

# Manchester Aquatics Centre Phase 1

## Condition Discharge Report

27112/RP4

19 May 2023

For:  
Kier Construction Limited  
3rd Floor Optimum House  
Clippers Quay  
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## Condition Discharge Report 27112/RP4

### Document Control

| Issue | Date       | Comment | Prepared by                                                                       | Authorised by                                                                       |
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|       |            |         |                                                                                   |                                                                                     |

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Appendix A – Acoustic Terminology

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## 1.0 Introduction

The refurbishment project at Manchester Aquatics Centre was granted planning on 01 November 2021 subject to a number of conditions (ref: 131571/VO/2021). Phase 1 of the works are now close to practical completion and the conditions requiring verification reports, namely Condition 5b and 6b, need to be discharged prior to the first use of the building.

As such, Hann Tucker Associates has been appointed undertake post completion assessments with the aim of discharging Conditions 5b and 6b set by Manchester City Council.

## 2.0 Condition Wording

### 2.1 Condition 5b

Condition 5b is the verification part to Condition 5a which states that *"the premises shall be acoustically insulated and treated in accordance with the recommendations in the 'Environmental Noise Survey Report ref. 27112/NIA1"*.

It is assumed that the above relates to earlier versions of "27112/NIA1" which assessed a scheme where the existing glazing to the Level 01 Gyms was to be replaced. The glazing to the Gyms has not been replaced and has been left as existing so the Condition may no longer be relevant to the scheme. However, Condition 5b still remains on the Decision Notice and in the interest of providing a robust assessment, the existing condition will be assessed with a view to discharging Condition 5b.

The specific wording for Condition 5b is presented below:

*"Prior to first use of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria."*

### 2.2 Condition 6b

Condition 6b is the verification part to Condition 6a which states that *"externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with the recommendations in the 'Noise Survey & Plant Noise Assessment Report ref. 27112/NIA1."*



The specific wording for Condition 6b is presented below:

*“Prior to first use of the equipment, a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.”*

## **3.0 Objectives**

### **3.1 Condition 5b**

To visit site to carry out a series of facade sound insulation tests with a view to establishing the performance of the Gym facades.

Using the measured façade performance and typical gym activity noise levels, calculate the noise egress levels associated with potential gym use at the nearest affected premises to show compliance with Condition 5b.

N.B Please note that due to site limitations the façade sound insulation test procedure was not in-line with ISO 16283-3:2016. See Section 7.1 for further information.

### **3.2 Condition 6b**

To visit site to carry out noise measurements of the operational plant installation and surrounding background noise levels.

Calculate the cumulative noise levels of the operational plant items at the nearest affected premises.

Based on the calculated cumulative noise levels of the operational plant items, determine whether the installation is in-line with the approved scheme and the requirements of Planning Condition 16b.

## **4.0 Acoustic Terminology**

Please refer to Appendix A for an explanation of acoustic terminology used herein.



## 5.0 Site Description

### 5.1 Location

The Manchester Aquatics Centre is located on Oxford Road in Manchester. The site falls under the jurisdiction of Manchester City Council (MCC). See site location plan below.



Location Map (Map Data @ 2021)

### 5.2 Description

The site lies to the south of Manchester City Centre close to Manchester Metropolitan University. The site is bound by Oxford Road to the west and neighbouring buildings to all other sides. There are commercial properties and The Church of Jesus Christ of Latter-day Saints to the north-west, however the surrounding area is predominantly university buildings. The nearest residential buildings are over 180m away to the west (Cavendish Hall Student Residential) and 105m to the north (Residential; on Hanworth Close). See site plan below.



Site Plan (Map Data @ 2021)



## 6.0 Environmental Noise Survey

Fully automated environmental noise level monitoring was undertaken between 10:00 hours on Wednesday 07 April 2021 and 16:00 hours on Thursday 08 April 2021 and between 13:00 hours on Wednesday 12 May 2021 to 14:00 hours on Friday 14 May 2021. The survey was carried out to establish the existing daytime and night-time background noise levels around the vicinity of the site and the nearby receptors.

Supplementary attended noise level measurements were undertaken between 17:30 and 19:00 hours on Thursday 08 April 2021 to establish representative noise levels close to the MECD Building at Manchester University.

Please see Appendix B for the full Environmental Noise Survey Report.

## 7.0 Condition 5b Assessment

### 7.1 Procedure

Sound insulation tests across the façade were carried out as follows:

- Noise sources generating high levels of pink noise were placed in the Gym area and the reverberation noise level within the space measured using a Type 1 Sound Level Meter.
- The resulting noise level external to the Gym area was then measured with the noise source still operating.
- The noise sources were turned off and the “background” noise level externally was measured.
- Using the above measurements the level difference, D, across the Gym facade was established.

