UCL Estates | The Bartlett School of Architecture | Hawkins\Brown

UCL WATES HOUSE MAJOR REFURBISHMENT AND EXTENSION

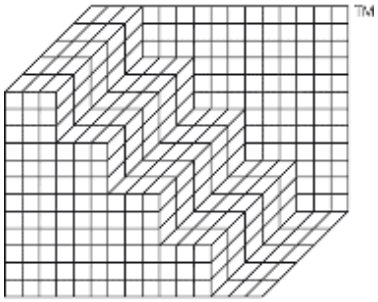
NOISE IMPACT ASSESSMENT

Buro Happold

The Bartlett School of Architecture

UCL

22 MAY 2014



Buro Happold

Wates House UCL

Noise Impact Assessment

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Contents

1 Scope **9**

1.1 Scope 9

2 Project Description and Summary of Findings **10**

2.1 Project Description 10

2.2 Summary of Findings 11

3 Guidance and Acoustic Requirements **12**

3.1 Camden Council Development Policies 12

4 Background Noise Survey and Acceptable Noise Levels **13**

4.1 Background Noise Survey 13

4.2 Acceptable Noise Levels 13

5 Wates House Mechanical Plant and Equipment **14**

5.1 Existing and Proposed Mechanical Equipment 14

6 Predicted Mechanical Plant Noise Emission **15**

6.1 Predicted Noise Levels 15

7 Noise Mitigation Measures **16**

7.1 Workshop Undercroft Noise Mitigation Measures 16

8 Conclusion **17**

Appendix A Mechanical Plant Locations

Appendix B - Background Noise Survey

Glossary

Term	Definition
A - Weighting	A-weighting has been found to give the best correlation between perceived and actual loudness. Measurement to which this weighting has been applied is described as being in dBA.
Decibel (dB)	A logarithmic unit for measuring the relative loudness of noise, i.e. the sound level.
L_{90}	The L_{90} refers to the level exceeded for 90% of the measurement period and is widely considered to represent background noise.
L_{eq}	Equivalent continuous sound level, widely used for assessing environmental noise.
Sound Pressure level - L_p	Is a logarithmic measure of the effective sound pressure of a sound relative to a reference value dB re 20 µPa.
Sound Power Level - L_w	Is a logarithmic measure of the sound power in comparison to a specified reference level dB re 10^{-12} W.

1 Scope

1.1 Scope

This Noise Impact Assessment has been prepared by Buro Happold to support the planning application for the refurbishment of Wates House which is located within the University College London's (UCL) Central London Campus.

The scope of this project is to assess the noise impact of the proposed mechanical equipment serving Wates House at the nearest affected noise sensitive receptors (NSR's).

This assessment identifies the following:

- The locations of the nearest affected NSR's with respect to Wates House and its mechanical equipment,
- The results of the background noise survey which was conducted during Stage C of this project dated 11 April 2013,
- The locations of the mechanical plant and equipment and the make, model and noise specifications,
- The noise emission of the mechanical plant and equipment at the nearest affected NSR, and provide practical noise mitigation measures in order to meet the noise requirements of Camden Council.

2 Project Description and Summary of Findings

2.1 Project Description

University College London intends to refurbish Wates House which is home to the Bartlett Faculty of the Built Environment. The building will include wood and metal workshops, computer rooms, lecture rooms, offices and studios. These rooms will be served by mechanical plant and equipment in the form of air handling units (AHUs), air-conditioning condensers and dust/extract fans.

The locations of the mechanical plant and equipment are spread over two floors. Equipment such as the AHUs, air-conditioning condensers and extract fans will be located at basement level within a Plant Zone and Workshop Undercroft. Additional AHUs, condensers, extract fans, chillers and pumps will be located at roof level. Locations of the plant are shown in the architectural drawings Appendix A.

Wates House is located within the University College London's (UCL) Central London Campus as shown in the Site Map below (Figure 1). The building is bounded by other UCL academic buildings as well as the Campbell House which is used for student accommodation.

