# MIB CHILLER REPLACEMENT, UNIVERSITY OF MANCHESTER

# ENVIRONMENTAL NOISE ASSESSMENT

**Date:** **17th December 2012**
**Our Ref:** **B7041/ENV/P2**
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# QUALITY MANAGEMENT

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| Date: | **17th December 2012** |
| Project Number/Document Reference: | **B7041/ENV/P2** |


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# 1 INTRODUCTION

1.1 RPS (Acoustics) has been commissioned by the Univesity of Manchester (UoM) to carry out a noise impact assessment of the proposed replacement chiller units at the Manchester Interdisciplinary Biocentre (MIB) John Garside building.

1.2 The purpose of this Report is to assess the calculated noise impact of the proposed replacement chiller units upon the nearest noise sensitive receptors (NSRs), in accordance with the criteria set by the Local Authority.

1.3 To assess the level of noise impact due the proposed replacement chiller units, the noise level at the nearest residential properties due to each building services scenario (i.e. level due to existing units & level due to proposed units) has been modeled using SoundPLAN 7.1 noise modelling software. A comparison of the two models has then been made so as to establish the impact of the proposed chiller units relative to the existing noise climate.

# 2 NOISE UNITS, STANDARDS AND GUIDANCE

## a) Noise Units

2.1 Noise is defined as unwanted sound. The range of audible sound is from 0dB to 140dB. The frequency response of the ear is usually taken to be about 18Hz (number of oscillations per second) to 18,000Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise-measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dB(A) weighting. This is an internationally accepted standard for noise measurements.

2.2 For variable noise sources such as traffic, a difference of 3dB is generally accepted as just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3dB. The "loudness" of a noise is a purely subjective parameter but it is generally accepted that an increase/decrease of 10dB corresponds to a doubling/halving in perceived loudness.

2.3 External noise levels are rarely steady but rise and fall according to activities within an area. In an attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

### *i. The $L_{Aeq}$ noise level*

2.4 This is the "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 [1] as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

2.5 It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

### *ii. The $L_{A90}$ noise level*

2.6 This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

## b) Standards and Guidance

### *i. Local Authority Criteria*

2.7 It is understood from correspondence with the Local Authority that the new chiller units should be designed so that the cumulative specific noise level, when measured at the nearest noise sensitive receptors, does not exceed that of the existing equipment i.e. the resultant noise impact will be equal to or less than the existing level and should therefore not cause an increase in background levels.

# 3 SITE DESCRIPTION

3.1 The MIB John Garside Building is located off Brook Street in the southwest quadrant of the north campus of the UoM. It is surrounded by existing university, commercial and residential properties on all sides. The A57(M) Mancunian Way is located approximately 100m to the south of the site.

3.2 Two existing chillers and one dry air cooler at the site are proposed to be replaced with new energy efficient models as detailed in Table 3.1 below:

**Table 3.1 : Existing and proposed plant items**

| Existing Item | Reference | Proposed Replacement Item | Reference |
|---|---|---|---|
| 2No. Main Chillers | Climaveneta Chiller FOCS-CA / SL | 2No. Main Chillers | Airedale Turbo Chill TTC12E210X95 |
| 1No. Dry Air Cooler | GEA Searle T2R 100KW | 1No. Process Chiller | Airedale 6K-00-0411 with AA203 acoustic package |

3.3 It is understood that all items are located at rooftop level. It is further understood that the 2No. replacement main chillers are to be located in a similar position to the existing chiller units whereas the new process chiller unit is to be located to the north east of the existing dry air cooler.

3.4 The nearest noise sensitive properties to the development are Weston Hall (located approximately 20m to the north of the site) and Princess House (located approximately 20m to the west of the site). The assessment contained within this report is therefore based upon considering the noise impact on these locations

3.5 A site plan indicating the proposed location of the replacement chiller units and the location of nearest residential properties is given in Appendix 1.