The location of the façade sound insulation testing carried out is highlighted below:



Location of Façade Tests – Level 01 Gyms to Outside



## 7.2 Equipment

The following equipment was used for the testing.

| Equipment                      | Make and Model         | Serial Number | Calibration Date | Certificate No |
|--------------------------------|------------------------|---------------|------------------|----------------|
| Precision Sound Analyser Meter | Brüel & Kjær Type 2250 | 2600445       | 05/12/2022       | 04944/2        |
| Sound Level Calibrator         | Brüel & Kjær Type 4231 | 2115545       | 05/12/2022       | 04944/1        |

## 7.3 Results

The results of the airborne sound insulation testing are presented in the table below where L1 is the measured noise level inside the Gym with the speaker running, L2 is the measured noise levels externally with the speaker running and BG is the measured noise levels externally with the speaker not running.

| Description     | Element | Test Reference | Measured Sound Pressure Level (dB) at Octave Band Centre Frequency (Hz) |     |     |     |      |      |      |
|-----------------|---------|----------------|-------------------------------------------------------------------------|-----|-----|-----|------|------|------|
|                 |         |                | 63                                                                      | 125 | 250 | 500 | 1000 | 2000 | 4000 |
| Cardio Suite    | Facade  | L1             | 97                                                                      | 102 | 96  | 90  | 87   | 83   | 81   |
|                 |         | L2             | 69                                                                      | 67  | 63  | 57  | 54   | 49   | 44   |
|                 |         | BG             | 61                                                                      | 55  | 50  | 47  | 48   | 40   | 31   |
| Fitness Suite 2 | Facade  | L1             | 98                                                                      | 102 | 96  | 91  | 88   | 82   | 80   |
|                 |         | L2             | 65                                                                      | 67  | 60  | 50  | 48   | 43   | 39   |
|                 |         | BG             | 63                                                                      | 58  | 53  | 52  | 49   | 45   | 41   |

Some of the external noise levels measured with the speaker running are lower than with the speaker not running (see 2000 and 4000 Hz for the Fitness Suite 2 test). This is due to the fact that externally to Fitness Suite 2 is an existing plant room that was generating noise that masked the noise break-out.

To a lesser extent traffic noise from Oxford Road affected the measured results, however, every effort was made to minimise the impact of traffic noise on the measurements by taking measurements during lulls in traffic.



## 7.4 Assessment

### 7.4.1 Façade Performance

Based on the measurement results, the calculated level difference across each façade is shown below:

| Façade          | Measured Level Difference (dB D) at Octave Band Centre Frequency (Hz) |     |     |     |      |      |      | D <sub>w</sub> (dB) |
|-----------------|-----------------------------------------------------------------------|-----|-----|-----|------|------|------|---------------------|
|                 | 63                                                                    | 125 | 250 | 500 | 1000 | 2000 | 4000 |                     |
| Cardio Suite    | 28                                                                    | 35  | 38  | 42  | 41   | 40   | 42   | 42                  |
| Fitness Suite 2 | 19                                                                    | 34  | 33  | 34  | 34   | 33   | 37   | 35                  |

### 7.4.2 Noise Breakout Assessment

To inform our assessment of the Gym, we have drawn upon previously measured noise levels to be considered as typical highest 1-hour noise levels during operation (ie worst case), as set out below.

| Description                                       | Reverberant Noise Level (dB L <sub>eq,1hr</sub> ) at Octave Band Centre Frequency (Hz) |     |     |     |    |    |    | dBA |
|---------------------------------------------------|----------------------------------------------------------------------------------------|-----|-----|-----|----|----|----|-----|
|                                                   | 63                                                                                     | 125 | 250 | 500 | 1k | 2k | 4k |     |
| <b>Worst-case</b><br>(Loud Music/Amplified Voice) | 75                                                                                     | 80  | 85  | 85  | 85 | 90 | 90 | 95  |

We have assessed noise breakout to the worst affected receptors as follows:

- **Daytime (07:00 – 19:00)** Geoffrey Manton Building, 25m away
- **Night-time (23:00 – 07:00)** Cavendish Hall Student Residential, 180m away

We have calculated the level of noise egress based on the following equation for reverberant noise breakout and source noise levels above.

$$SPL_{out} = SPL_{in} - SRI + 10 \log_{10} \left( \frac{S}{r^2} \right) - 14$$

Where:

SRI measured sound reduction performance of façade element  
 r distance from radiating element to receptors  
 S approximate area of radiating element

