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To whom it may concern,

15538: 11 ROSSLYN HILL, LONDON, NW3 5UL

1. AIMS & OBJECTIVES

To undertake a review of the overall scenario in terms of proposed works at 11 Rosslyn Hill, London, NW3 5UL against the noise and vibration which are anticipated to be generated by site works, and propose a reasonable control strategy in order to ensure that the operations of Air Studios are unimpeded, while fully satisfying the Conditions by Camden Council. The new conditions are the same as Camden Council's Environmental Health officer originally suggested in July 2016, and would provide the optimum sound protection against the different types of noise that $L_{A,Max}$ and NR measure. The conditions are the following:

Condition 1

Prior to commencement of the development, a noise assessment shall be submitted to the Council detailing proposed construction site noise levels and proposed site sound acoustic screening that will meet the following studio internal noise limit of 25dB $L_{Amax,s}$

Reason: *To ensure that the amenity of occupiers of the surrounding premises is not adversely affected by noise from plant/mechanical installations/ equipment.*

Condition 2

Construction noise break-in from the development shall achieve an internal noise level of NR15 in any recording studio room of the adjacent premises. These levels are to be permanently maintained during the construction period.

Reason: *To ensure that the amenity of occupiers of the surrounding premises is not adversely affected by noise from plant/mechanical installations/ equipment.*

It is inferred from all correspondence, that Air Studios would be satisfied with the above limits imposed by Camden Council.

2. PROFESSIONAL EXPERTISE

2.1 My name is Kyriakos Papanagiotou. I hold a 1st Class Hons. in Electroacoustics from the University of Salford in Manchester. This led to a MSc in Sound and Vibration and a PhD in Digital Signal Processing for Acoustics, from the Institute of Sound and Vibration Research from the University of Southampton.

2.2 I have been working as an acoustic consultant since 2003. My professional career has allowed me to be a member of Alan Saunders Associates, now Clarke Saunders Associates, in the UK, and since 2007, a founder and director of my own practice.

2.3 My main specialisation is on building acoustics, psychoacoustics and telemetry of noise and vibration.

3. THE MEASUREMENT OF NOISE

3.1 Acoustic Terms

The sound pressure level of a noise is commonly expressed in terms of the A-Weighted Sound Pressure Level in Decibels, expressed as dB(A). A Weighting reflects the ear's frequency response to sound and therefore provides values which have some relation to how people subjectively experience noise.

The annoyance produced by noise is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and any variations in its level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

dB (A):	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.
L_{10} & L_{90}:	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the `average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise, as being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic noise.
L_{eq}:	The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise. L_{eq} is defined as a notional steady sound level which, over a stated period of time,

	would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc). The use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward. Because L_{eq} is effectively a summation of a number of noise events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute noise limit.
L_{max} :	L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Table 3.1: Acoustic Terms

3.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation have agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

Octave Band Centre Frequency, Hz	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz

Table 3.2: Octave band centre frequencies

3.3 Human Perception of Broadband Noise

Due to the logarithmic nature of the decibel scale, it should be borne in mind that noise levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) is not twice as loud as 50 dB(A) sound level. It has been found experimentally that changes in the average level of fluctuating sound, such as traffic noise, need to be of the order of 3 dB(A) before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10 dB(A) is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in traffic noise level can be given.

Change in Sound Level dB(A)	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

Table 3.3: Subjective impressions of change in noise level

The equivalent continuous sound level (L_{Aeq}) is, as its name implies, the level of a notional steady sound which, at a given position and over a defined period of time, would have the same A-weighted acoustic energy as the actual fluctuating noise. L_{Aeq} can be determined over various periods and the relevant period should be stated.

A range of example noise levels to relate to would be:

- 25-30dB(A) – recording studio
- 30-35dB(A) – quiet residential environment
- 40dB(A) – quiet library
- 45dB(A) – fridge at 1m
- 40-50dB(A) – ambient noise level in a quiet commercial space
- 55dB(A) – microwave at 1m
- 60dB(A) – normal conversation
- 75dB(A) – vacuum cleaner at 1m
- 85dB(A) – smoke alarm at 1m

The information content of noise can profoundly influence how it is perceived, and it turn, how much it may disrupt the listener. If a noise is intermittent, or unexpected, such as drilling or hammering, in what would normally be a quiet environment, it would result in being more disrputive than if it were heard by the side of a busy road, even though the noise level is the same.