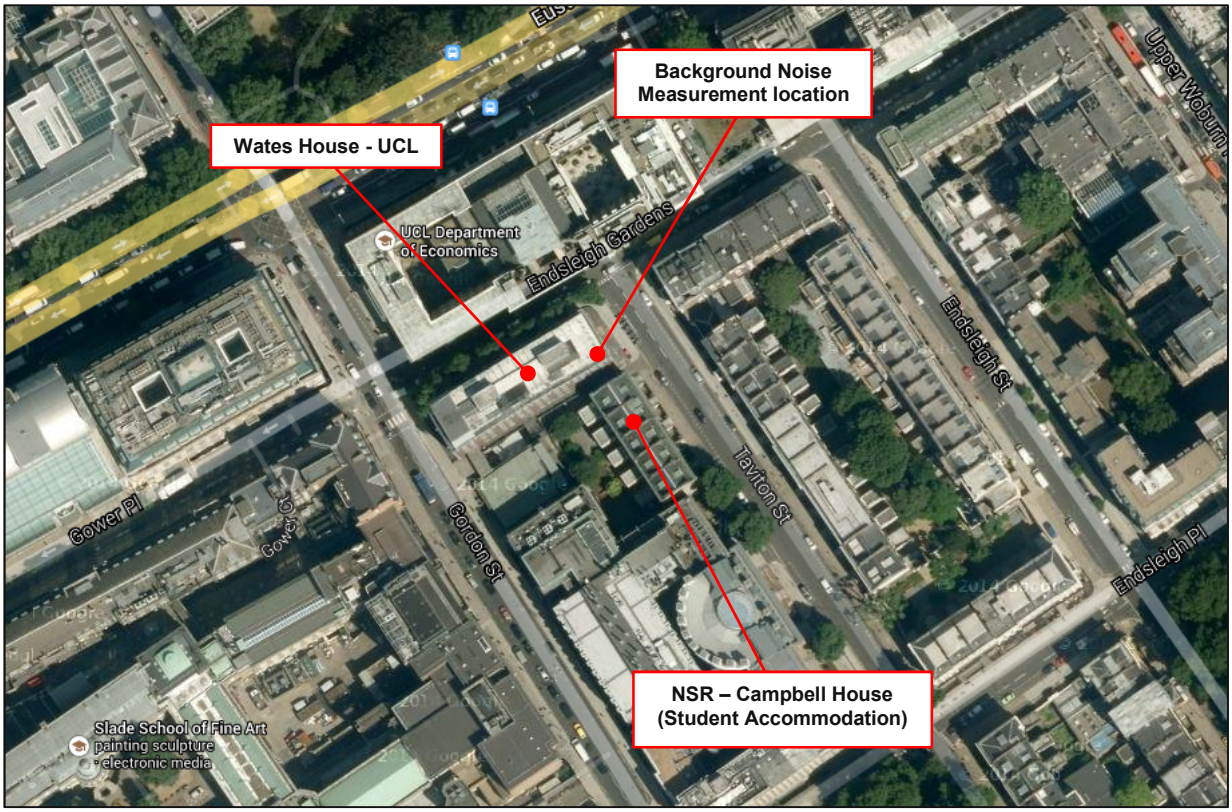


Figure 1 Site Map

2.2 Summary of Findings

Camden Council's noise level criteria for developments containing mechanical plant and machinery are based upon the measured background noise levels and guidance contained in the published document, *Camden Development Policies 2010-2025 – Local Development Framework.* These levels are detailed in Section 4 of this report.

Noise modelling based on the proposed design of the mechanical plant and equipment show that the noise level at the nearest affected NSR is predicted to exceed the noise level criteria by up to 8 dB. Therefore noise mitigation measures in the form of acoustic duct attenuators are required.

Recommendations for decreasing the noise to within acceptable levels include the installation of acoustic duct attenuators to the AHUs located at basement level. Detailed mitigation measures are given in Section 7 of this report.

Provided the noise mitigation measures are satisfactorily implemented, the noise emission from the mechanical plant and equipment will be within the acceptable noise limits detailed in Section 4 of this report.

