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Project:

UCL Anatomy Refurbishment - Phase 5

Title:

Plant Noise Assessment - Phase 5



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Report Title	UCL Anatomy Refurbishment - Phase 5 Plant Noise Assessment - Phase 5
Reference	DP/EC12844-008
Version	Final
Issue Date	26 July 2013
Client	Fowler Martin
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1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by Fowler Martin to undertake an acoustic assessment of a number of mechanical services plant items proposed as part of Phase 5 of the University College London (UCL) refurbishment of the Anatomy Building, London, WC1E 6BT.
- 1.02 This noise assessment has been conducted in accordance with the policies and requirements of Camden Council (CC) 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 CC and national planning policy, standards and guidance;
 - the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed plant selection and locations; and
 - the prediction of the cumulative noise impacts at worst affected noise sensitive receptors based on Phase 5 and Phase 7 planning applications.
- 1.04 This report is prepared solely for Fowler Martin. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party.
- 1.05 Whilst every effort has been made to ensure that this report is accessible to the reader, 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 The UCL Anatomy Building is a five storey educational building located centrally within the UCL complex, off Malet Place.
- 2.02 Access to Malet Place is located off Torrington Street, in close proximity to Euston station. Although situated close to Euston Road and Gower Street, the proposed plant location is surrounded by other existing buildings associated with the UCL site and is therefore screened from the majority of local road traffic noise.
- 2.03 A number of existing building services that serve UCL dominate the immediate ambient noise climate.
- 2.04 The proposals are for the following units to be located at ground floor level, adjacent to the south facing facade of the Anatomy Building;
 - 1 no Mitsubishi PURY P500 condenser unit, with a stated manufacturers sound pressure level of 60dBA measured at a distance of 1m;
 - 1 no Mitsubishi SUZ-KA71VA2 DX condenser unit, with a stated manufacturers sound pressure level of 55dBA measured at a distance of 1m;
 - 1 no Mitsubishi PUHZ-RP200YKA DX condenser unit, with a stated manufacturers sound pressure level of 59dBA measured at a distance of 1m; and
 - 1 no FlaktWoods Air Handling Unit, with a stated manufacturers break-out sound power level of 58dBA.
- 2.05 All of the above units have the potential to operate 24 hours a day.
- 2.06 The proposed locations of the above units are as presented in the figure presented in Appendix B.
- 2.07 The air intake and exhaust of the air handling unit is also proposed to be located within the plant space, however it has been assumed in this assessment that, should they be required, in-line attenuators will be included in the design to ensure that the noise from the unit does not contribute to the overall predicted noise level.
- 2.08 The only surrounding properties which could be considered sensitive are other educational buildings associated with the UCL site. The nearest residential properties are more than 40 metres away and benefit from significant screening from intervening UCL buildings that are typically 5 storeys high.
- 2.09 Therefore, in this instance, it is considered practical and pragmatic to assume the closest noise sensitive receptor to the proposed plant locations would be the closest UCL building with noise sensitive windows that are not served by the proposed items of plant.
- 2.10 In this instance, the closest UCL building to the Anatomy Building that could potentially be conceived as noise sensitive would be the adjacent building indicated in the Figure in Appendix B, which is between 12m and 19m from each item of plant.
- 2.11 A number of plant items are also proposed to be located at second floor level as part of the Phase 7 planning application. Reference to the types and locations of these items can be found in the EEC Report, Plant Noise Assessment Phase 7, EC 12844-009.

3 GUIDANCE

- 3.01 Local and National Planning Policy for Camden Council is presented in Appendix C of this document.
- 3.02 The pertinent text stated in Policy D28 relating to this application is reproduced below as an extract from Table E of that policy;

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< td=""></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< td=""></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< td=""></la90<>	
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBLAeq'	

3.03 For the purposes of this assessment the design target will be to ensure that the rating noise (L_{Ar}) level of the new plant is at least 5dB less than the existing background noise at the noise sensitive locations. The principles and outline of BS4142 are contained in Appendix C.

4 MEASUREMENTS

- 4.01 Environmental noise measurements were carried out over a weekday period, between 1100 hours on Monday 15th July 2013 and 1045 hours the following day, to establish the existing background noise levels at the site. The survey methodology and results are set out below.
- 4.02 Noise measurements were carried out at the following location, as shown in Appendix B and described as:
 - Position 1: 1.5 metres above ground floor level, approximately 1 metre from the southern facade of the Anatomy Building.
- 4.03 Position 1 was used to measure noise levels representative of the closest noise sensitive receptor to the proposed location, which, for the purposes of this assessment is considered to be the adjacent UCL building.