In addition, if these noises are an ongoing source of annoyance, people can become hypersensitive to the source, and so will find it more annoying than a person who has not heard the noise before.

3.4 Planning requirements for noise

Local Authorities recognise the need for development and change within their boundaries and so allow relaxation in noise levels compared to the typical noise climate in an area during demolition and construction works. However, through the planning process and environmental health departments, they seek to minimise disturbance to residents. This is carried out in a case by case approach, as there are many different factors to be considered to minimise impact on the receivers. In some situations, such as where there is a particularly noise sensitive use in the vicinity, a contractor may need to go over and above standard requirements to minimise disturbance.

- London Borough of Camden Council's 'Guide for Contractors Working in Camden' which refers to British Standard BS-5228-1:2009 will be used as the primary document for noise and vibration matters during the construction process.
- The Party Wall etc Act 1996 requires works to be carried out with reasonable skill and care, with considered methods of working against unreasonable inconvenience with reasonable endeavour.
- BS 5228: Part 1: 2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise provides three different protocols for setting limits from construction noise.

3.5 British Standards relevant to Noise

BS8233: 2014 *Guidance on sound insulation and noise reduction for buildings* provides suitable internal ambient noise levels for different uses within buildings. It does provide guidance for noise levels for a range of spaces, although it is important to note that the guideline noise levels are for steady sources, such as road traffic or continuously running plant. Table 3.4 is an excerpt from BS8233 showing suitable internal noise levels in a range of spaces.

Activity	Location	Design Range dB $L_{Aeq,T}$
Speech or telephone communications	Department store Cafeteria, canteen, kitchen	50 - 55
	Concourse Corridor, circulation space	45 - 55
Study and work requiring concentration	Library, Gallery, museum	40 – 50
	Staff/meeting room, training room	35 – 45
	Executive office	35 - 40
Listening	Place of worship, counselling, meditation, relaxation	30 - 35

Table 3.4: Typical noise levels in non-domestic buildings (BS8233: 2014, Table 6).

Identifiable noise sources, such as hammering, drilling, etc. are more intrusive at lower noise levels. This is due to their unpredictable, intermittent and unusual nature in comparison to the normal noise climate for a space. This unpredictable nature can result in people becoming even more aware of them, even at low noise levels, as they wait for the next event, rather than habituating to the noise, as they would do for a constant noise source such as road noise.

3.6 Current target for noise

Based on all recent developments, it is inferred that Air Studios have agreed to Conditions 1 and 2, as shown in Section 1 and below:

Condition 1

Prior to commencement of the development, a noise assessment shall be submitted to the Council detailing proposed construction site noise levels and proposed site sound acoustic screening that will meet the following studio internal noise limit of 25dB LAmax,s

Condition 2

Construction noise break-in from the development shall achieve an internal noise level of NR15 in any recording studio room of the adjacent premises. These levels are to be permanently maintained during the construction period.

As demonstrated in Section 5, we are confident that the above conditions can be met during the construction period.

4. THE MEASUREMENT OF VIBRATION

4.1 Structure-borne Noise

Although not directly related to this scenario, it would be useful to provide a short description of how vibration from an Underground train, or in a broader sense a vibration generating source within the ground, is translated into noise within a building.

Generally with underground train lines, the most commonly experienced noise within a building is what is called 'groundborne noise'. This is vibration in the building structure from the trains, generated at the interface between the train wheels and the track. This vibration is not generally perceptible as tactile vibration to the occupants, but causes small movements in floors and walls, such that they radiate airborne noise into the space. In simple terms, this is why underground trains can be heard in buildings, when the occupants are not aware of any actual vibration. These vibrations represent the normal manner in which airborne sound passes through a wall or window and is heard inside the building.

It should be stressed that the very small movements required for noise re-radiation cannot be felt or seen. Neither are they of any significance to the structural integrity, being many orders of magnitude below even minor vibration damage criteria.

