of the affected individual receptor. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that corresponds to the response of the human ear is the A-weighting scale.

This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90}, etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) of a steady source is generally regarded as the minimum difference needed to perceive a change.

3.2 Legislation and Policy

3.2.1 National Planning Policy Framework and the Noise Policy Statement for England

The National Planning Policy Framework (NPPF) sets out the general requirements for gaining planning permission. Comments regarding noise found within the document are as follows.

Planning policies and decisions should contribute to and enhance the natural and local environment by:
e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life (See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Section Ground conditions and pollution states the following*:*

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The NPPF references the Noise Policy Statement for England (NPSE) which intern references two concepts used by the World Health Organisation (WHO) which can be used to ascertain relevant noise levels for individual sites. The concepts are LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level).

The NPPF then gives three aims to adhere to:

Aim 1 – Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
Aim 2 – Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy of sustainable development.
Aim 3 – Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

To avoid 'significant adverse impacts on health and quality of life', by creating a situation where the impact of noise lies below the SOAEL we will refer to both BS8233 *Guidance on sound insulation and noise reduction for buildings*, and the World Health Organisation (WHO) 'Guidelines for Community Noise' which both provide good criteria for internal noise levels for residential buildings.

In the context of assessing noise impact from the site, acceptable amenity levels for gardens are discussed within WHO Guidelines for Community noise, these criteria are also taken up by BS 8233: 2014 *Guidance on sound insulation and noise reduction for buildings*.

3.2.2 World Health Organisation (WHO) 'Guidelines for Community Noise'

This document states that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. According to this document, to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}. A commentary on these guideline values is provided within our assessment later within this report.

3.2.3 British Standard BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

The scope of BS8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.

BS8233 suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests an internal noise level of 35 dB $L_{Aeq,T}$ during day time, and 30 dB $L_{Aeq,T}$ during night time within bedrooms. In the daytime, the standard recommends 35 dB $L_{Aeq,T}$ in living rooms and in 40 dB $L_{Aeq,T}$ dining rooms. Table 4 below is extracted from this document. BS8233:2014 Excerpt:

7.7.2 Internal ambient noise levels for dwellings

In general, for steady external noise sources, it is **desirable** that the internal ambient noise level does not exceed the guideline values in Table 4.

Table 4 **Indoor ambient noise levels for dwellings**

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233:2014 states the following:

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values.

NOTE 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

Design criteria for external noise

Regarding the external areas, BS8233:2014 states the following:

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.

3.2.5 Guidelines for Environmental noise impact assessment

These guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).

In order to assess the potential noise impact on nearby residential properties, the table below includes the scale of significance effect for change in noise level.

TABLE 7-14 IMPACT FROM THE CHANGE IN SOUND LEVELS
(Source HS2 Phase 1 Environmental Statement)

Long-term Impact Classification	Short-term Impact Classification	Sound level change dB L_{pAeqT} (positive or negative) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB
Major		≥ 10 dB

Figure 2. Impact from the change in sound levels.

Negligible effect occurs when the calculated noise levels from the proposal will not have a representative increase in the ambient noise levels affecting the nearby residential receptors.

4. Noise Survey.

4.1 Baseline Noise Level Survey Details.

A noise survey at the locations of the nearest noise sensitive receptors which have the potential to be affected by the noise emission from the proposed sculptures was completed on Wednesday 12th February 2025.

The noise survey comprised of three attended monitoring locations on site which are described in detail below.

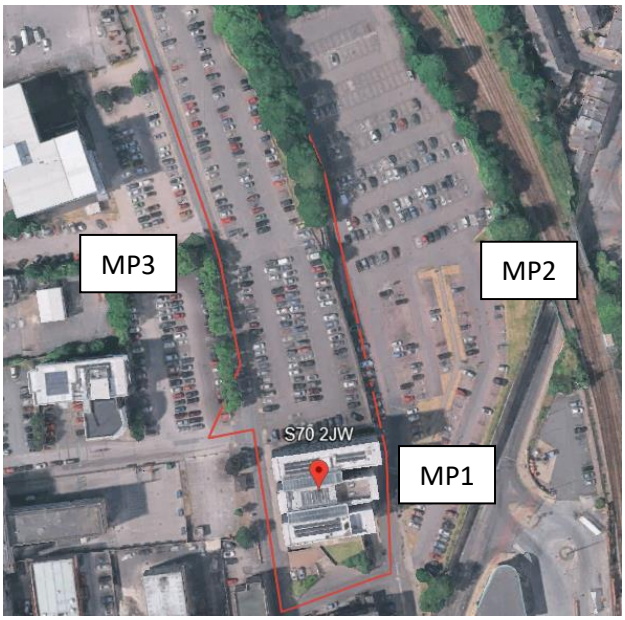

Figure 3. Noise survey locations.

- Southern Boundary (MP1): Attended continuous monitoring position recorded the noise climate affecting the nearest noise sensitive receptor DMC 01 building. The sound level meter was positioned at a height of 1.5 metres above ground level, and 3.5 metres from any reflective surface. The image below shows the noise survey location.

