NSL
Noise Solutions Ltd

The Firs, Church Grove
Hampton Wick
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Plant Noise
Impact Assessment

On behalf of

FLOWER MICHELIN

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Document Information

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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved
A	6/12/16	Updated site plan	JS	DB

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1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by Flower Michelin to undertake a noise impact assessment for new car lift plant serving a proposed residential development at The Firs, Church Grove, Hampton Wick.

1.2. An environmental sound survey has been undertaken to establish the prevailing background sound levels at a location representative of the sound pressure levels outside the nearest noise sensitive receptors to the site.

1.3. Cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptors and assessed using BS4142:2014[1].

2.0 Details of development proposals

2.1. The proposed residential development at The Firs is to include a basement level car park. This will be accessed from the ground floor by a single-vehicle lift.

2.2. The hydraulic lift will be powered by a pump situated within an enclosed lift motor room at basement level.

2.3. It is understood that the proposed equipment may operate without time constraints.

3.0 Nearest noise sensitive receptors

3.1. The area surrounding the site is predominantly residential in nature, with detached houses and blocks of flats along Church Grove (to the north and south of the site). There are additional residential properties (on Saddlers Mews) to the east, although there is a large area occupied by allotments to the west (on the far side of Church Grove).

3.2. The most affected residential properties will be the flats to the north (R1) on Church Grove.

3.3. All other nearby receptors benefit from increased distance/screening to the plant such that compliance with the criterion will be achieved.

3.4. Appendix C contains an aerial photograph showing the site and surrounding area.

[1] Bs4142:2014 Methods for rating and assessing industrial and commercial sound

4.0 Existing noise climate

4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the site during the quietest times at which the lift will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of survey results and details of the methodology are presented in Appendix D.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 - 23.00 hours)	66-76	77-105	70-77	46-59
Night-time (23.00 - 07.00 hours)	53-73	76-88	40-77	25-55

5.0 Plant noise design criteria

BS4142: 2014

5.1. BS4142: 2014 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS4142: 2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*. The standard has been referenced as appropriate for the assessment of noise from plant.

5.2. The procedure contained in BS4142: 2014 provides an assessment of the likely effects of sound on people when comparing the specific noise levels from the source with representative background noise levels. Where the noise contains *"a tone, impulse or other characteristic"* then various corrections of can be added to the specific (source) noise level to obtain the *"rating level"*. Specifically "Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

5.3. The likely effects of sound on people are assessed by subtracting the background noise level from the rating level. BS4142: 2014 states the following:

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;

- A difference of around +5 dB 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 sound level, the less likely it is that the specific sound source will have an adverse impact or a 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 impact, depending on the context.

5.4. BS4142 requires uncertainties in the assessment to be considered and, where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

5.5. It would be considered appropriate for noise from the plant, assessed as per the methodology of BS4142:2014 to be of less than *'low impact'*, ensuring that *'the amenity of nearby residential properties is appropriately protected'*. Plant noise rating levels at or below the existing background noise level would be deemed appropriate.

5.6. Based on the above criteria the cumulative noise rating level for the proposed plant at the nearest noise sensitive windows should not exceed the limits shown in the table below. In order to be robust, these limits have been based on the lowest recorded background noise level rather than a representative background established through statistical analysis of the measured data.

Table 2 Plant noise emission limits at residences

Time	Cumulative plant noise rating level (dBA)
Daytime (07.00 - 23.00 hours)	46
Night-time (23.00 – 07.00 hours)	25

5.7. The above limits have not been approved by the local authority at this stage.

6.0 Plant noise impact assessment

6.1. The cumulative plant noise levels at the nearest noise sensitive receptors have been predicted. The assessment has considered directivity and distance attenuation, along with screening and other losses provided by the building fabric.

6.2. The manufacturer of the lift system has provided noise level information for the hydraulic pump when the lift is being raised and when it is lowered. This is presented in Appendix B.