3 Guidance and Acoustic Requirements

3.1 Camden Council Development Policies

Camden Council's requirement for good acoustic amenity is detailed in a published document, *Camden Development Policies 2010-2025 – Local Development Framework*. The document detail guidelines for acceptable noise levels at sensitive receptors from new developments containing mechanical plant and machinery. These levels are shown in Table E of the Development Policy and reproduced in Table 1 below.

Table 1 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	5 dBA < L_{A90}
Noise that has a distinguishable discrete continuous noise (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10 dBA < L_{A90}
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10 dBA < L_{A90}
Noise at 1 metre external to sensitive façade where L_{A90}>60 dB	Day, evening and night	0000-2400	L_{Aeq} 55 dB

4 Background Noise Survey and Acceptable Noise Levels

4.1 Background Noise Survey

A background noise survey was conducted on 25 March 2013 by Buro Happold as part of the Stage C Acoustic Report. As agreed with Camden Council, it was established that the background noise level on the roof edge of Wates House is equivalent to the background level at the nearest residential premises located approximately 8 metres away. Therefore 24-hour noise monitoring was conducted at the roof edge of Wates House. Results of the noise monitoring are shown in Appendix B.

Table 2 Lowest $L_{A90,\ 1\ hour}$ Background Noise Level during the Day, Evening and Night

Day (0700-1900)	Evening (1900-2300)	Night (2300-0700)
59 dBA	59 dBA	58 dBA

Table 2 above shows the lowest $L_{A90,\ 1\ hour}$ background noise level during the day, evening and night-time period. The background level was predominated dominated by the rooftop mechanical plant located at the adjacent Chemistry building.

4.2 Acceptable Noise Levels

Based on the measured background noise levels and Camden Council's noise criteria, the noise emission from the proposed mechanical plant and equipment must not exceed the levels detailed in Table 3.

Table 3 Acceptable Noise Levels at 1 Metre from the Façade of NSR

NSR Location	Day (0700-1900)	Evening (1900-2300)	Night (2300-0700)
Campbell House (Student Accommodation)	54 dBA	54 dBA	53 dBA

It is assumed that the mechanical equipment is broadband in nature with no intermitted or impulsive characteristics. Therefore no corrections for tonal or intermitted noise have been included.

5 Wates House Mechanical Plant and Equipment

5.1 Existing and Proposed Mechanical Equipment

The Workshop Undercroft contains four existing dust extract units which operate when required which is typically during the day. Three of the four extract units will be removed while the remaining unit will be refurbished.

The proposed mechanical equipment such as the AHUs, air-conditioning condensers and extract fans are located at basement level within a Plant Zone and Workshop Undercroft. Additional AHUs, extract fans, chillers and pumps are located at roof level. These locations are shown in Appendix A.

Mechanical equipment and their respective manufacturers' data have been provided by Buro Happold. The make and model of some mechanical equipment have yet to be finalised however typical noise levels for such equipment are assumed. Details of the proposed equipment are given in Table 4 below. It is assumed that all plant is broadband in nature with no intermitted or impulsive characteristics.

Table 4 Proposed Mechanical Equipment Sound Power level

Plant Description		Octave Band Noise Level – dB re 10^{-12} W								dBA
		63	125	250	500	1000	2000	4000	8000	
AHU-01 to 04 FläktWoods Air Handling Unit eQ	Inlet	65	75	61	58	52	51	41	36	62
	Outlet	69	84	87	88	82	80	75	72	89
	Breakout	69	76	64	53	54	55	50	37	61
EF-01 to 04*	Outlet	76	76	72	69	67	63	61	56	72
TEF*	Outlet	76	78	75	74	72	68	65	59	77
Dust Extract unit Donaldson Series UMA 450	-	No Spectrum Available								78
A/C Condensers*	-	No Spectrum Available								76
Chilled Water Pump*	-	No Spectrum Available								75
Free Cooling Chiller Uniflair BCEF0632A	-	No Spectrum Available								82
Air Cooled Chiller Uniflair BREC2802 ULN	-	No Spectrum Available								83

* Equipment selection has yet to be finalised therefore typical sound power levels are given.