Figure 4. Noise survey location MP1.

- Eastern Boundary (MP1): Attended continuous monitoring position recorded the noise climate affecting the eastern boundary, and the nearest noise sensitive receptor located on Eldon St N. The sound level meter was positioned at a height of 1.5 metres above ground level, and 3.5 metres from any reflective surface. The image below shows the noise survey location.

Figure 5. Noise survey location. MP2

- Western Boundary (MP1): Attended continuous monitoring position recorded the noise climate affecting the noise sensitive receptors Barnsley college, and DMC 02 building. The sound level meter was positioned at a height of 1.5 metres above ground level, and 3.5 metres from any reflective surface. The image below shows the noise survey location.

Figure 6. Noise survey location. MP3

Noise measurements were made with a calibrated precision grade sound level meter which achieves the requirements of BS EN 61672:2013. The survey was carried out in accordance with the principles of BS 7445:1997 Parts 1-3, *Description and Measurement of Environmental Noise.*

4.2 Equipment

- Norsonic 140 precision grade sound level meters. Serial numbers 1407673, and 1407142 .
- Norsonic Sound Calibrator 1251. Serial number 32199.
- Environmental wind shields

The sound level meters were calibrated before and after the survey. No significant drift was noted between the two reference checks.

4.3 Weather

To evaluate the weather conditions four weather check measurements were undertaken on site. During the weather checks, it was noted that the climatic conditions were stable during the whole measurement period. During the visits the sky was cloudy.

Table 2. Weather condition.

	^{o}C	Wind speed m/s	Relative Humidity %	Wind direction
15:00	3	0.5	95	NW
17:00	4	1	98	N
20:00	3	0.9	97	NE

5. Survey Results

The table below includes the results of the noise survey during the hours of operation of the car park (08:00 AM to 18:00 PM). The full set of survey data is included in the Annex.

Table 3. Measured continuous noise level at MP locations(dB)

Start date & time	L_{Aeq} dB	$L_{AFmax\ (fast)}$ dB	L_{A90} dB
MP1			
16:00 to 17:00	58	76	54
20:00 to 21:00	57	75	52
MP2			
16:00 to 17:00	56	65	53
20:00 to 21:00	55	65	52
MP3			
17:05 to 18:05	53	62	49
21:05 to 22:05	51	60	48

Note. The noise climate at each noise survey location is clearly dominated by the noise levels from the adjacent road network, car park, and train noise.

6. Noise assessment of the noise sources.

The noise assessment from the proposed sculptures have been evaluated at the receptors included in section 4.1. (Building DMC 01, residential dwellings on Eldon St N, and DMC 02).

The calculated noise impact from the sculptures is explained in detail within the following sections.

6.1 Noise levels of the sculptures.

The noise emission from each sculpture has been provided by DZA. The sound description is explained by them, below.

Localised Sound: Each rose functions as an independent audio zone with its own dedicated set of 6 speakers. This allows for different audio content to be played at each rose, creating a varied and engaging experience for listeners as they move between them.

Mono Audio: The use of mono audio simplifies the system and ensures a consistent sound experience regardless of the listener's position within each rose. This is a practical choice given the likely close proximity of listeners to the speakers.

No Subwoofers: The absence of subwoofers emphasises mid-range and high-frequency clarity, contributing to the intimate and detailed audio experience. This design choice however necessitates careful consideration of audio content, ensuring it doesn't rely heavily on low-frequency effects for impact.

Centralised Control: Amplifiers and control systems are located at a main control point, simplifying system management and operation. This centralized approach allows for easy adjustment of audio levels and content distribution across all roses.

Infrastructure: Speaker cabling utilises ductwork, streamlining installation and minimizing disruption.

Acoustic Simulation: The use of acoustic simulation data during the design phase is crucial. This will help optimize speaker placement and configuration within each rose, ensuring even coverage and minimising unwanted reflections or acoustic anomalies.

It should be noted that the noise emission from the sculptures includes a Volume Management which can be used to modify the output.

The noise emission extracted from DZA submitted information is included below.

(Intended Use)- Measurements are based on broadband. Peak is 86dB right under the canopy, which is a volume we would never aspire to, and from what I can see, it drops off to about 66dB by the time

you get to the edge of the canopy, so it seems fairly well contained. The central larger structure has the speakers higher, and therefore has a bit of a wider spread in terms of coverage.

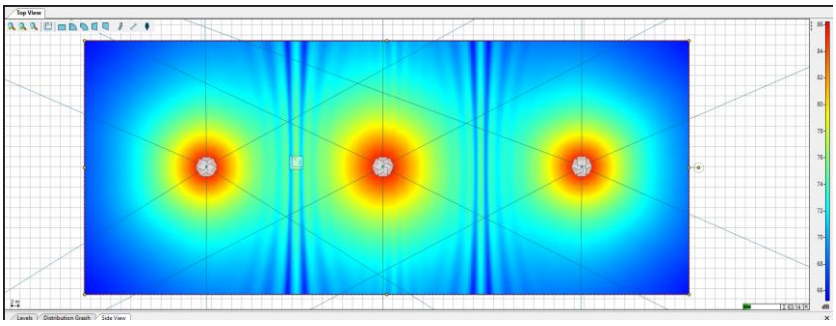

Figure 7. Noise levels information.