6.3. The noise level information for raising and lowering the lift can be used in conjunction with the time taken to raise and lower the platform (calculated from the relative heights of ground and

basement level and the speeds of the lift mechanism) to calculate the overall noise impact of its operation. It is proposed to assess the noise impact during the night-time period; there are no time restrictions on the equipment and if the impact is acceptable during the more sensitive night-time period then it follows that daytime operation will be acceptable.

6.4. In order to account for intermittent operation and possible tonality of the hydraulic pump (although available data suggests the noise to be relatively broadband) a total acoustic feature correction of +6dB has been added to the specific noise level.

6.5. Table 3, below, summarises the results of the assessment at the most affected noise sensitive properties (R1 to the north). All other nearby receptors benefit from increased distance/screening to the plant such that compliance with the proposed criteria will be achieved. The full set of calculations can be found in Appendix E.

Table 3 Assessment of predicted noise levels at the nearest noise sensitive receptors

Receptor	Period	Predicted rating level at receptor, L_{Aeq} (dB)	Criterion (dB)	Difference (dB)
R1.	Night-time (23.00 - 07.00 hours)	9	25	-16

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by Flower Michelin to undertake a noise impact assessment for new car lift plant serving a proposed residential development at The Firs, Church Grove, Hampton Wick.

7.2. An environmental sound survey has been undertaken to establish the prevailing background sound levels around the site.

7.3. The cumulative plant noise emission levels for the proposed equipment have been predicted at the most affected noise sensitive receptor locations and assessed taking into consideration suitable assessment criteria, in line with the requirements of BS4142:2014.

7.4. The results of the assessment demonstrate that cumulative plant noise emissions from the proposed plant should be acceptable during the daytime and night-time periods when the plant will operate. Therefore, noise from the plant proposals should not be a reason for refusal of planning permission.

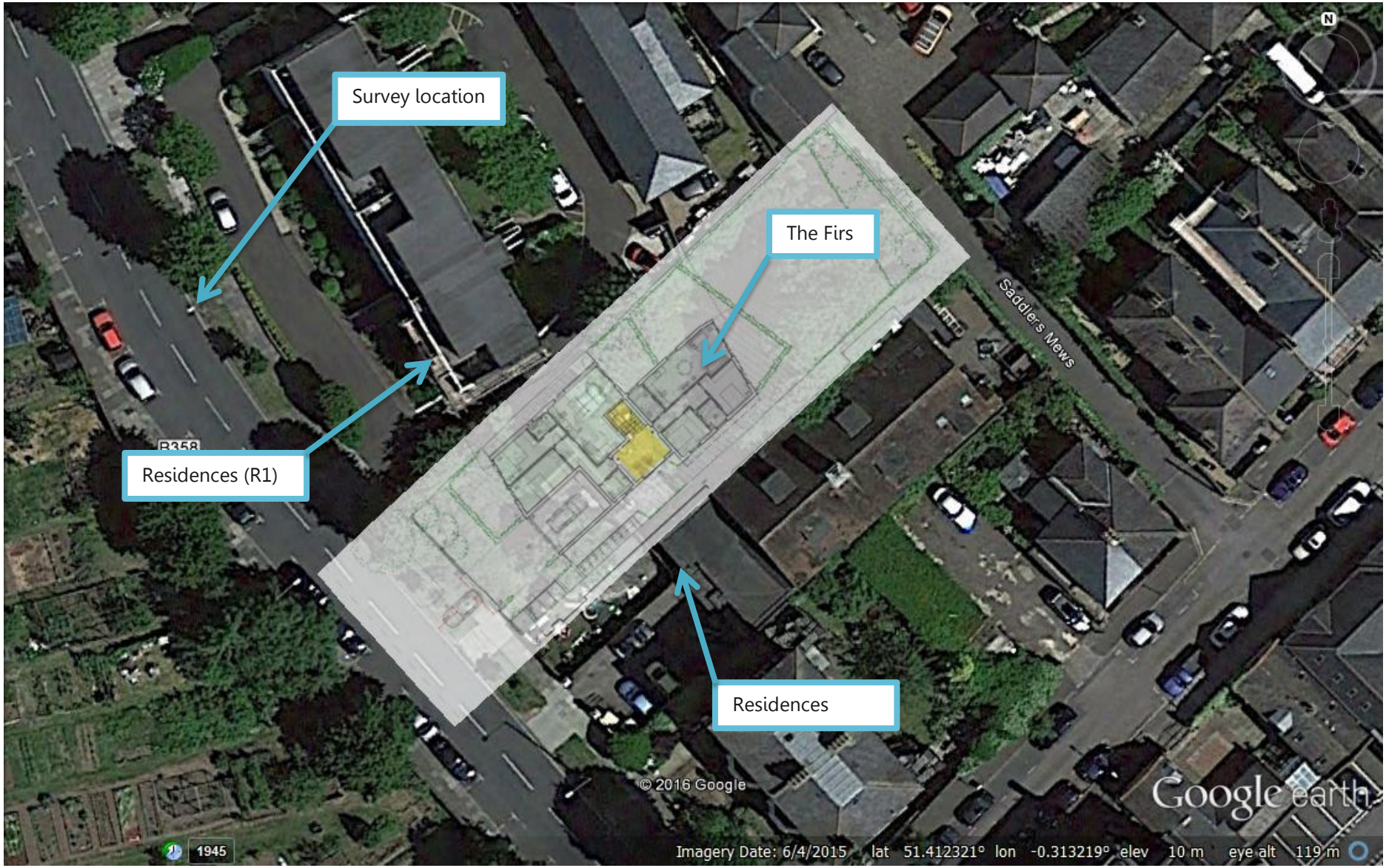
Appendix A Acoustic Terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near (LAeq,T).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), LAx	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
LAeq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
Lmax,T	A noise level index defined as the maximum noise level recorded during a noise event with a period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. LA10,18h is the A –weighted arithmetic average of the 18 hourly LA10,1h values from 06:00-24:00.