Whilst train vibration levels usually have frequencies of up to about 50-60Hz, the groundborne noise when manifested by the building structure are usually at higher frequencies, of up to about 125Hz. Generally the passage of trains is perceived as a low frequency 'rumble'. These levels of noise vary with soil type; foundation type; building structure; floor level under consideration etc.

4.2 Current Condition on Vibration

Based on all recent developments, it is understood that Camden Council's requirement related to construction vibration is the following:

"Prior to commencement of the development, details shall be submitted to and approved in writing by the Council, of building site vibration levels generated by the demolition/construction etc. together with appropriate mitigation measures where necessary. The vibration criteria to normally be met are: Vibration for occupiers 0.5mm.s-1 and Structural vibration 3.0 mm.s- within the nearest vibration sensitive premises unless otherwise agreed with the Council in advance. The assessment method shall be as specified in BS 6472:2008. No part of the development shall commence until the approved details have been agreed. Approved details shall

thereafter be permanently retained during the construction period unless otherwise agreed with the Council in advance."

5. IN-SITU ASSESSMENT OF NOISE & VIBRATION

In order to demonstrate that the current operations will not have an impact on the operation of Air Studios, an in-situ exercise of flight auger piling has been undertaken. This was conducted on 3rd March 2017 at City North, Islington.

Noise and vibration measurements of typical site operations were undertaken 'at source' and vibration amplitudes have been predicted at the façade of the Air Studios main Hall.

The equipment calibration was verified before and after use. The equipment used was as follows:

- 1 No. Svantek Type 958A Class 1 Sound Level Meter
- 1 No. PCB Piezotronics Tri-axial accelerometer, Model 356B18
- B&K Type 4231 Class 1 Calibrator

5.1 Guidance for propagation and attenuation characteristics of various ground vibrations

Since no British Standard provide any guidance on ground vibration propagation from other sources than pilling, compacting or blasting, prediction of Peak Particle Velocity (PPV) vibration amplitudes has been based on vibration propagation equations presented in Acoustic Standards *Woods RD, Jedele LP. Energy attenuation relationships from construction vibrations. Vibration Problems in Geotechnical Engineering. ASCE Convention in Detroit, Michigan, 1985.*

Theory

Ground vibration caused by machinery operating on the ground surface diminishes with distance from the source. This attenuation is due to two factors: expansion of the wavefront (geometrical attenuation) and dissipation of energy within the soil itself (material damping).

The modelling of the equation for the propagation of ground vibration from point "*a*" (at distance r_a from the source) to point "*b*" (at distance r_b from the source) may be stated as follows:

$$V_b = V_a \left(\frac{r_a}{r_b}\right)^{\Upsilon} e^{\alpha(r_a - r_b)}$$

where:

Υ is a coefficient dependent upon the type of propagation mechanism

α a material damping coefficient

V_a is the measured vibration amplitude

V_b is the resulting vibration amplitude at point b

In this instance, Υ would have a value of 0.5 for vibration point source and Rayleigh (surface) waves propagation. Based on the Basement Impact Assessment report prepared by Alan Baxter in March 2015, α has been given a value of 0.3.

5.2 Prediction of vibration levels due to flight auger piling

Taking into consideration the measuring distance of 1.5m for the vibration source, a distance of approximately 1m from the source to the façade of the main hall and the aforementioned equation, calculations have been conducted using the worst-case scenario of the PPV values from operations.

The vibration results at the receiver (Air Studios) are shown in Tables 5.1 to 5.3.

	Type of Operation: Drilling and Positioning		
	X-Axis	Y-Axis	Z-Axis
Measured PPV at 1.5m from source (mm/s)	0.7	0.9	0.8
Predicted PPV at main Hall of Air Studios (mm/s)	0.9	1.1	1.0

Table 5.1 Measured PPV near source and predicted PPV at receiver from preliminary drilling & positioning of the flight auger kit

	Type of Operation: Drilling		
	X-Axis	Y-Axis	Z-Axis
Measured PPV at 1.5m from source (mm/s)	0.8	1.1	1.0
Predicted PPV at main Hall of Air Studios (mm/s)	1.1	1.4	1.3

Table 5.2 Measured PPV near source and predicted PPV at receiver from drilling operations

	Type of Operation: Concrete filling		
	X-Axis	Y-Axis	Z-Axis
Measured PPV at 1.5m from source (mm/s)	1.3	1.7	1.8
Predicted PPV at main Hall of Air Studios (mm/s)	1.7	2.2	2.4

Table 5.3 Measured PPV near source and predicted PPV at receiver from concrete filling

As shown in Tables 5.1 - 5.3 predicted PPV values of continuous vibration at the façade of Air Studios main Hall due to flight auger piling are below Camden Council's set criterion. This conclusion is based on the aforementioned empirical measurements from similar site operations in another London-based construction site (City North, Islington).