3.6 Manufacturer's plant noise data for existing and proposed items of mechanical services plant is shown in Appendix 2.

# 4 NOISE IMPACT ASSESSMENT

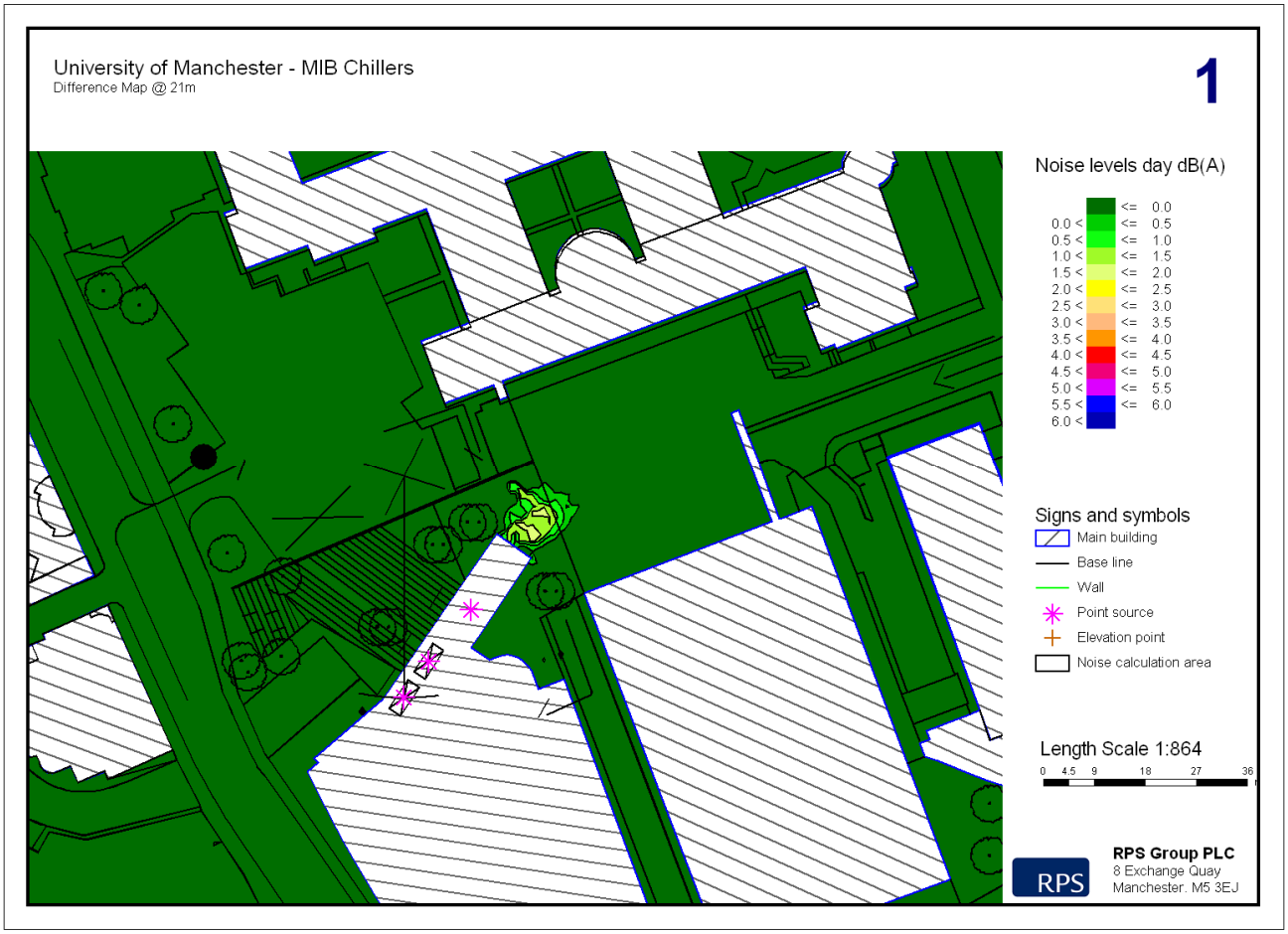
4.1 Using the manufacturers noise data detailed in Appendix 2, the noise level at the nearest residential façade has been predicted using a model produced using SoundPLAN 7.1 modelling software for the following two scenarios:

Scenario 1: Existing situation with 2No. chillers and 1No. dry air cooler

Scenario 2: Proposed situation with 2No. replacement air cooled chillers and 1 process chiller

4.2 Grid Noise Map 1 below shows a comparison between the Scenario 1 (existing) and Scenario 2 (proposed) plant noise computer models. The map shows the computational difference between the 'existing' and 'proposed' models. Areas of noise impact due to the proposed chiller units which are at least equal to, or below, the level of noise impact from the existing situation are shown in dark green.

**Grid Map 1: Difference in predicted noise levels between existing and proposed chiller scenarios**



4.3 As can be seen from the results detailed in Grid Noise Map 1, noise emissions at the nearest residential properties due to the proposed replacement chiller units are no higher than the current background noise level, thereby satisfying the design criteria set by the Local Authority. It is worth noting that RPS Acoustics have worked closely with RPS Building Services to achieve this criteria. Initially, the proposed process chiller was designed to emit significantly higher noise emissions than the existing dry air cooler. A number of acoustically attenuated design iterations have been entered into SoundPLAN to achieve the results shown in Grid Noise Map 1.

4.4 It can be seen from the data provided in Appendix 2 that noise emissions for existing plant is in broad band only, and no frequency content was available for use in the SoundPLAN model. In order to compensate for the lack of frequency data, a typical chiller spectrum shape was applied to each unit in the 'existing' situation. It is considered that this should provide the most meaningful of modelling results in the absence of specific frequency data.

**a) Design Progression**

4.5 In order to see that future selection changes do not alter the outcome of the planning assessments, it is recommended that the data given in Appendix 2 be considered as a plan of plant constraints for the development.

# 5 CONCLUSIONS

5.1 A design stage noise impact assessment has been carried out in order to support the planning application for the proposed replacement chiller units at the UoM MIB John Garside building.

5.2 Noise models detailing the predicted noise levels at the nearest residential façades due to existing and proposed chiller unit scenarios have been calculated using SoundPLAN 7.1 noise modelling software. Models have been based on manufacturer's plant noise data.

5.3 A comparison of noise models for each scenario has indicated that the impact at the nearest residential properties due to the proposed replacement chiller units will be no greater than the existing plant noise levels, thereby demonstrating compliance with the Local Authority criteria.