Appendix B Manufacturer's plant noise data

Plant item	Model	Quantity	Operation	Speed	Noise level	
					dB(A)	Unit
IdealPark	IP1-HMT V07	1	Raising	0.10ms^{-1}	71	Lp at 1m
			Lowering	0.15ms^{-1}	64	Lp at 1m

Appendix C Aerial photograph of site showing areas of interest



Appendix D Environmental Sound Survey

Details of environmental sound survey

D.1 Measurements of the existing background sound levels were undertaken from 14.20 hours on Tuesday 11 October to 09.05 hours on Wednesday 12 October 2016.

D.2 The sound level meter was programmed to record the A-weighted L_{eq}, L_{90}, L_{10} and L_{max} noise indices for consecutive 15-minute sample periods for the duration of the survey.

Measurement position

D.3 The sound level meter was positioned on a lamp post to the front of the adjacent flats to the north of The Firs. The approximate location of the sound level meter is shown in the aerial photograph in Appendix C.

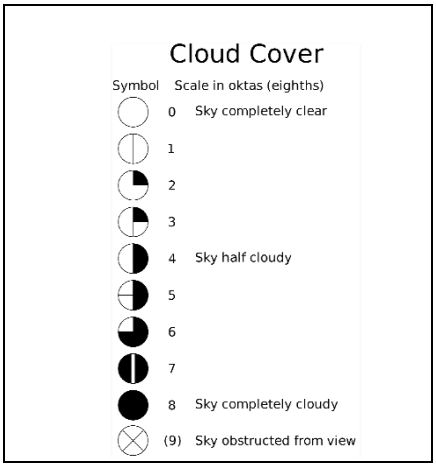
Equipment

D.4 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-31 / 00593605	18/02/2016	14919
Condenser microphone	Rion UC-53A / 316131		
Preamplifier	Rion NH-21 / 30365		
Calibrator	Rion NC-74 /35094453	18/02/2016	14918