It is anticipated that no hard ground would be present during site operations. Should, however, this be encountered it would be picked up immediately by site operatives, as well as any vibration monitoring sensors installed on site. Piling operations would stop instantly until any active Studio sessions have finished, after which they would be resumed with specific procedures to ensure no additional vibration is generated.

5.3 Prediction of noise levels due to flight auger piling

During the same exercise, manual noise measurements were also undertaken in order gain a realistic appreciation of actual noise levels generated by flight auger piling. These are shown below:

	L_{eq} dB(A)	L_{max} dB(A)
Drilling and Positioning	77.3	87.7
Drilling	74.9	84.6
Concrete filling	83.8	89.6

Table 5.4 Measured noise levels L_{eq} and L_{max} at 1.5m from flight auger operations

The data shown above is acquired from a similar site (City North, Islington) with the same flight auger operations that are proposed at Rosslyn Hill. As seen in Table 5.4, the operation with the highest amplitude appears to be concrete filling. This however is the noise level for a short period of time and is not continuous. These operations shown in Table 5.4. would not be expected to run continuously at Rosslyn Hill.

5.4 Prediction of noise levels due to other site operations

Section 5.3 dealt with the prediction of noise from the flight auger piling operations. Other activities will also accompany site works, so a pragmatic model has been generated in order to encompass most of these site operations. Detailed predictions are shown in Appendix A, where cumulative noise levels during a typical day are shown.

5.5 Proposal of localised noise control measures

From a careful review of all correspondence up to date, it is understood that all spaces of Air Studios are acoustically isolated by means of proprietary acoustic design. The primary concern, however, is related to the main Hall which is not isolated.

During a recent site visit, it was observed that all windows of the main Hall facing onto the proposed area of site works, entail sealed units. Specific technical details are unknown, however from a careful observation one can notice that the glazed units encase the total area of the window arches on sealed frames, while the glazed panes are comprised of a minimum of a 10mm glass.

This system, in conjunction with the primary windows, would be anticipated to provide an in-situ sound reduction in excess of 45dB.

In order to ensure full compliance with Camden Council's target of NR15, i.e. 25dB(A) internally, we would recommend the erection of a temporary screen which would completely block line of sight to the flight augering and other site operations. This would provide a minimum of 10-12dB attenuation to all site operations, as it would be installed immediately adjacent to them.

The combined effect of Air Studios' current glazing configuration, in parallel with our proposed acoustic screen would ensure that any noise break-in elements are well within the set target.

Moreover, it is understood that discussions related to a criterion of NR25, L_{Amax} have taken place. The above mitigation strategy would also ensure that L_{max} noise levels are controlled well within this target.

6. BEST PRACTICABLE MEANS (BPM)

Best Practicable Means is defined under Section 72 of the Control of Pollution Act 1974. "Practicable" means reasonably practicable considering amongst other things:

- Local conditions and circumstances
- Current state of technical knowledge
- Financial implications.

The project will always be working to best practicable means in all activities, methodologies and choice of plant to mitigate noise from construction.