5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
- 01dB Outdoor Microphone Kit and a
- Tripod.
- 5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Cound Loval Mator	Serial No.	61719	
Old Plack Solo	Calibration Date	15/08/2012	
UTUB BIACK 2010	Cal Certificate No.	CE-DTE-T-12-PVE-59147	
	Serial No. 15079		
⁷² IVICE ZIZ	Calibration Date	15/08/2012	
Condenser Mile.	Cal Certificate No.	CE-DTE-T-12-PVE-59147	
	Serial No.	1761563	
Calibrator B&K4231	Calibration Date	31 st October 2012	
	Cal. Certificate No.	01079/1	

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

6 RESULTS

- 6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind.
- 6.02 The dominant noise source at the site is that from the operation of existing and extensive mechanical services plant associated with the surrounding UCL Buildings.
- 6.03 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.
- 6.04 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods are shown in Table 6.1. The minimum L_{A90} is the lowest fifteen minute measurement in the specified period.

Period	Average L _{Aeq,T} – dB	Lowest L _{A90 15 min} – dB
Day time (0700-1900 hrs)	59.7	54.8
Evening (1900-2300 hrs)	58.0	56.3
Night-time (2300-0700 hrs)	57.5	54.8

Table 6.1: Measured Ambient and Lowest Background Noise Levels, Facade

6.05 The sound level meter was calibrated before the measurements using the listed acoustic calibrator, and its calibration checked afterwards. No significant calibration drifts were found to have occurred.

7 PLANT NOISE ASSESSMENT

- 7.01 This application is for a number of plant items to be installed at ground level, adjacent to the Anatomy Building of the UCL complex.
- 7.02 Based on the standard requirements of CC and the lowest measured background noise level in each time period, Table 7.1 sets out the recommended noise limits that the proposed items of plant should meet.

Position	Period	Measured Existing L _{A90,T}	Proposed Noise Limit L _{Ar}
1	Day	55dB	50dB
	Evening	56dB	51dB
	Night	55dB	50dB

Table 7.1: Suggested Plant Noise Emission Limits Based on Lowest Measured L_{A90}, Facade dB



- 7.03 Note that the limits suggested above are rating levels and as such any design should take into account the acoustic characteristics of the plant. In this instance the proposed unit displays none of the characteristics whereby the acoustic correction should be applied.
- 7.04 Based on the units and noise data presented in Section 2 of this report, predicted noise levels have been calculated at the closest existing noise sensitive location, the adjacent UCL building, which is between 12 and 19 metres from each individual item of plant.
- 7.05 Other UCL buildings, and noise sensitive receptors located further from the site will be subject to lower noise levels than those predicted at the above location.
- 7.06 For easy reference in the following table, the noise level for the AHU has been converted from a sound power level to a sound pressure level at 1m based on parallelepiped propagation.
- 7.07 Tables 7.1 present the results of worst-case plant noise predictions at the closest noise sensitive receptor to the site, and compares the predicted cumulative noise level with the noise limit stated in Table 7.1

Plant Item	Sound pressure level at 1m, dBA	Directivity, dB	Distance, m	Conformal Losses over stated distance, dB	Noise Level at receptor, dBA
PURY P500	60	+6.0	19	-20	46
SUZ-KA71VA2	55	+6.0	12	-18	43
PUHZ-RP200YKA	59	+6.0	13	-18	47
AHU	41	+6.0	17	-19	28
Total Cumulative Noise Level at Receptor					50
Noise Criteria					50
Exceedance of Noise Criteria					0

Table 7.2: Worst-Case Cumulative Noise Calculation

- 7.08 It can be seen from Table 7.1 that the noise level at the closest noise sensitive window is predicted to be 50dBA, which meets the noise criteria during all periods.
- 7.09 As stated previously, an assessment for a number of plant items proposed at the site has been undertaken by EEC as part of Phase 7 (EEC12844-009). Noise levels at the same assessment location are predicted to be 40dBA as a result of Phase 7 only. Therefore the cumulative noise level at the closest considered noise sensitive property to the plant location with the operation of Phase 5 (50dBA) and Phase 7 (40dBA) will be 50dBA, which meets the stated criterion.
- 7.10 With regard to the air intake and exhaust of the AHU, in-line attenuators may be required to ensure the predicted noise levels are 10dB below the proposed noise limit.
- 7.11 With respect to the NPPF, this can be classified as being below the Lowest Observed Adverse Effect Level, the LOAEL.

