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Project:

1 Norfolk Road

Title:

Plant Noise Impact Assessment

quietly moving forward

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Revision	Date	Author	Checked
0			

CONTENTS:

1 INTRODUCTION

1.01 Environmental Equipment Corporation Ltd has been commissioned by Edward Pearce LLP to undertake a noise assessment of new mechanical services, heating, and ventilation plant to serve a proposed residential house at 1 Norfolk Road, London, NWX 6AX.

1.02 This noise assessment has been conducted in accordance with the policies and requirements of The London Borough of Camden Council (LBCC) and is based on a noise survey carried out at the site over a typical weekday period.

1.03 This assessment includes:

- the setting of plant noise limits in accordance with the requirements of LBCC and national planning policy, standards and guidance; and
- the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.

1.04 This report is prepared solely for Edward Pearce LLP. Environmental Equipment Corporation Ltd accepts no responsibility for its use by any third party.

1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

2.01 This application is for a proposed residential house at 1 Norfolk Road and the associated mechanical services, heating, and ventilation plant. The site is located in a residential area of London.

2.02 At present, 1 Norfolk Road is a detached two-storey residential house. The property is bound by the following:

- North – gardens of adjacent residential properties of Queen's Grove;
- East – a residential property of 1a Norfolk Road;
- South – Norfolk Road and residential properties beyond; and
- West – a residential property of 2 Norfolk Road.

The approximate boundaries of the site are indicated in Appendix B.

2.03 The proposed items of plant are to be housed in a dedicated basement-level plant room located towards the front of the planned house. The plant room is to be served by fresh air intake and exhaust ducts terminating in two separate light wells located in front of the house, as indicated in Appendix B. Some ancillary items of plant will be located in various locations around the house.

2.04 The closest noise sensitive receptor to the proposed plant is the first-floor front window of 2 Norfolk Road, within the line of sight to the front area of the planned 1 Norfolk Road building where the main plant room's duct terminations are to be located. The location of this window is indicated in Appendix B.

2.05 All other noise sensitive receptors are at a greater distance from the proposed location of the units, or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

3 GUIDANCE

3.01 Guidance on noise management, control and rating pertinent to this application is provided by the planning policy for LBCC, National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE), World Health Organisation (WHO) Night Noise Guidelines for Europe, and British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS4142:2014). The relevant parts of these documents are presented in Appendix C.

3.02 Typically Camden Council require that noise from new mechanical services is designed to a level of between 5 and 10 dB below the existing L_{A90} noise level, as assessed outside of any noise sensitive facades.

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekday period, between approximately 1105 hours on Wednesday 13th May 2015 and 1100 hours on Thursday 14th May 2015, to establish the existing noise levels at the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the following location, as shown in Appendix B and described as:

- Position 1: located at a height of approximately 1.5 metres above the ground, approximately 1.5 metres from the front facade of the existing 1 Norfolk Road building. The measurement was not located within 3.5 metres of any other reflecting surface.

4.03 This location is considered to be representative of the nearest noise sensitive location described in Section 2.03.

4.04 The weather conditions were suitable for outdoor noise measurement, it being dry with little wind and a limited cloud cover for the majority of the survey's duration. The weather conditions changed in the morning hours of the second day of the survey to be overcast with rain. However, the occurrence of this rainfall is not considered to have affected the parameters and periods relevant to the outcomes of this assessment.

4.05 The predominant noise source at the site was local and distant noise traffic. No other significant sources of noise were identified during the survey.

5 EQUIPMENT

5.01 Equipment for the survey was as follows:-

- Brüel & Kjær type 2250 Light Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994.
- Brüel & Kjær Condenser Microphone type 4950;
- Brüel & Kjær Outdoor Microphone, type 4952/UA1679;
- Tripod.