Weather Conditions

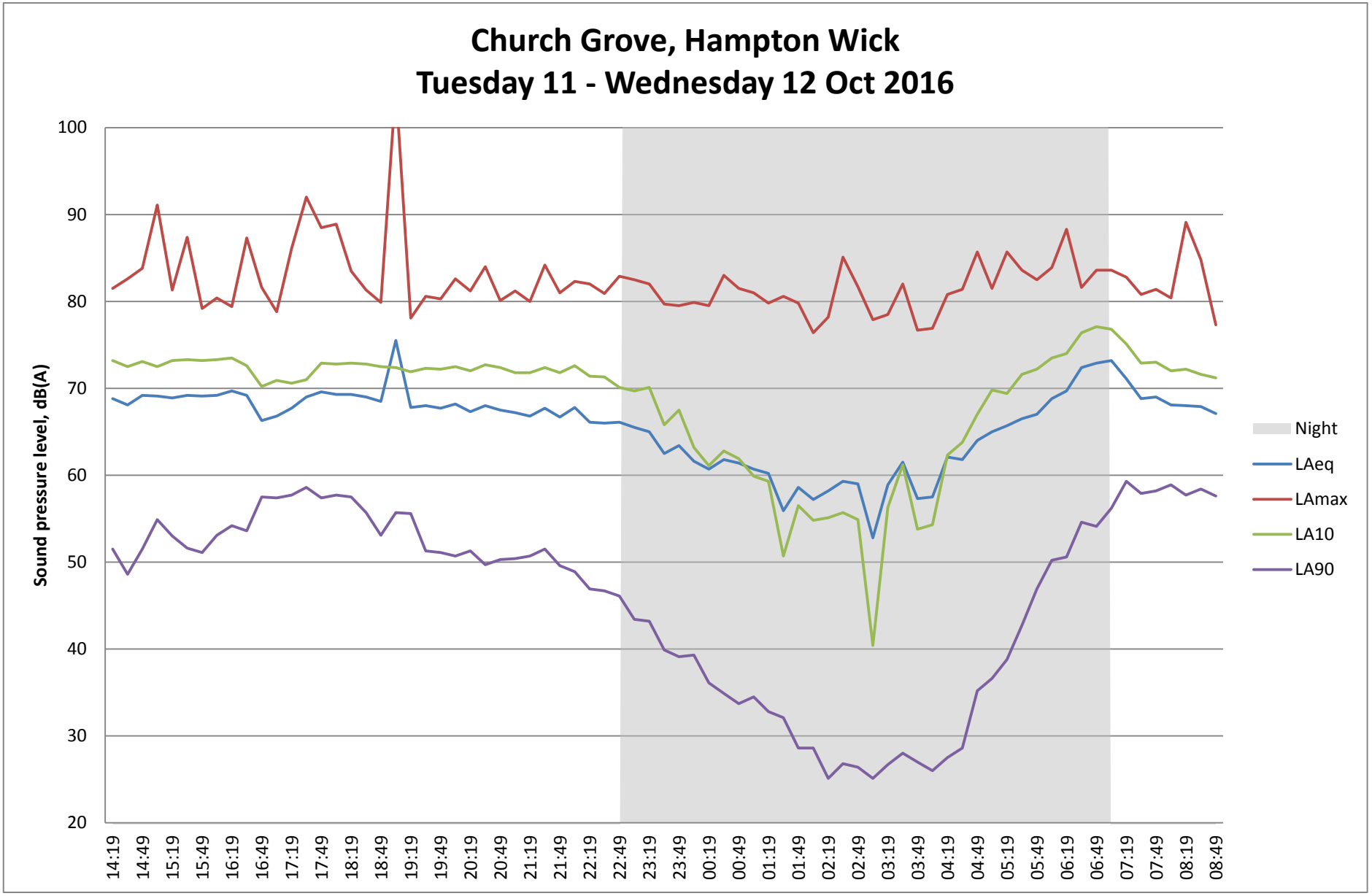
D.5 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table overleaf presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	**Date/Time**	**Description**	**Beginning of Survey**	**End of Survey**
As indicated on Appendix B	11/10/16 – 12/10/16	Temperature (°C)	16	13
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	4	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	Slight
		Wind Speed (m/s)	-	-
		Wind Direction	-	-
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

D.6 The results of the survey are considered to be representative of background sound pressure levels at the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate. The noise climate at the beginning and end of the survey period consisted of local road traffic, overflying aircraft and other local plant.