The calculated egress levels to both receptors are shown below for the lowest performing façade (ie the Fitness Suite 2):



| Daytime Assessment<br>to Geoffrey Manton Building                                                   | Octave Band Centre Frequency (Hz) |     |     |     |      |      |      | dBA |
|-----------------------------------------------------------------------------------------------------|-----------------------------------|-----|-----|-----|------|------|------|-----|
|                                                                                                     | 63                                | 125 | 250 | 500 | 1000 | 2000 | 4000 |     |
| Internal noise level (dB L <sub>eq</sub> )<br>$SPL_{in}$                                            | 75                                | 80  | 85  | 85  | 85   | 90   | 90   | 94  |
| Sound Reduction, R, (dB)                                                                            | 19                                | 34  | 33  | 34  | 34   | 33   | 37   | -   |
| Distance & radiating area propagation<br>correction (dB)<br>$10\log_{10}\left(\frac{S}{r^2}\right)$ | -5                                | -5  | -5  | -5  | -5   | -5   | -5   | -   |
| Internal diffuse field to external free-field<br>hemispherical radiation correction (dB)            | -14                               | -14 | -14 | -14 | -14  | -14  | -14  | -   |
| Calculated egress level (dB L <sub>Aeq</sub> )                                                      | 37                                | 27  | 33  | 32  | 32   | 38   | 34   | 41  |

| Night-time Assessment<br>to Cavendish Halls Student<br>Residential                                  | Octave Band Centre Frequency (Hz) |     |     |     |      |      |      | dBA |
|-----------------------------------------------------------------------------------------------------|-----------------------------------|-----|-----|-----|------|------|------|-----|
|                                                                                                     | 63                                | 125 | 250 | 500 | 1000 | 2000 | 4000 |     |
| Internal noise level (dB L <sub>eq</sub> )<br>$SPL_{in}$                                            | 75                                | 80  | 85  | 85  | 85   | 90   | 90   | 94  |
| Sound Reduction, R, (dB)                                                                            | 19                                | 34  | 33  | 34  | 34   | 33   | 37   | -   |
| Distance & radiating area propagation<br>correction (dB)<br>$10\log_{10}\left(\frac{S}{r^2}\right)$ | -22                               | -22 | -22 | -22 | -22  | -22  | -22  | -   |
| Internal diffuse field to external free-field<br>hemispherical radiation correction (dB)            | -14                               | -14 | -14 | -14 | -14  | -14  | -14  | -   |
| Calculated egress level (dB L <sub>Aeq</sub> )                                                      | 20                                | 10  | 16  | 15  | 15   | 21   | 17   | 24  |

Based on the above, calculations indicate that the building façade is capable of controlling noise break-out as the above noise egress levels are at least 10 dB below the existing background noise levels within the vicinity of the site. As such, this should serve as suitable evidence to show that Condition 5b can be discharged.

See Appendix A for the full details relating to the noise survey.

## 8.0 Condition 6b Assessment

### 8.1 Established Plant Noise Emission Limits

On the basis of the aforementioned acoustic standards and the results of our surveys, we propose that the following plant noise emission limits be achieved at 1 metre (incident) from the windows of the nearest noise sensitive receptors.



| Receptor Location          | Plant Noise Rating Limit $L_{A,Tf}$ (dB) |                                  |                                     |
|----------------------------|------------------------------------------|----------------------------------|-------------------------------------|
|                            | Daytime<br>(07:00 – 19:00 hours)         | Evening<br>(19:00 – 23:00 hours) | Night-time<br>(23:00 – 07:00 hours) |
| Oxford Road                | 52                                       | 49                               | 40                                  |
| South (Entrance Courtyard) | 55 <sup>1</sup>                          | 49                               | 40                                  |
| North (York Street)        | 49                                       | 48                               | 41                                  |

Note 1: Plant noise egress level of 55 dB  $L_{A,Tf}$  is 2 dB below the background noise level rather than 5 dB below. However, this level was agreed with Graeme Souter MCC Environmental Health via email on 16 August 2021.

Noise shall be assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality.

## 8.2 Survey Procedure

A fully attended noise survey was undertaken by Jake Howarth BEng(Hons) from approximately 18:47 to 19:00 on Thursday 18 May 2022.

All measurements were collated in general accordance with BS 7445-1:2003 *Description and Measurement of Environmental Noise*.

Weather conditions were considered suitable for obtaining representative readings of plant noise, with low winds.

Both ASHPs were running at 100% duty and were currently heating up the swimming pools.

## 8.3 Measurement Locations

There are external ASHPs located within an existing compound on the south façade. 2No measurement locations were selected to measure the noise from these units as follows:

- Position A: Located approximately 3.2m from the right most unit as seen the plan overleaf. The measurement position was carried out externally to the compound, however, the compound itself is a slatted timber fence which would be acoustically transparent.
- Position B: Located approximately 16.4m from the edge of the plant compound close to the site hoarding. This position was selected to be representative of the noise levels experienced at The Church of Jesus Christ of Latter-day Saints.