5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter B&K2250L	Serial No.	2766725
	Calibration Date	25th June 2013
	Cal Certificate No.	01356/4
Outdoor ½" Condenser Mic. B&K 4952	Serial No.	2742570
	Calibration Date	25th June 2013
	Cal Certificate No.	01356/4
Calibrator B&K4231	Serial No.	2389051
	Calibration Date	27th August 2014
	Cal. Certificate No.	01968/1

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

6.01 A list of the levels measured is included in Appendix D and represented graphically in Appendix E. The data are presented with a -3 dB correction, applied to the measured levels to compensate for the reflections from the closest wall and to represent free field measurement conditions.

6.02 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods is shown in Table 6.1. The minimum L_{A90} is the lowest five minute measurement in the specified period.

Location	Period	Average $L_{Aeq,T}$ (dB)	Minimum $L_{A90,5min}$ (dB)
Position 1	Day time (0700-1900 hrs, T = 12 hrs)	49	36
	Evening (1900-2300 hrs, T = 4 hrs)	46	34
	Night time (2300-0700 hrs, T = 8 hrs)	45	28

Table 6.1: Measured ambient and lowest background noise levels. The levels are corrected to eliminate the influence of wall reflections and represent free field conditions (-3 dB with respect to the measured levels).

7 PLANT ASSESSMENT

7.01 This application is for the installation of a new mechanical services, heating, and ventilation plant to serve a proposed house at 1 Norfolk Road. It is understood that the plant will consist of the following items:

A) 1 No. air conditioning (AC) condenser – Daikin RYYQ20T;

B) 1 No. heat recovery ventilation unit (HRVU) – Thermal Technology Recupovent 4007; and

C) Ancillary plant.

7.02 The above items of plant have the following manufacturer's stated noise levels:

A) Daikin RYYQ20T – sound power level 88 dB(A).

B) Thermal Technology Recupovent 4006 – sound power level 74 dB(A) (in-duct per fan).

7.03 The results of the noise measurements were used to establish the noise rating limits for the proposed plant. Following the recommendations of LBCC, it is proposed that the noise at 1 metre from the closest residential windows should not exceed 5 dB below the lowest measured L_{A90} in all periods of plant operation, as shown in Table 7.1 below. Note that the suggested limits are rating levels, and so considerations have been given to the acoustic characteristics of the plant, as outlined in Appendix C. In this instance the proposed units are understood to display none of the characteristics whereby a more stringent criterion of 10 dB below the lowest measured L_{A90} should be applied.

7.04 With respect to the NPPF, setting the rating level to 5 dB below the existing L_{A90} background level should result in the noise tending to the NOEL (No Observed Effect Level) in all periods of plant operation. Furthermore, according to WHO Night Noise Guidelines for Europe, setting the night-time noise limit below 30 dB(A) will result in the noise being below the NOEL during this period.

Position	Period	Lowest Measured $L_{A90,5min}$ (dB)	Proposed Noise Limit L_{Ar} (dB)
1	Day time (0700-1900 hrs)	36	31
	Evening (1900-2300 hrs)	34	29
	Night time (2300-0700 hrs)	28	23

Table 7.1: Proposed plant noise emission limits at the closest residential receptors based on lowest measured $L_{A90,5min}$, free-field.

7.05 Predicted noise levels have been calculated at the worst affected noise sensitive residential windows, which are the front first floor windows of 2 Norfolk Road.

7.06 Other residential receptors will be subject to lower noise levels than those predicted at the above locations.

7.07 Tables 7.2-7.5 below present the worst-case plant noise predictions for the worst affected noise sensitive residential windows. The calculations are for plant items A and B listed in Section 7.01 (AC condenser and HRVU), which will be the predominant sources of noise at the assessment location.

7.08 To ensure the required noise limits are met, a noise control scheme has been designed by EEC Ltd. The design includes a set of high-performance fresh air inlet and exhaust attenuators, providing between 21 dB and 28 dB of broadband noise attenuation. The design has taken account of airflow and pressure requirements to ensure the efficiency of the units is maintained.