6 Predicted Mechanical Plant Noise Emission

6.1 Predicted Noise Levels

Noise predictions at the NSRs were calculated using the CadnaA computer modelling software. The predictions were based on architectural drawings by Hawkins Brown and plant locations/specifications by Buro Happold. It is assumed that all plant and equipment except for the dust extraction unit will be operating at all times. Therefore the predicted noise levels have been assessed against the night-time criteria whereby background noise levels are at their lowest. The following parameters and assumptions were utilised;

- Formulas contained in ISO 9613:1996 – Acoustics – Attenuation of sound during propagation outdoors,
- Atmospheric temperature of 15 °C and relative humidity of 70 %,
- Average distance from source to receptor is approximately 10 metres,
- Workshop Undercroft is a highly reverberant field with hard concrete surfaces, and
- No existing barriers have been accounted for between the noise sources and receptors.

Table 5 Predicted Noise Level at NSR during the Night

Receptor	Contribution from the Workshop Undercroft	Contribution from Rooftop	Cumulative Noise Level	Noise Criterion	Compliance
Campbell House - GF (Student Accommodation)	61 dBA	31 dBA	61 dBA	53 dBA	No 8 dB exceedence
Campbell House - 3F (Student Accommodation)	51 dBA	38 dBA	51 dBA	53 dBA	Yes

Table 5 shows the noise emission from the proposed mechanical plant and equipment at Wates House exceeds the noise level criteria by up to 8 dB at ground floor. Therefore noise mitigation measures are required. The most dominant noise contribution is from the Workshop Undercroft due to the basement level AHUs which have a discharge sound power level up to 11 dB higher than other plant and equipment located in the Undercroft.

When the dust extract unit operates during the day, the contribution from the Workshop Undercroft remains 61 dBA at ground floor. Therefore the extract unit does not contribute to the cumulative noise level.

7 Noise Mitigation Measures

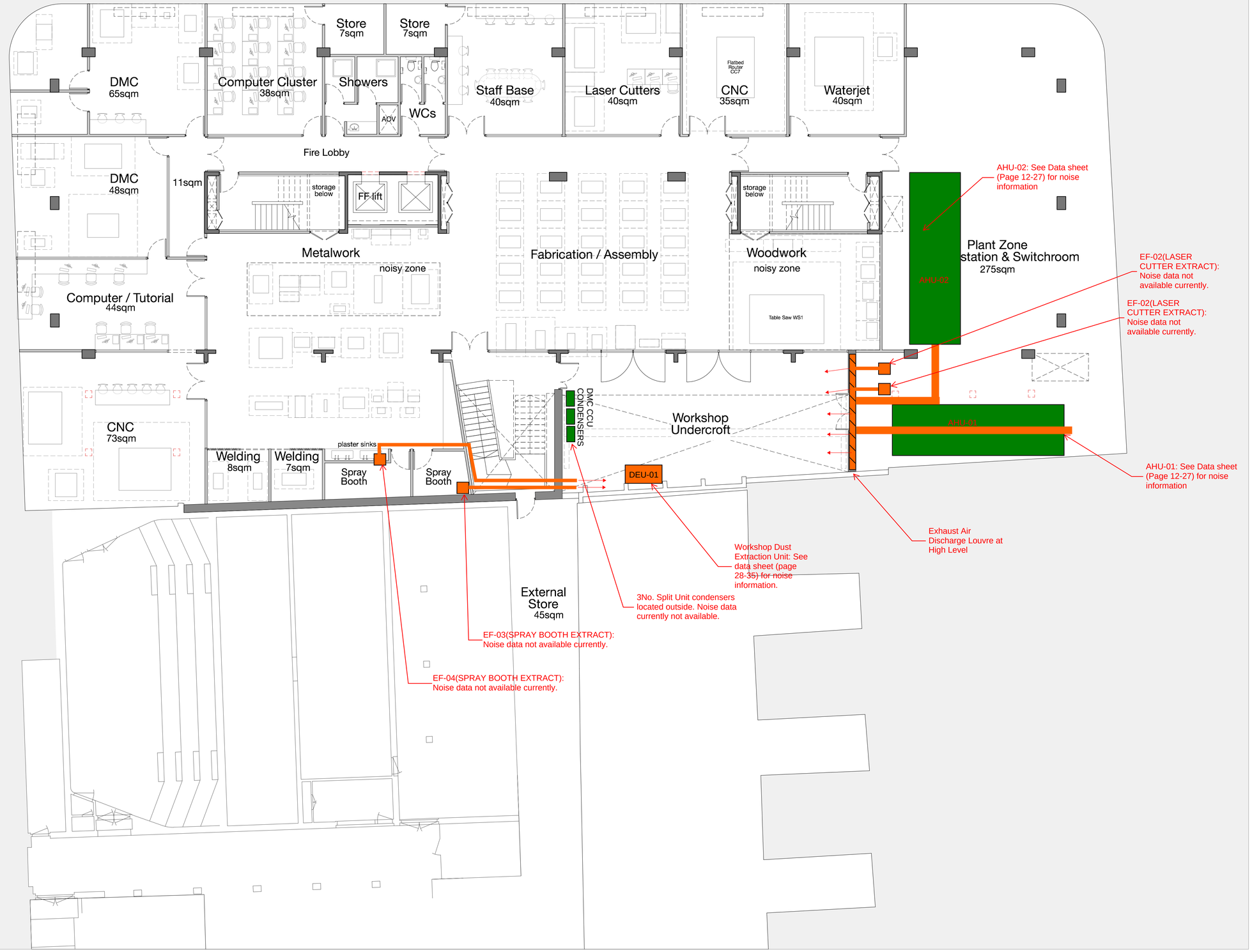
7.1 Workshop Undercroft Noise Mitigation Measures