This section defines both the general approach and specific measures to be taken by the contractor in identifying and adopting BPM. The following order of priority shall be considered as the general principle for following best practicable means:

- Control at source, selecting quiet and low vibration emitting equipment (such as the flight auger piling method) and choosing suitable location of plant within the site
- Screening either by site perimeter, site welfare offices or specific hoarding or enclosure, as discussed in the previous section

A list of BPM measures being applied to this site is given below:

- Each item of plant used will be carefully selected to comply with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701.
- Consideration will be given to the recommendations set out in Annex B of Part 1 of BS 5228 noise sources, remedies and their effectiveness;
- Consideration will be given to the recommendations set out in Section 8 of Part 2 of BS 5228 control of vibration;
- Equipment will be well-maintained and where possible will be used in the mode of operation that minimises noise;
- Plant and equipment will be shut down whenever they are not in use;
- Mobile construction plant will be located, as far as is reasonably practicable, away from adjacent occupied buildings or as close as possible to noise barriers or site hoardings to provide additional screening from sensitive noise receptors;
- Materials will be handled in a manner that minimises
- All site personnel will be instructed on BPM measures to reduce noise and vibration as part of their induction training;
- Site layout will be designed to minimise the need for reversing

- Only designated lorry routes will be used, in normal working hours whenever possible
- Vehicles will not wait or queue on the public highway with engines running
- Reversing alarms will incorporate one of the following features where practicable: directional sounders, broadband signals, self-adjusting sounders, flashing warning lights. Alternative comparable systems may be used
- Active co-operation with the users of Air Studios will be undertaken to provide respite during their particularly sensitive activities

Dated 16 March 2017

Signed: [redacted]

Kyriakos Papanagiotou,
B.Eng MSc PhD MIOA,
Director
KP Acoustics

APPENDIX A

11 ROSSLYN HILL, LONDON

BS5228 CALCULATIONS OF SITE ACTIVITY NOISE

Source: Demolition/Construction Site	*Frequency, Hz*								
Receiver: Nearest Noise Sensitive façade	***63***	***125***	***250***	***500***	***1k***	***2k***	***4k***	***8k***	***dB(A)***
5.0 Site set-up/soft strip : Typical day									
Handheld crowbar (SPL@10m)	66	66	68	68	63	67	55	51	
Distance correction (min. 2m)	14	14	14	14	14	14	14	14	
Correction due to on- time (5hr per day)	-3	-3	-3	-3	-3	-3	-3	-3	
Attenuation provided by screening	-12	-12	-12	-12	-12	-12	-12	-12	
Total	***65***	***65***	***67***	***67***	***62***	***66***	***54***	***50***	**70**
Delivery vehicle with lifting arm - DAF CF65 FA CF 65.220 Crane Vehicle (SPL@10m)	83	77	70	70	70	68	64	58	
Correction due to on- time (30 minutes per day)	-13	-13	-13	-13	-13	-13	-13	-13	
Total	***70***	***64***	***57***	***57***	***57***	***55***	***51***	***45***	**62**
Diesel generator (SPL@10m)	64	67	68	65	58	54	49	42	
Correction due to on- time (10hr per day)	0	0	0	0	0	0	0	0	
Attenuation provided by screening	-12	-12	-12	-12	-12	-12	-12	-12	
Total	***52***	***55***	***56***	***53***	***46***	***42***	***37***	***30***	**54**
Predicted Daily Airborne Noise Level, dB $L_{Aeq,10h}$ at the nearest sensitive façade	**71**	**68**	**68**	**68**	**63**	**66**	**56**	**51**	**70**
5.1 Demolition: Typical day									
Mini digger removing ground - Kyboto U10-3 0.75 tonne digger (SPL@10m)	76	74	68	70	65	63	59	55	
Distance correction (min. 2m)	14	14	14	14	14	14	14	14	
Correction due to on- time (4hr per day)	-4	-4	-4	-4	-4	-4	-4	-4	
Attenuation provided by screening	-12	-12	-12	-12	-12	-12	-12	-12	
Total	***74***	***72***	***66***	***68***	***63***	***61***	***57***	***53***	**69**
Conveyor to remove spoil - Easikit Conveyor EK300 (SPL@10m)	78	76	62	63	60	59	58	49	
Distance correction (min. 2m)	4	4	4	4	4	4	4	4	
Correction due to on- time (6hr per day)	-2	-2	-2	-2	-2	-2	-2	-2	
Attenuation provided by screening	-12	-12	-12	-12	-12	-12	-12	-12	
Total	***68***	***66***	***52***	***53***	***50***	***49***	***48***	***39***	**57**
Grab truck to empty skip - DAF CF 410 FAD Grab truck (SPL@10m)	82	84	77	74	70	65	59	55	
Correction due to on- time (20 minutes per day)	-15	-15	-15	-15	-15	-15	-15	-15	
Total	***67***	***69***	***62***	***59***	***55***	***50***	***44***	***40***	**61**
Predicted Daily Airborne Noise Level, dB $L_{Aeq,10h}$ at the nearest sensitive façade	**76**	**74**	**68**	**69**	**64**	**62**	**58**	**53**	**70**
5.2 Ground Level Reduction: Typical day									
Same as Section 5.1									**70**
5.3 Basement excavations: Typical day									
Mini digger removing ground - Kyboto U10-3 0.75 tonne digger (SPL@10m)	76	74	68	70	65	63	59	55	
Distance correction (min. 3m)	10	10	10	10	10	10	10	10	
Correction due to on- time (4hr per day)	-4	-4	-4	-4	-4	-4	-4	-4	
Attenuation provided by screening	-12	-12	-12	-12	-12	-12	-12	-12	
Total	***70***	***68***	***62***	***64***	***59***	***57***	***53***	***49***	**65**
Roller (SPL@10m)	85	70	62	62	61	59	53	45	
Correction due to on- time (5hr per day)	-3	-3	-3	-3	-3	-3	-3	-3	
Total	***82***	***67***	***59***	***59***	***58***	***56***	***50***	***42***	**64**
Predicted Daily Airborne Noise Level, dB $L_{Aeq,10h}$ at the nearest sensitive façade	**82**	**71**	**64**	**65**	**62**	**60**	**55**	**50**	**68**
5.4 Installation of pile mat: Typical day									
Same as Section 5.3									**68**
5.5 Existing foundations grubbed out, and backfilled: Typical day									
Same as Section 5.3									**68**