7.09 It can be seen that assuming a noise control scheme achieving the attenuation stated above, the predicted noise levels will meet the adopted criteria during all periods of plant operation.

7.10 To ensure that the cumulative noise is below the required limits, the noise from the ancillary items of plant will be controlled not to exceed 19 dB(A) at the assessment location, which will increase the plant noise levels predicted in Table 7.5 to a maximum of 23 dB(A).

Item	Level	Notes
Daikin RYYQ20T – fan **inlet** and case radiated noise (**reverberant**)	**70 dB(A)**	Reverberant sound pressure level in the plant room (includes -5 dB with respect to the total sound power level due to power split and coil losses). Assumes acoustic lining on walls and a concrete floor and ceiling.
Reverberant to direct sound transition	-6 dB	Transition between the plant room and atmosphere
Distance losses over 17 metres (Rathes method)	-32 dB	Distance to worst affected residential window (facing louvre dimensions 1.7 m × 1.0 m)
Reflections	+6 dB	Additional reflections from facade and ground surfaces
EEC noise control scheme	-22 dB	High performance fresh air inlet acoustic attenuator and associated ductwork
Total noise level	**16 dB(A)**	Worst affected residential window
Daikin RYYQ20T – fan **outlet** noise	**85 dB(A)**	Sound power level at fan outlet (-3 dB with respect to the total sound power level due to power split)
EEC noise control scheme	-28 dB	High performance acoustic attenuator on the discharge side of fan and associated ductwork
Distance losses over 14 metres (point source)	-34 dB	Distance to worst affected residential windows
Directivity correction	-5 dB	Loss due to directivity of radiation (-90° off-axis angle)
Total noise level	**18 dB(A)**	Worst affected residential window
Cumulative noise level	**20 dB(A)**	Total noise level at the worst affected residential window

Table 7.2: Worst-case AC condenser noise calculation for the worst affected residential window.

Item	Level	Notes
Recupovent 4007 – fan **inlet** noise	**71 dB(A)**	Cumulative sound power level at fan outlets (-3 dB with respect to the total sound power level due to power split)
EEC noise control scheme	-21 dB	High performance acoustic attenuator on the fresh air intake side of fan and associated ductwork
Distance losses over 17 metres (point source)	-36 dB	Distance to worst affected residential window
Directivity correction	-3 dB	Loss due to directivity of radiation (-90° off-axis angle)
Total noise level	**11 dB(A)**	Worst affected residential window
Recupovent 4007 – fan **outlet** noise	**71 dB(A)**	Cumulative sound power level at fan outlets (-3 dB with respect to the total sound power level due to power split)
EEC noise control scheme	-21 dB	High performance acoustic attenuator on the fresh air intake side of fan and associated ductwork
Distance losses over 14 metres (point source)	-34 dB	Distance to worst affected residential window
Directivity correction	-3 dB	Loss due to directivity of radiation (-90° off-axis angle)
Total noise level	**13 dB(A)**	Worst affected residential window
Cumulative noise level	**15 dB(A)**	Total noise level at the worst affected residential window

Table 7.3: Worst-case HRVU noise calculation for the worst affected residential window.

Item	Level dB(A)
Daikin RYYQ20T	20
Recupovent 4007	15
Total noise level	**21**

Table 7.4: Worst-case cumulative plant noise calculation.

Property	Period	Proposed Noise Limit L_{Ar} (dB)	Predicted $L_{Aeq,T}$ (dB)	Exceedance of noise limit (dB)
Worst affected residential window	Day time (0700-1900 hrs, T = 12 hrs)	31	21	-10
	Evening (1900-2300 hrs, T = 4 hrs)	29	21	-8
	Night time (2300-0700 hrs, T = 8 hrs)	23	21	-2

Table 7.5: Assessment of predicted plant noise levels based on proposed noise limits.