Locations were as indicated on the plan shown below:



Measurement Locations shown on Site Plan

## 8.4 Instrumentation

During the testing, the following equipment was used.

| Equipment                      | Make and Model         | Serial Number | Calibration Date | Certificate No |
|--------------------------------|------------------------|---------------|------------------|----------------|
| Precision Sound Analyser Meter | Brüel & Kjær Type 2250 | 2600445       | 05/12/2022       | 04944/2        |
| Sound Level Calibrator         | Brüel & Kjær Type 4231 | 2115545       | 05/12/2022       | 04944/1        |

## 8.5 Survey Results

The following table summarises noise levels recorded at each of the measurement positions along with notes detailing the purpose of each measurement.

| Pos | Time  | Sound Pressure Level (dB) |                    | Notes                                                                                                                                                                                                                                            |
|-----|-------|---------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |       | L <sub>Aeq,T</sub>        | L <sub>A90,T</sub> |                                                                                                                                                                                                                                                  |
| A   | 18:47 | 56                        | 55                 | ASHPs running at 100%<br>ASHPs were dominant but traffic along Oxford Road could be heard.                                                                                                                                                       |
|     | 18:50 | 56                        | 55                 |                                                                                                                                                                                                                                                  |
|     | 18:56 | 48                        | 48                 | ASHPs off<br>Traffic along Oxford Road and plant from other buildings was dominant. Noise level considered to be lower than would be typical due to the site cabins being located along Oxford Road providing acoustic screening.                |
|     | 18:57 | 50                        | 49                 |                                                                                                                                                                                                                                                  |
| B   | 18:51 | 50                        | 49                 | ASHPs running at 100%.<br>ASHPs were audible but not dominant against the traffic along Oxford Road. However, please note that the traffic noise levels are considered to be lower than would be typical due to the presence of the site cabins. |
|     | 18:52 | 50                        | 49                 |                                                                                                                                                                                                                                                  |



| Pos | Time  | Sound Pressure Level (dB) |                    | Notes                                                                                                                                                                                                                |
|-----|-------|---------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |       | L <sub>Aeq,T</sub>        | L <sub>A90,T</sub> |                                                                                                                                                                                                                      |
|     | 18:59 | 50                        | 49                 | Traffic along Oxford Road and plant from other buildings was dominant. Noise level considered to be lower than would be typical due to the site cabins being located along Oxford Road providing acoustic screening. |
|     | 19:00 | 50                        | 50                 |                                                                                                                                                                                                                      |

## 8.6 Discussion of Noise Climate

The site is directly adjacent to Oxford Road, however, existing site cabins were located long the Oxford Road side of the site. The site cabins provided screening to the measurements positions that would not be there once the site is in operation. As such, the noise levels measured in absence of any ASHP noise are considered to be lower than would be measured in practice.

With the ASHPs operating, the noise emitted was clearly audible in Position A and somewhat audible in Position B. However the noise levels in Position B be were masked by traffic noise and other plant noise within the area.

Based on the measured noise levels in Position B, it would not be possible to establish the specific plant noise level in this location as the measured noise levels with both the units operation and not operation were the same. As such, for the purpose of the assessment the noise levels at Position A have been used and the specific plant noise egress levels have been calculated to see receptor. See Section 8.7 for more details.

## 8.7 Assessment

### 8.7.1 Daytime Assessment

The closest day-time receptor is considered to be The Church of Jesus Christ of Latter-day Saints located approximately 17m from the ASHP enclosure along York Street.

The following table summarises our assessment of day-time atmospheric noise emissions from the plant to this receptor:

| Results              |                           | Relevant Clause | Commentary                                             |
|----------------------|---------------------------|-----------------|--------------------------------------------------------|
| Ambient Sound Level  | 56 dB L <sub>Aeq</sub>    | 7.3.1           | Noise level measured in Position A – Units running     |
| Residual sound level | 48 dB L <sub>Aeq</sub>    | 7.3.2           | Noise level measured in Position A – Units not running |
| Specific Sound Level | 55 dB dB L <sub>Aeq</sub> | 7.3.3           | Specific level corrected for residual level            |



| Results                                |                    | Relevant Clause | Commentary                                                                                  |
|----------------------------------------|--------------------|-----------------|---------------------------------------------------------------------------------------------|
| Acoustic feature corrections           | +3 dB              | 9.2             | ASHPs could operate intermittent so a 3 dB correction has been applied to account for this. |
| Distance correction                    | -10 dB             | -               | Distance loss from 3.2m to receptor (17m) using "5-sided box" calculation method            |
| Rating level                           | 48 dB $L_{A_{Tr}}$ | 9.2             | Calculated by adding acoustic feature corrections to the specific sound level.              |
| MCC Limit (York Street – Daytime)      | 49 dB $L_{A90}$    | -               | See Section 8.1                                                                             |
| Excess of rating over MCC Requirements | <b>-1 dB</b>       | 11              | -                                                                                           |

Based on the above and the results of our noise survey, the levels of plant noise egress at the nearest noise sensitive receptor are likely below the requirements set out in Section 8.1. As such, Condition 5b is likely achieved by the current installations.