5.6 Piles reduced and reinforced concrete retaining wall and capping beam constructed: Typical day									
Cutting steel reinforcement - 9" grinder, handheld: Makita GA9050/1 (SPL@10m)	72	72	69	72	73	72	71	71	
Distance correction (min. 2m)	14	14	14	14	14	14	14	14	
Correction due to on- time (1hr per day)	-10	-10	-10	-10	-10	-10	-10	-10	
Attenuation provided by screening	-12	-12	-12	-12	-12	-12	-12	-12	
Total	***64***	***64***	***61***	***64***	***65***	***64***	***63***	***63***	**70**
Predicted Daily Airborne Noise Level, dB $L_{Aeq,10h}$ at the nearest sensitive façade	**64**	**64**	**61**	**64**	**65**	**64**	**63**	**63**	**70**
5.7 Full cross propping provided. Excavation progressed to basement level: Typical day									
Crane to remove props (SPL@10m)	60	67	60	61	62	61	50	40	
Distance correction (min. 3m)	10	10	10	10	10	10	10	10	
Correction due to on- time (1hr per day)	-10	-10	-10	-10	-10	-10	-10	-10	
Total	***60***	***67***	***60***	***61***	***62***	***61***	***50***	***40***	**66**
Predicted Daily Airborne Noise Level, dB $L_{Aeq,10h}$ at the nearest sensitive façade	**60**	**67**	**60**	**61**	**62**	**61**	**50**	**40**	**66**
5.8 Formwork for Ground Floor constructed. Ground floor slabs cast: Typical day									
Crane to remove props (SPL@10m)	60	67	60	61	62	61	50	40	
Distance correction (min. 3m)	10	10	10	10	10	10	10	10	
Correction due to on- time (1hr per day)	-10	-10	-10	-10	-10	-10	-10	-10	
Total	***60***	***67***	***60***	***61***	***62***	***61***	***50***	***40***	**66**
Concrete delivery - 8 wheel ready mix concrete truck Volvo FMX420 8x4 Concrete Mixer (SPL@10m)	75	76	71	70	71	68	64	60	
Correction due to on- time (1.75hr per day)	-8	-8	-8	-8	-8	-8	-8	-8	
Total	***67***	***68***	***63***	***62***	***63***	***60***	***56***	***52***	**67**
Predicted Daily Airborne Noise Level, dB $L_{Aeq,10h}$ at the nearest sensitive façade	**68**	**71**	**65**	**65**	**66**	**64**	**57**	**52**	**70**