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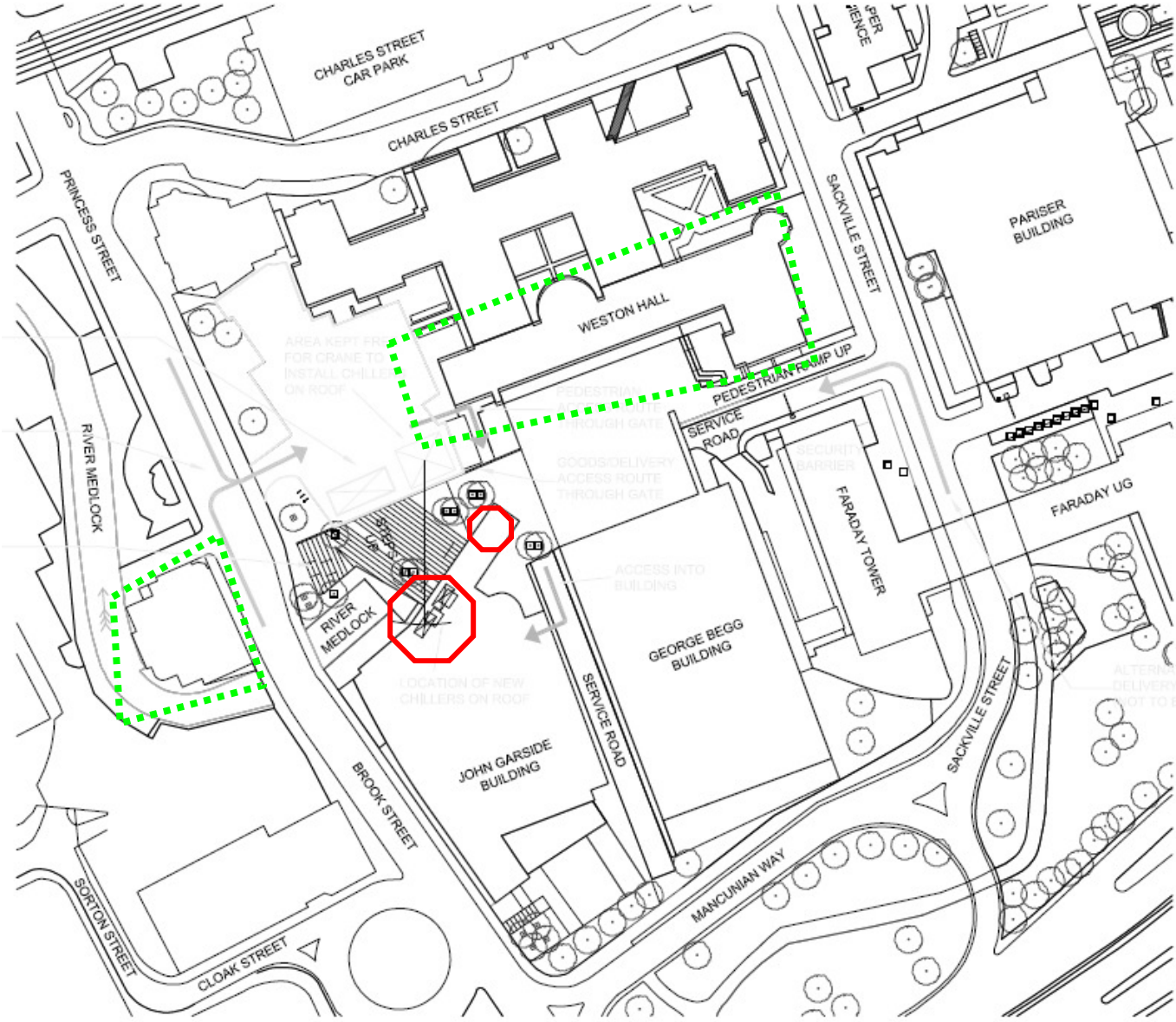
## APPENDIX 1. APPROXIMATE MEASUREMENT POSITIONS




**Key:**

Nearest Residential Properties

Approximate Location of proposed 2No. main chiller units

Approximate Location of proposed 1No. process chiller unit

## APPENDIX 2. MANUFACTURERS PLANT NOISE LEVEL DATA

Existing Rooftop Units

| Item | No. Units | Reference | Acoustic Descriptor | Broadband Data – dB(A) |
|---|---|---|---|---|
| Main Chillers | 2 | Climaveneta Chiller FOCS-CA / SL | Sound Power Level | 90 |
| Dry Air Cooler | 1 | GEA Searle T2R 100KW | Sound Pressure Level @ 1m | 65 |

Replacement Rooftop Units

| Item | No. Units | Reference | Acoustic Descriptor | 1/1 Octave Band Data – dB(lin) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Main Chillers | 2 | Airedale Turbo Chill TTC12E210X95* | Sound Power Level | 92 | 86 | 88 | 84 | 84 | 81 | 75 | 72 |
| Process Chiller | 1 | Airedale 6K-00-0411 with AA203 acoustic package* | Sound Pressure Level @ 10m | 58 | 40 | 37 | 32 | 40 | 30 | 29 | 29 |

* Including composite insulation to discharge pipework and compressor housing, and straight duct extensions.

** 'AA203 acoustic package' includes lift-off intake acoustic louvres + 900mm high discharge attenuator.