### 8.7.2 Night-time Assessment

The table provided overleaf summarises our assessment of night-time atmospheric noise emissions from the plant to the night-time receptor.

In addition, given the distance between the plant and the receptor no penalties have been applied to the plant noise egress level as it is unlikely any features would be audible.

| Results                                |                    | Relevant Clause | Commentary                                                                       |
|----------------------------------------|--------------------|-----------------|----------------------------------------------------------------------------------|
| Ambient Sound Level                    | 56 dB $L_{Aeq}$    | 7.3.1           | Noise level measured in Position A – Units running                               |
| Residual sound level                   | 48 dB $L_{Aeq}$    | 7.3.2           | Noise level measured in Position A – Units not running                           |
| Specific Sound Level                   | 55 dB $L_{Aeq}$    | 7.3.3           | Specific level corrected for residual level                                      |
| Acoustic feature corrections           | +0 dB              | 9.2             | ASHPs are unlikely to be audible at the receptor. No correction needed.          |
| Distance Correction                    | -29 dB             | -               | Distance loss from 3.2m to receptor (180) using "5-sided box" calculation method |
| Screening Loss                         | -15 dB             | -               | Screening due to building massing along Oxford Road                              |
| Rating level                           | 11 dB $L_{A_{Tr}}$ | 9.2             | Calculated by adding acoustic feature corrections to the specific sound level.   |
| MCC Limit (Lowest – Night)             | 40 dB $L_{A90}$    | -               | See Section 8.1                                                                  |
| Excess of rating over MCC Requirements | <b>-29 dB</b>      | 11              | -                                                                                |



Based on the above and the results of our noise survey, the levels of plant noise egress at the nearest noise sensitive receptor are likely below the requirements set out in Section 8.1. As such, Condition 5b is likely achieved by the current installations.

## Appendix A

The acoustic terms used in this report are defined as follows:

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dB               | Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).                                                                                                                                                                                                                                                                    |
| dBA              | <p>The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The A-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The <sub>A</sub> subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted</p> <p>It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.</p> |
| L <sub>10</sub>  | L <sub>10</sub> is the noise level exceeded for 10% of the period (i.e., the quietest 90% of the measurement).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| L <sub>90</sub>  | L <sub>90</sub> is the noise level exceeded for 90% of the period (i.e., the quietest 10% of the measurement) and is often used to describe the background noise level.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| L <sub>Aeq</sub> | L <sub>Aeq</sub> is the equivalent continuous A-weighted sound pressure level. It is an average of the total sound energy measured over a specified time period.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| L <sub>max</sub> | L <sub>max</sub> is the maximum sound pressure level recorded over the period stated. L <sub>max</sub> is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L <sub>eq</sub> noise level.                                                                                                                                                                                                                                                                                                                                            |

Sound Pressure Level (L<sub>p</sub>) is the sound pressure relative to a standard reference pressure of  $2 \times 10^{-5}$  Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

## **Appendix B**

### **Noise Impact Assessment Report**

# Manchester Aquatics Centre

## Noise Survey & Plant Noise Assessment Report

27112/NIA1

11 October 2021

For:  
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## Noise Survey & Plant Noise Assessment Report 27112/NIA1

| Rev | Date       | Comment                                     | Prepared by                                                                          | Checked by                                                                            |
|-----|------------|---------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 5   | 11/10/2021 | Update to incorporate newly proposed scheme |     | -                                                                                     |
|     |            |                                             | Jake Howarth<br>Principal Consultant<br>BEng(Hons), MIOA                             | -                                                                                     |
| 4   | 08/10/2021 | -                                           |     | -                                                                                     |
|     |            |                                             | Jake Howarth<br>Principal Consultant<br>BEng(Hons), MIOA                             | -                                                                                     |
| 3   | 24/08/2021 | -                                           |  |  |
|     |            |                                             | Thomas Jebson<br>Technical Assistant<br>SMIOA                                        | Andrew Jameson<br>Director<br>BSc(Hons), MIOA, MIET                                   |
|     |            |                                             |                                                                                      |                                                                                       |
|     |            |                                             |                                                                                      |                                                                                       |



## **Noise Survey & Plant Noise Assessment Report 27112/NIA1**

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### **Attachments**

Appendix A – Acoustic Terminology

Appendix B – Time History Plot – 28599/TH1 and 28599/TH2



## 1.0 Introduction

As part of a refurbishment within the Manchester Aquatics Centre the installation of new plant items to the north west of the site is proposed.