8 CONCLUSIONS

8.01 Edward Pearce LLP has appointed Environmental Equipment Corporation Ltd to undertake a noise assessment of new mechanical services, heating, and ventilation plant to serve a proposed residential house at 1 Norfolk Road, London, NWX 6AX.

8.02 The assessment has been carried out in accordance with relevant standards, national planning guidance and the requirements of LBCC, and was based on an environmental noise survey conducted at the site over a typical weekday period.

8.03 The potential noise impact of the proposed plant has been evaluated at the most noise sensitive residential receptor. Predictions have shown that the proposed noise criteria are met at the assessment location during all periods of plant operation.

8.04 Assessing the site in accordance with the principles of the NPPF has shown that the noise levels predicted outside the most noise sensitive residential window will be tending to or remain below the level at which no effects are observed to occur, the NOEL.

8.05 On the basis of this assessment it is considered that noise does not pose a material constraint to the operation of the proposed plant.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

TECHNICAL TERMS AND UNITS

Decibel (dB) - This is the unit used to measure sound. The human ear has an approximately logarithmic response to sound over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). We therefore use a logarithmic scale to describe sound pressure levels, intensities and power levels. The logarithms used are to base 10; hence, an increase of 10 dB in sound pressure level corresponds to a doubling in perceived loudness of the sound.

Sound Power Level (SWL) - This is a function of the noise source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) - This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. For example, a sound pressure level measured at 1 metre from a sound source of certain sound power in reverberant room will not be the same as the sound pressure level a 1 metre from the sound source measured in open space.

Octave and One-Third Octave Bands - The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For finer analysis, each octave band may be split into one-third octave bands.

"A" Weighting - A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

Noise Rating (NR) Curves - The "A" weighted sound pressure level cannot be used to define a spectrum or to compare sounds of different frequencies. NR curves convey frequency information in a single-figure index. This is done by defining the maximum permissible sound pressure level at each frequency for each curve. To measure the noise rating of a given environment, the SPL is measured in octave or one-third octave bands and the noise rating is then the highest NR curve touched by the measured levels.

Intermittency and Time-Weighting - The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:-

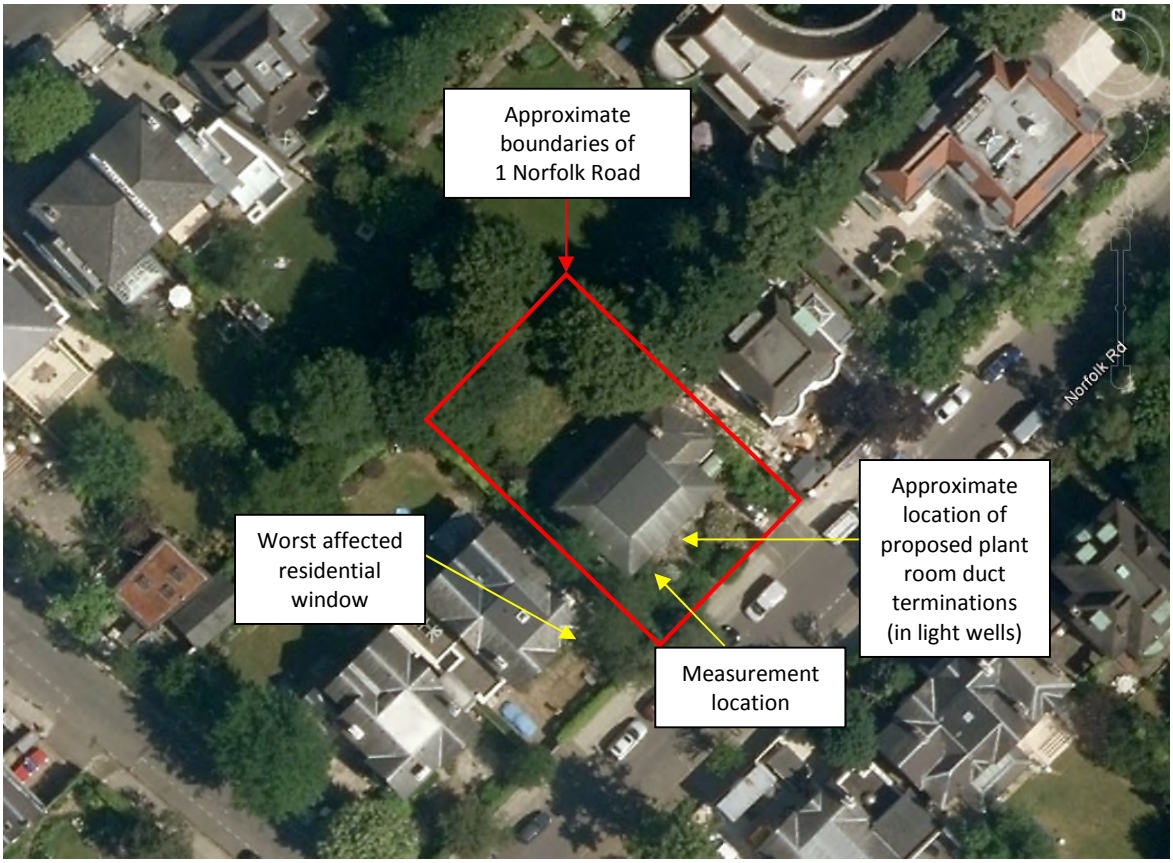
L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{10} This is the sound pressure level exceeded for 10% of the measurement period. It is widely used to measure traffic noise. For a given measurement period, the L_{10} level is by definition greater than or equal to the L_{90} level.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.