8 CONCLUSION

- 8.01 Environmental Equipment Corporation Limited has been commissioned by Fowler Martin to undertake an acoustic assessment of a number of mechanical services plant items proposed as part of Phase 5 of the University College London (UCL) refurbishment of the Anatomy Building, London, WC1E 6BT.
- 8.02 The assessment has been carried out in accordance with national planning guidance, and the requirements of Camden Council (CC), and is based on an environmental noise survey conducted at the site over a mid-week period.
- 8.03 A noise assessment has been undertaken to evaluate the potential noise impact of the proposed plant items at the closest noise sensitive receptor, which is taken to be the adjacent UCL Building.
- 8.04 Plant noise limits have been set, based on the methodology contained in BS4142, the results of a background noise survey and the requirements of CC, to control the noise from the proposed plant items.
- 8.05 The noise impact assessment has shown that the proposed items of plant satisfy the noise criteria requirements of CC based on their proposed location and operating hours.
- 8.06 The cumulative noise level as a result of the plant items proposed as part of Phase 7 has also been considered. Predicted noise levels as a result of both phases at the closest noise sensitive receptor are predicted to meet the criteria during all periods.
- 8.07 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be below the Lowest Observed Adverse Effect Level, the LOEAL.



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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.



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APPENDIX B

SITE AND MEASUREMENT LOCATION





quietly moving forward



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APPENDIX C

GUIDANCE AND PLANNING POLICY



Planning Policy in the Camden

DP28 Noise and Vibration

Noise and vibration can have a major effect on amenity and health and therefore quality of life.

Camden's high density and mixed-use nature means that disturbance from noise and vibration is a particularly important issue in the borough. Camden's Core Strategy recognises the importance of this issue for Camden's residents and policy DP28 contributes to implementing a number of Core Strategy policies, including CS5 – Managing the impact of growth and development, CS9 – Achieving a successful Central London, CS11 – Promoting sustainable and efficient travel and CS16 – Improving Camden's health and well-being.

The effect of noise and vibration can be minimised by separating uses sensitive to noise from development that generates noise and by taking measures to reduce any impact. Noise sensitive development includes housing, schools and hospitals as well as offices, workshops and open spaces, while noise is generated by rail, road and air traffic, industry, entertainment (e.g. nightclubs, restaurants and bars) and other uses.

The Council will only grant planning permission for development sensitive to noise in locations that experience noise pollution, and for development likely to generate noise pollution, if appropriate attenuation measures are taken, such as double-glazing. Planning permission will not be granted for development sensitive to noise in locations that have unacceptable levels of noise.

Where uses sensitive to noise are proposed close to an existing source of noise or when development that generates noise is proposed, the Council will require an acoustic report to ensure compliance with PPG24: Planning and noise. A condition will be imposed to require that the plant and equipment which may be a source of noise pollution is kept working efficiently and within the required noise limits and time restrictions. Conditions may also be imposed to ensure that attenuation measures are kept in place and effective throughout the life of the development.

In assessing applications, we will have regard to the Noise and Vibration Thresholds, set out below. These represent an interpretation of the standards in PPG24 and include an evening period in addition to the day and night standards contained in the PPG, which provide a greater degree of control over noise and vibration during a period when noise is often an issue in the borough.

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.



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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< td=""></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< td=""></la90<>
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dBLAeq'

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



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.

British Standard 4142

British Standard (BS) 4142: 1997 *Method for rating industrial noise affecting mixed residential and industrial areas* is intended to be used to assess whether noise from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises is likely to give rise to complaints from people residing in nearby dwellings.

The procedure contained in BS4142 for assessing the likelihood of complaints is to compare the "specific noise level", which is the measured or predicted noise level from the source in question immediately outside the dwelling, with the background noise level. Where the noise contains a "distinguishable discrete continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters or thumps), or if the noise is irregular enough to attract attention" then a correction of +5dB is added to the specific noise level to obtain the "rating level" or L_{Ar} .

The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:

"A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely."