Hann Tucker Associates have therefore been commissioned to conduct a baseline noise survey and assess the potential noise impact on nearby noise sensitive receptors.

This report presents our findings.

## 2.0 Objectives

To visit site to carry out environmental noise level measurements to establish the prevailing external noise climate in the vicinity of the site and nearby receptors.

To set plant noise emission limits in line with Local Authority guidance and subsequently assess the noise egress from the proposed plant installations.

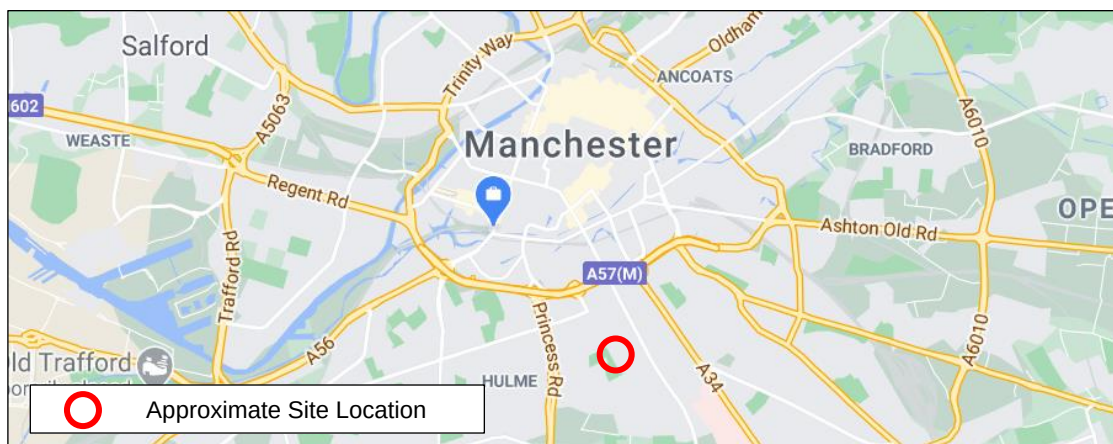
## 3.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

## 4.0 Site Description

### 4.1 Location

The Manchester Aquatics Centre is located on Oxford Road in Manchester. The site falls under the jurisdiction of Manchester City Council (MCC). See site location plan below.



Location Map (Map Data @ 2021)



## 4.2 Description

The site lies to the south of Manchester City Centre close to Manchester Metropolitan University. The site is bound by Oxford Road to the west and neighbouring buildings to all other sides. There are commercial properties and The Church of Jesus Christ of Latter-day Saints to the north-west, however the surrounding area is predominantly university buildings. The nearest residential buildings are over 180m away to the west and 105m to the north. See site plan below.



Site Plan (Map Data @ 2021)

## 5.0 Acoustic Standards & Guidelines

### 5.1 Local Planning Requirements

Manchester City Council requirements are outlined in Section 3.0 of Manchester City Council's Planning & Noise Technical Guidance document (December 2015).

#### 5.1.1 Fixed Plant Noise Emissions

Section 3.6.1.5.1 outlines that the noise assessment for fixed plant should be based on BS 4142:2014 and the assessment must demonstrate that

*“Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme so as to achieve a rating level of 5dB ( $L_{Aeq}$ ) below the typical background ( $L_{A90}$ ) level at the nearest noise sensitive location.”*



## 5.2 National Planning Policy Framework

The following paragraphs are from the NPPF (published July 2021):

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- “Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.”



### 5.3 BS 4142:2014

BS 4142: 2014 describes methods for rating and assessing the effects of outdoor sound levels, of an industrial and/or a commercial nature, *“on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident”*.

The impact of a specific sound is indicated by subtracting the existing background noise level from the rating level (i.e. noise level from the proposed items of plant/machinery/etc plus any acoustic feature corrections). The standard states that:

- *“a difference of around +10dB or more is likely to be an indication of a significant adverse impact”;*
- *“a difference of around +5dB is of marginal significance is likely to be an indication of an 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”.*

The noise from the new development is expressed in terms of a rating level and given as a  $L_{Aeq, T}$  noise level. The existing background noise level is expressed in terms of a  $L_{A90, T}$  noise level.  $T$  is the assessment time interval, which is 1-hour for operations during daytime hours (07:00 to 23:00 hr) and 15-minutes for operations during night-time hours (23:00 to 07:00 hr).