APPENDIX B

SITE PLAN
&
MEASUREMENT LOCATION



APPENDIX C

PLANNING POLICY AND GUIDANCE

PLANNING POLICY AND GUIDANCE

Planning Policy in the London Borough of Camden

DP POLICY

DP28 – Noise and vibration

The Council will seek to ensure that noise and vibration is controlled and managed and will not grant planning permission for:

a) development likely to generate noise pollution; or

b) development sensitive to noise in locations with noise pollution, unless appropriate attenuation measures are provided.

Development that exceeds Camden's Noise and Vibration Thresholds will not be permitted.

The Council will only grant permission for plant or machinery if it can be operated without cause harm to amenity and does not exceed our noise thresholds.

The Council will seek to minimise the impact on local amenity from the demolition and construction phases of development. Where these phases are likely to cause harm, conditions and planning obligations may be used to minimise the impact.

With relation to plant noise emissions, DP28 provides the following table which sets maximum noise criterion limits above which planning permission will not be granted. The policy explains that noise sensitive development includes housing, schools and hospitals as well as offices.

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$L_{Aeq'}$

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

The NPPF contains four aims, which are set out at paragraph 123 in Section 11 of the document, titled *Conserving and enhancing the natural environment*:

> *"Planning policies and decisions should aim to:*
>
> > *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
> >
> > *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
> >
> > *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
> >
> > *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

> *"NOEL – No Observed Effect Level*
>
> *This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> *2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*
>
> *SOAEL – Significant Observed Adverse Effect Level*
>
> *This is the level above which significant adverse effects on health and quality of life occur."*

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:*
>
> > *avoid significant adverse impacts on health and quality of life;*
> >
> > *mitigate and minimise adverse impacts on health and quality of life; and*
> >
> > *where possible, contribute to the improvement of health and quality of life."*

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

> *2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).*
>
> *2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.*
>
> *2.25 This aim* (the third aim)*, seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."*

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

World Health Organisation (WHO) Night Noise Guidelines for Europe – Recommendations for Health Protection

Average night noise level over a year $L_{night,outside}$	Health effects observed in the population
Up to 30 dB	Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{night,outside}$ of 30 dB is equivalent to the no observed effect level (NOEL) for night noise.
30 to 40 dB	A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{night,outside}$ of 40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.
40 to 55 dB	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.
Above 55 dB	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.