The standard also notes that:



"The greater this difference the greater the likelihood of complaints."

BS4142 states the following in the Scope;

"The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low."

It goes on to state;

"For the purposes of this standard, background noise levels below about 30dB and rating levels below about 35dB are considered to be very low."

In the context of the NPPF, it is considered that a situation where BS4142 suggests complaints are unlikely would equate to the No Observed Effect Level (NOEL). The situation where BS4142 suggests complaints are likely would equate to the Significant Observed Adverse Effect Level (SOAEL).

The Lowest Observed Adverse Effect Level (LOAEL) has been equated to the situation that BS4142 describes as "marginal" as this is the only intermediate threshold identified in BS4142.

This assessment is carried out over a one hour period for the daytime and a five minute period for the night-time. Day or night are not defined in the standard but it states that night should cover the times when the general adult population are preparing for sleep or are actually sleeping. For the purposes of this assessment, it is assumed that daytime and night-time are 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the development.





APPENDIX D

SURVEY RESULTS (TABULATED)



Fowler Martin

Tabulated Noise data

Sheet 1 of 1

Time	L _{Aeq}	L _{AMax}	L _{A90}
11:00:00	63	83	59
11:15:00	60	79	58
11:30:00	59	73	58
11:45:00	60	75	58
12:00:00	61	74	59
12:15:00	63	79	59
12:30:00	65	89	59
12:45:00	61	76	59
13:00:00	60	68	59
13:15:00	60	69	59
13:30:00	62	77	59
13:45:00	61	79	59
14:00:00	60	71	59
14:15:00	61	73	59
14:30:00	60	72	59
14:45:00	60	69	58
15:00:00	59	68	58
15:15:00	61	77	59
15:30:00	61	73	58
15:45:00	61	72	59
16:00:00	60	67	59
16:15:00	60	66	58
16:30:00	60	74	58
16:45:00	60	70	58
17:00:00	60	65	59
17:15:00	60	63	59
17:30:00	60	63	59
17:45:00	60	68	58
18:00:00	59	64	58
18:15:00	59	66	58
18:30:00	59	63	59
18:45:00	59	63	58
19:00:00	58	62	57
19:15:00	58	63	58
19:30:00	58	64	57
19:45:00	58	63	57
20:00:00	58	68	57
20:15:00	58	60	57
20:30:00	58	61	57
20:45:00	58	63	58
21:00:00	58	62	58
21:15:00	58	60	57
21:30:00	58	61	57
21:45:00	58	63	56
22:00:00	58	61	57
22:15:00	58	60	57
22:30:00	58	60	58
22:45:00	58	64	58

Time	L _{Aea}	L _{AMax}	L _{A90}
23:00:00	58	62	58
23:15:00	58	60	57
23:30:00	58	63	57
23:45:00	58	62	57
00:00:00	58	61	57
00:15:00	58	63	56
00:30:00	57	60	56
00:45:00	57	60	56
01:00:00	57	60	56
01:15:00	57	74	55
01:30:00	57	67	56
01:45:00	57	60	56
02:00:00	57	60	56
02:15:00	58	60	57
02:30:00	58	60	57
02:45:00	58	60	57
03:00:00	58	60	57
03:15:00	58	63	57
03:30:00	58	61	56
03:45:00	58	60	56
04:00:00	58	61	56
04:15:00	57	60	55
04:30:00	57	60	55
04:45:00	57	68	55
05:00:00	57	60	55
05:15:00	57	65	56
05:30:00	57	73	56
05:45:00	58	73	56
06:00:00	57	62	56
06:15:00	58	77	56
06:30:00	59	82	56
06:45:00	58	63	56
07:00:00	58	74	57
07:15:00	58	78	56
07:30:00	59	75	57
07:45:00	63	89	59
08:00:00	62	80	59
08:15:00	60	73	58
08:30:00	62	80	58
08:45:00	63	82	57
09:00:00	62	76	58
09:15:00	61	77	57
09:30:00	60	83	57
09:45:00	59	68	58
10:00:00	61	71	59
10:15:00	63	84	58
10:30:00	60	75	57

quietly moving forwarc



UCL Anatomy Refurbishment - Phase 5

26 July 2013

APPENDIX E

SURVEY RESULTS (GRAPHICAL)



Noise Level Time History at UCL Anatomy Phase 5



– LAeg – LAFmax – LAF90