BS 4142:2014 states that if a noise source contains an 'acoustic feature', such as tonality, intermittency or impulsiveness, an appropriate penalty should be applied.

## 6.0 Baseline Noise Survey

### 6.1 Procedure

#### *First Survey Visit – April 2021*

Fully automated environmental noise level monitoring was undertaken from 10:00 hours on Wednesday 07 April 2021 to 16:00 hours on Thursday 08 April 2021 to establish the existing daytime and night-time background noise levels to the front courtyard area (southeast of site, Oxford Road side). The equipment was set to take readings continuously of the A-weighted (dBA)  $L_{90}$ ,  $L_{eq}$  and  $L_{max}$  sound pressure levels over 15-minute periods.



Fully manned noise level measurements were undertaken between 17:30 and 19:00 hours on Thursday 08 April 2021 to establish representative noise levels at the opposite end of the courtyard (close to MECD Building). Measurements were taken of the A-weighted and octave band (dBA)  $L_{90}$ ,  $L_{eq}$  and  $L_{max}$  sound pressure levels over periods of not less than 10 minutes. Atypical noises were excluded as far as reasonably possible.

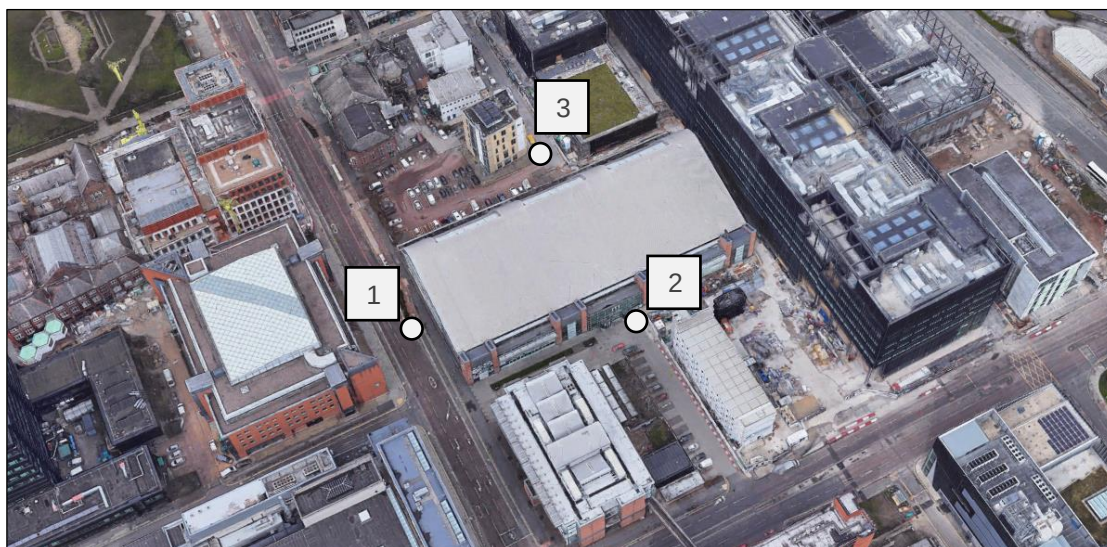
### **Second Survey Visit – May 2021**

Fully automated environmental noise level monitoring was undertaken from 13:00 hours on Wednesday 12 May 2021 to 14:00 hours on Friday 14 May 2021 to establish daytime and night-time background noise levels to the rear of the Aquatics Centre (northwest of site). The equipment was set to take readings continuously of the A-weighted (dBA)  $L_{90}$ ,  $L_{eq}$  and  $L_{max}$  sound pressure levels over 15-minute periods.

## **6.2 Measurement Positions**

Noise levels were recorded in three locations overall, as described below.

| Position | Survey                      | Description                                                                                                                                                                             |
|----------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | First Visit<br><i>April</i> | Automated monitoring. To the west of the site with the microphone in free-field conditions approximately 2m from the near roadside edge of Oxford Road and 3m above street level.       |
| 2        | First Visit<br><i>April</i> | Manned measurements. To the south east of the site with the microphone in free field conditions approximately 1.5m above street level.                                                  |
| 3        | Second Visit<br><i>May</i>  | Automated monitoring. To the north west of the site with the microphone in free-field conditions approximately 2m from the near roadside edge of York Street and 3m above street level. |



Site Plan showing automated noise monitoring positions (Map Data @ 2021)



### 6.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

| Description                                                | Manufacturer | Type    | Serial Number | Date of Last Calibration |
|------------------------------------------------------------|--------------|---------|---------------|--------------------------|
| Position 1 & 3<br>Type 1 Data Logging<br>Sound Level Meter | Larson Davis | LxT     | 4568          | 08/04/2020               |
| Position 2<br>Type 1 Data Logging<br>Sound Level Meter     | Larson Davis | LxT     | 5111          | 08/04/2020               |
| Type 1 Calibrator                                          | Larson Davis | Call200 | 3083          | 19/05/2020               |

The unmanned sound level meters were installed inside a small security box with the microphone protruding approximately 6cm out of the box via an extension cable. The box was fixed to a lamp post (on the side facing Oxford Road / York Street).