Table 3
Effects of different levels of night noise on the population's health

British Standard 4142

BS4142:2014 'Methods for rating and assessing industrial and commercial sound' gives guidance on assessing the likelihood of adverse noise impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the rating level to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background noise level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low sound impact, depending on the context.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq}.
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

APPENDIX D

SURVEY RESULTS
(TABULAR)

EC 14048 - 1 Norfolk Road

Edward Pearce LLP

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
11:10	47	64	36
11:15	47	67	38
11:20	48	66	38
11:25	50	70	39
11:30	49	59	44
11:35	48	61	38
11:40	49	62	40
11:45	51	63	40
11:50	45	61	37
11:55	48	67	37
12:00	52	67	37
12:05	45	60	37
12:10	42	54	38
12:15	44	58	37
12:20	46	64	38
12:25	51	67	39
12:30	45	61	37
12:35	46	61	38
12:40	47	61	40
12:45	43	59	39
12:50	43	58	37
12:55	47	67	38
13:00	47	65	38
13:05	43	59	37
13:10	41	53	37
13:15	45	59	37
13:20	47	61	38
13:25	46	61	36
13:30	47	65	37
13:35	44	59	37
13:40	44	58	36
13:45	42	58	37
13:50	47	63	38
13:55	44	62	38
14:00	46	64	38
14:05	46	60	40
14:10	41	52	37
14:15	46	58	39
14:20	42	51	37
14:25	46	61	38
14:30	48	68	38
14:35	46	58	38
14:40	49	62	38
14:45	50	61	40
14:50	50	63	39
14:55	46	64	37
15:00	52	69	39
15:05	56	76	39

Time	L_{Aeq}	L_{AMax}	L_{A90}
15:10	59	78	39
15:15	55	76	40
15:20	49	63	39
15:25	47	61	39
15:30	47	63	39
15:35	49	65	40
15:40	44	61	38
15:45	47	60	38
15:50	49	68	39
15:55	51	71	40
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17:20	47	60	39
17:25	49	64	40
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17:55	48	61	39
18:00	48	60	41
18:05	46	59	40
18:10	49	67	38
18:15	48	62	38
18:20	49	65	39
18:25	45	59	38
18:30	47	63	39
18:35	48	65	39
18:40	48	61	39
18:45	47	64	39
18:50	46	61	40
18:55	49	63	39
19:00	48	62	39
19:05	47	61	40

EC 14048 - 1 Norfolk Road

Edward Pearce LLP

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
19:10	46	61	39
19:15	47	63	38
19:20	48	61	40
19:25	50	65	39
19:30	45	59	38
19:35	47	61	39
19:40	48	66	39
19:45	45	63	39
19:50	46	61	39
19:55	43	56	39
20:00	46	60	40
20:05	47	63	40
20:10	43	56	38
20:15	47	61	38
20:20	49	61	40
20:25	50	62	39
20:30	49	60	40
20:35	47	62	39
20:40	43	52	39
20:45	43	55	38
20:50	48	63	38
20:55	45	61	38
21:00	42	51	36
21:05	43	59	37
21:10	45	60	37
21:15	45	59	38
21:20	46	62	37
21:25	41	51	37
21:30	42	58	37
21:35	44	61	36
21:40	39	46	35
21:45	43	59	36
21:50	46	61	37
21:55	45	60	38
22:00	40	52	37
22:05	50	68	36
22:10	45	62	36
22:15	39	46	34
22:20	45	63	35
22:25	50	65	36
22:30	48	67	35
22:35	49	64	37
22:40	47	63	35
22:45	40	55	34
22:50	43	60	35
22:55	39	46	34
23:00	45	65	34
23:05	44	55	36