6.2 Sculptures description.

The location of each sculpture is shown in the image below.

Figure 8. Sculptures location.

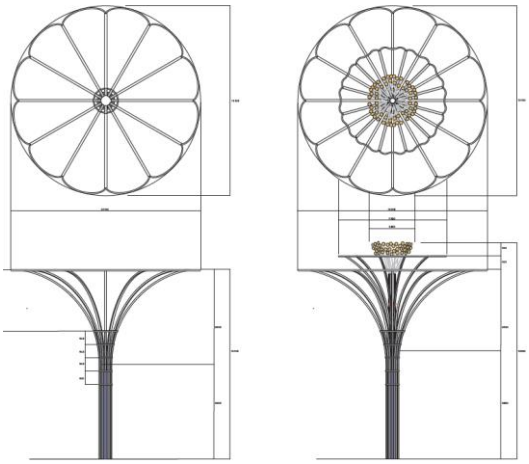

Figure 9. Sculptures elevation.

The central sculpture has a height of 15 metres, and the side sculptures 12 metres.

6.3 Noise Impact calculation.

The calculated noise emission from the sculptures has been executed based on the methodology recommended by ISO 9613 Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation was used. This ISO standard is incorporated in the SoundPLAN v 9.1 software. This software was used to generate outdoor sound levels from the Plant units to the nearest noise sensitive receptors and to produce noise contour maps.

The noise emission from the sculptures is restricted to 5-10 minutes between 16:00 to 22:00. Therefore, the noise emission is corrected for 10 minutes period every each hour between 16:00 to 22:00 hours according to the following equation.

The total on time (10 minutes) during a reference period (1 hr)

10*log (600 seconds/3600 seconds) = - 8.

Therefore, the 66 dBA at the edge of the canopy is corrected for on time operation during an hour period as follow 66 dBA – 8 = 58 dBA.

Based on the above methodology, the 58 dBA at the edge of the canopy is used to complete the noise impact assessment.

The table below includes the calculated noise emission of the three sculptures operating at the same time compared against the representative lowest measured noise climate.

Table 3. Calculated noise levels.

Receptor	Calculated $L_{Aeq, 1hr}$	Pre-existing lowest measured L_{Aeq} dB	Difference between calculated and Pre-existing L_{Aeq}
R1	49	57	-8
R2	38	55	-17
R3	34	51	-17

As can be seen from the above table the calculated noise levels are below the pre-existing noise climate at each noise sensitive receptor, which is clear evidence that the noise impact from the proposed sculptures is negligible.

The calculated noise levels are also below the criteria recommended by the WHO, and BS8233 as follow:

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T

7. Conclusion

The calculated noise levels of the proposed sculptures are below the pre-existing noise climate representative of the most affected noise sensitive receptors, and below the levels recommended by BS8233:2014, and WHO.

Finally, the overall noise impact of the proposed sculptures complies with the aims of the Noise policy statement for England as the noise emission from the proposal will not increase significantly the noise levels at the nearest noise sensitive receptors.

8 Annexes:

The figure below shows the full noise calculations at each receptor.

Source	Source type	Lw dB(A)	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	dLrefl dB(A)	Lr dB(A)
R1									
Sculpture noise levels 1 of 3	Point	81	65.24	-47.3	2.9	0	-0.6	2.5	38
Sculpture noise levels 2 of 3	Point	81	28.71	-40.2	2.6	0	-0.3	2.3	45
Sculpture noise levels 3 of 3	Point	81	28.84	-40.2	2.6	0	-0.3	3	46
R2									
Sculpture noise levels 1 of 3	Point	81	82.83	-49.4	2.9	0	-0.7	2.4	36
Sculpture noise levels 2 of 3	Point	81	123.31	-52.8	3	0	-1	2.5	32
Sculpture noise levels 3 of 3	Point	81	156.6	-54.9	3	0	-1.2	2.5	30
R3									
Sculpture noise levels 1 of 3	Point	81	124.88	-52.9	3	0	-1	4.5	34
Sculpture noise levels 2 of 3	Point	81	119.21	-52.5	3	-12.8	-0.2	0.6	19
Sculpture noise levels 3 of 3	Point	81	132.01	-53.4	3	-17.7	-0.3	1.1	13

Legend

Source		Source name
Source type		Type of source (point, line, area)
Lw	dB(A)	Sound power level per unit
S	m	Distance source - receiver
Adiv	dB	Mean attenuation due to geometrical spreading
Agr	dB	Mean attenuation due to ground effect
Abar	dB	Mean attenuation due to screening
Aatm	dB	Mean attenuation due to air absorption
dLrefl	dB(A)	Level increase due to reflections
Lr	dB(A)	Assessed level of time slice

The figure below includes the noise map of the study area at a height of 1.5m.