Noise emitted from the Undercroft is primarily due to the exhaust connection of the AHUs located within the basement Plant Zone. This is because the sound power level of the exhaust connection is up to 17 dB higher than other mechanical equipment as shown in Table 4. We recommend acoustic attenuators which achieve a 20 dB reduction be installed on the exhaust connection side of the AHUs.

8 Conclusion

Predictions show that the noise emission from the proposed mechanical plant exceed Camden Council's noise level criteria by up to 8 dB and therefore require noise mitigation measures. Provided the noise mitigations measures detailed in Section 7 are satisfactorily implemented, emission from the mechanical plant will be within acceptable levels at the nearest affected noise sensitive receptor.

Appendix A Mechanical Plant Locations



Revisions

01	25/04/14	Issued for Information
02	02/05/14	Issued for Information

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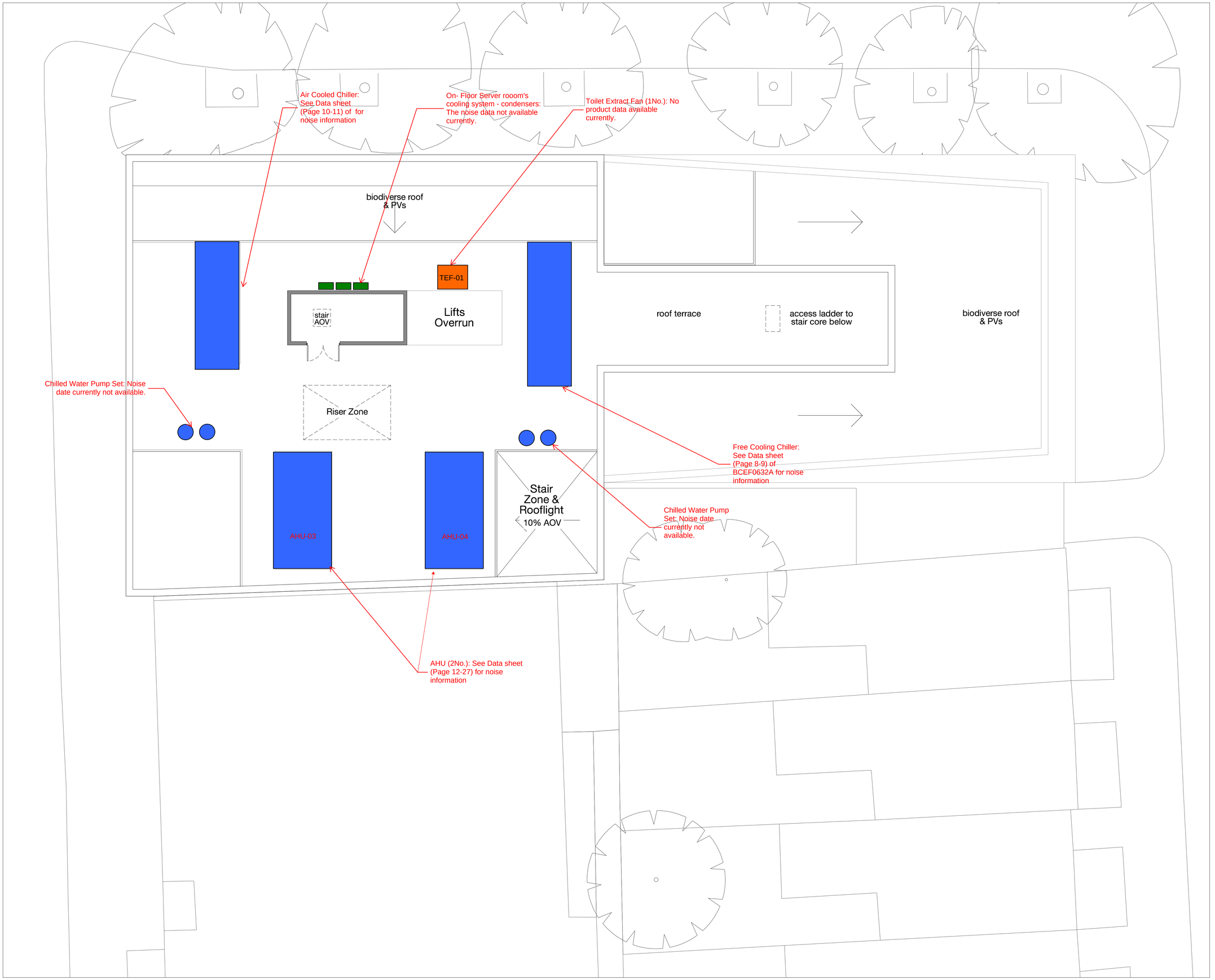
Drawing
Basement Plan Area
Proposed
Sketch Layouts

Scale: A1 (A3) 1:100 (1:200)	Date May 2014
Drawn by TC	Checked by TN
Job Number 1410	Status DRAFT

Drawing No. & Revision
1410_SK_246



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Project
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Drawing
Roof Level Plan Area
Proposed
Sketch Layouts

Scale: A1 (A3)	Date
1:100 (1:200)	May 2014
Drawn by	Checked by
TC	TN
Job Number	Status
1410	DRAFT

Drawing No. & Revision
1410_SK_252

Appendix B - Background Noise Survey

Noise Survey location

Wates House, Gordon Street, London WC1H 0QB

Date and Time of Survey

25 - 26 March 2013

Instrumentation

Brueler & Kjaer

Sound Level Analyser Type 2250, S/N: 2611546;

Microphone – ½"FF 0V, 4189, S/N: 2670669;

Preamplifier – 2250: ZC 0032, S/N: 13682;

Calibrator type 4231, S/N:2438725;

Outdoor microphone kit (UA 1404), Cable preamplifier extension (AO 0441-03).

Outdoor microphone kit (UA 1404), Cable preamplifier extension (AO 0441-03).

Calibration procedure

Before and after the survey the measurement apparatus was check calibrated to an accuracy of +/- 0.3 dB using the type 4231 Sound Level Calibration.