Time	L_{Aeq}	L_{AMax}	L_{A90}
23:10	46	58	37
23:15	40	47	36
23:20	56	74	36
23:25	41	55	35
23:30	45	61	36
23:35	40	48	35
23:40	40	51	36
23:45	39	46	33
23:50	40	51	33
23:55	38	45	34
00:00	38	46	33
00:05	41	58	34
00:10	38	50	34
00:15	38	47	33
00:20	41	67	32
00:25	37	46	34
00:30	40	57	33
00:35	39	46	33
00:40	43	60	33
00:45	36	44	32
00:50	37	52	31
00:55	41	60	30
01:00	40	57	31
01:05	36	47	31
01:10	46	67	31
01:15	39	56	30
01:20	36	47	32
01:25	35	46	31
01:30	36	47	30
01:35	39	58	30
01:40	39	57	30
01:45	32	41	29
01:50	35	45	30
01:55	34	44	30
02:00	35	47	30
02:05	31	38	29
02:10	33	43	30
02:15	29	36	28
02:20	34	44	29
02:25	33	45	28
02:30	35	44	31
02:35	34	45	30
02:40	33	44	29
02:45	33	44	30
02:50	33	43	30
02:55	35	46	31
03:00	35	43	30
03:05	36	43	33

EC 14048 - 1 Norfolk Road

Edward Pearce LLP

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
03:10	35	47	31
03:15	35	44	30
03:20	36	47	32
03:25	39	52	30
03:30	40	56	31
03:35	35	49	32
03:40	35	45	31
03:45	39	55	31
03:50	35	46	31
03:55	36	51	32
04:00	50	64	34
04:05	51	63	34
04:10	52	64	35
04:15	52	64	35
04:20	51	63	37
04:25	51	63	38
04:30	54	68	39
04:35	51	63	36
04:40	51	63	37
04:45	50	62	36
04:50	46	56	33
04:55	46	58	34
05:00	43	59	34
05:05	39	51	34
05:10	40	56	33
05:15	38	46	33
05:20	39	49	34
05:25	41	58	34
05:30	40	56	35
05:35	40	53	35
05:40	43	56	36
05:45	40	52	35
05:50	39	49	35
05:55	42	60	35
06:00	40	51	35
06:05	41	55	37
06:10	44	61	38
06:15	44	62	39
06:20	41	54	37
06:25	42	55	37
06:30	44	54	38
06:35	43	56	39
06:40	45	54	40
06:45	46	64	40
06:50	46	65	39
06:55	49	63	41
07:00	45	57	40
07:05	49	64	42

Time	L_{Aeq}	L_{AMax}	L_{A90}
07:10	44	54	40
07:15	48	61	41
07:20	46	60	40
07:25	44	60	40
07:30	47	59	41
07:35	48	59	47
07:40	45	65	40
07:45	46	58	41
07:50	50	68	42
07:55	45	54	42
08:00	45	53	42
08:05	47	58	43
08:10	49	62	44
08:15	48	61	43
08:20	48	59	43
08:25	50	62	44
08:30	47	58	43
08:35	50	68	44
08:40	46	57	42
08:45	46	59	43
08:50	48	63	43
08:55	50	67	44
09:00	48	66	44
09:05	45	63	43
09:10	48	68	43
09:15	47	59	42
09:20	49	62	42
09:25	50	66	43
09:30	48	66	42
09:35	46	58	42
09:40	46	69	43
09:45	48	62	44
09:50	50	66	42
09:55	50	71	43
10:00	47	60	43
10:05	48	61	44
10:10	47	60	43
10:15	48	61	44
10:20	49	62	43
10:25	46	54	44
10:30	50	61	45
10:35	48	63	45
10:40	48	60	44
10:45	49	62	44
10:50	49	60	45
10:55	47	57	44
11:00	48	60	45
11:05	50	59	45

APPENDIX E

SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at 1 Norfolk Road