D.7 The results of the survey are presented in a time history graph overleaf.


Church Grove, Hampton Wick
Tuesday 11 - Wednesday 12 Oct 2016
Sound pressure level, dB(A)
100
90
80
70
60
50
40
30
20
14:19
14:49
15:19
15:49
16:19
16:49
17:19
17:49
18:19
18:49
19:19
19:49
20:19
20:49
21:19
21:49
22:19
22:49
23:19
23:49
00:19
00:49
01:19
01:49
02:19
02:49
03:19
03:49
04:19
04:49
05:19
05:49
06:19
06:49
07:19
07:49
08:19
08:49
Night
LAeq
LAmax
LA10
LA90

Appendix E Calculations

E.1 Calculation of reverberant sound level in lift shaft

	63	125	250	500	1000	2000	4000	8000	dB(A)
SOURCE ROOM NOISE LEVELS									
Hydraulic pump sound power level[2]	78	74	67	68	73	75	70	63	**79**
DETAILS OF TRANSMITTING ELEMENT									
Separating Structure SRI	13	17	21	26	29	31	34	32	
(door to lift motor room)									
SOURCE ROOM REV LEVEL									
K_{rev}, hard surfaces	0.05	0.05	0.08	0.08	0.08	0.10	0.10	0.10	
Total absorption	4.1	4.1	6.56	6.56	6.56	8.2	8.2	8.2	
Krev	-0.3	-0.3	-2.5	-2.5	-2.5	-3.6	-3.6	-3.6	
Rev Lp=	77.5	73.7	64.9	65.6	70.5	71.2	66.6	59.3	**76**
RECEIVE ROOM REV LEVEL									
K_{rev}, hard surfaces	0.05	0.05	0.08	0.08	0.08	0.10	0.10	0.10	
Total absorption	6.68	6.68	10.68	10.68	10.68	13.35	13.35	13.35	
Krev	-2.4	-2.4	-4.6	-4.6	-4.6	-5.7	-5.7	-5.7	
Rev level in lift shaft=	68.10	60.32	45.27	40.99	42.93	40.56	32.97	27.63	**50**

[2] Spectral data based on information from BBC Research Department publication *On Minimising Noise Problems Caused By Passenger Lifts in Studio Centres*

E.2 Calculation of breakout from lift shaft to adjacent residence

Note		63	125	250	500	1000	2000	4000	8000	dB(A)
Rev Lp in lift shaft		68.1	60.3	45.3	41.0	42.9	40.6	33.0	27.6	**49.6**
Area of roller shutter	11.34m^2	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	
inside to outside		-6	-6	-6	-6	-6	-6	-6	-6	
SRI of Roller Shutter (nominal)	Rw27	-6	-9	-18	-25	-28	-29	-30	-30	
Lw of door		66.6	55.9	31.8	20.5	19.5	16.1	7.5	2.2	
Directivity 90°		-6	-6	-10	-10	-10	-10	-10	-10	
Distance loss	15m	-31.5	-31.5	-31.5	-31.5	-31.5	-31.5	-31.5	-31.5	
Lp at res (raise)		29.1	18.3	-9.7	-21.0	-22.0	-25.4	-34.0	-39.3	**5.6**
Lp at res (lower)		22.1	11.3	-16.7	-28.0	-29.0	-32.4	-41.0	-46.3	**-1.4**

E.3 Calculation of BS4142:2014 Rating Level

	Time, sec	SEL, dB(A)
Raising lift	47	22.4
Lowering lift	31	13.6
Total, one cycle	78	**22.9**

No. cycles in 15min[3]	10	
$L_{eq(15min)}$ at res.	3.4	
Feature correction	+6	
Rating Level	**9.4**	**dB(A)**

L_{eq}=SEL + 10.log(no.cycles) + 10.log(1/(15x60))

[3] Assumes constant operation of lift during 15-minute period