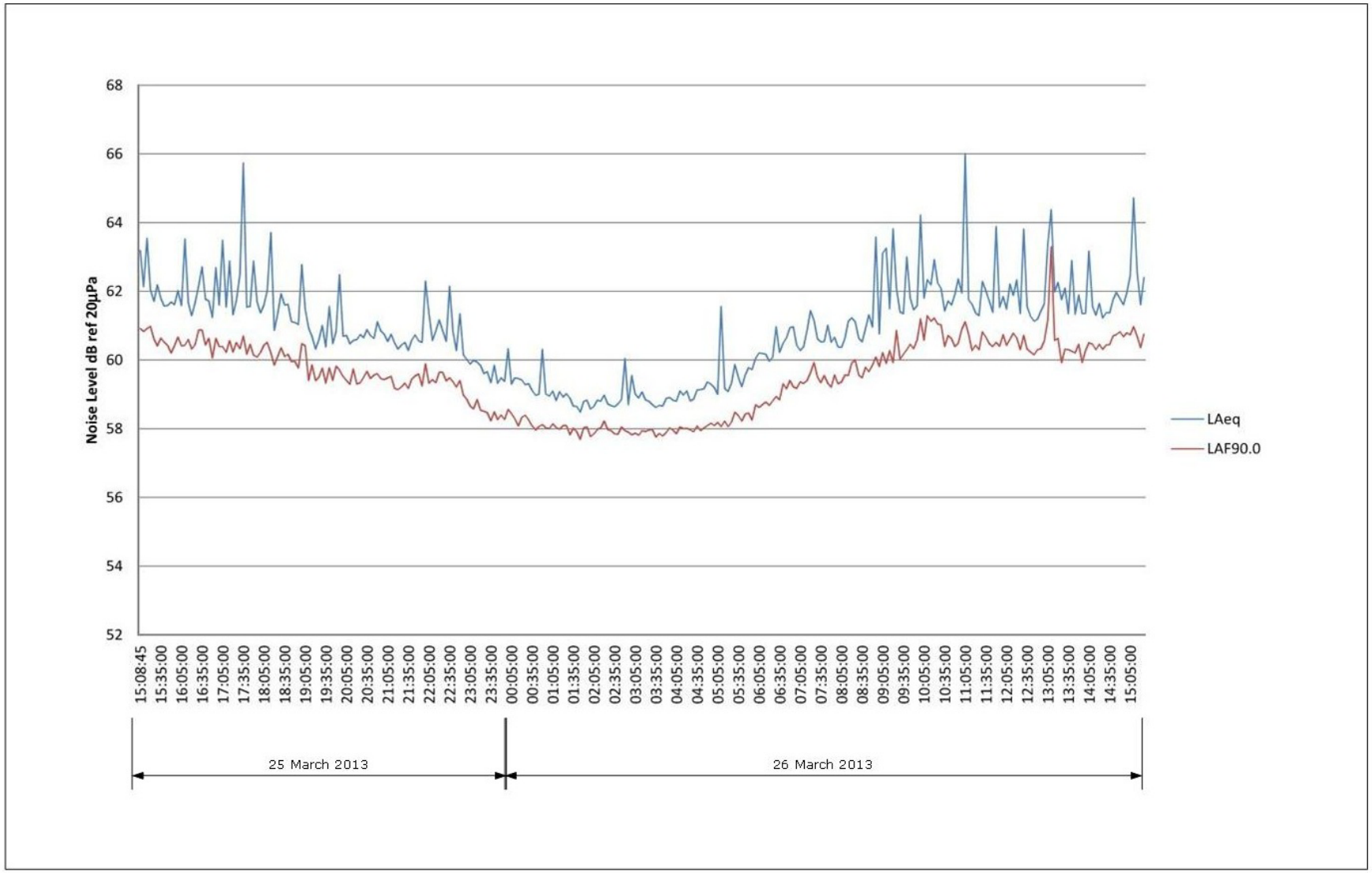

Figure 2 Measured L_{A90} Background Noise Level

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