The manned sound level meter was fixed above 1.5m ground level throughout the duration of the measurements.

All sound level meters, including extension cable where applicable, were calibrated prior to and on completion of the survey and no significant changes were found to have occurred (<0.3dB).

### 6.4 Weather Conditions

During the periods we were on site the wind conditions were mild and the sky was overcast. Weather reports suggest that generally throughout the survey period the weather conditions were similar to this description.

For the second survey, conditions were overcast and dry with light winds upon install and collection. Local weather reports indicate some rainfall, however, these brief time periods only accounted for a small proportion of the measured results.

These conditions are considered suitable for obtaining representative measurement results.

### 6.5 Discussion of Noise Climate

During the periods on site the dominant noise source at all measurement positions was generally noted to be road traffic, particularly on Oxford Road and Booth Street E.



## 6.6 Results & Analysis

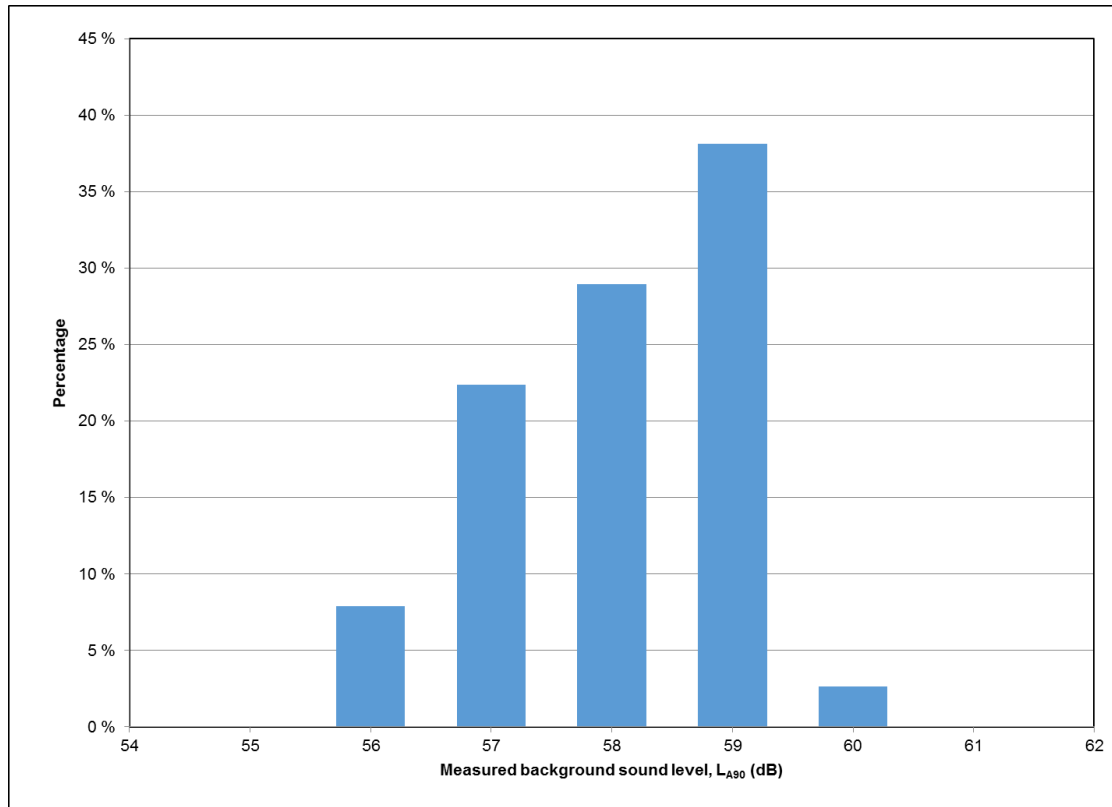
### *Positions 1 & 3 (Automated)*

The results have been plotted on Time History Graph 27112/TH1 enclosed presenting the free-field 15 minute A-weighted (dBA)  $L_{90}$ ,  $L_{eq}$  and  $L_{max}$  levels at each measurement position throughout the duration of the survey.

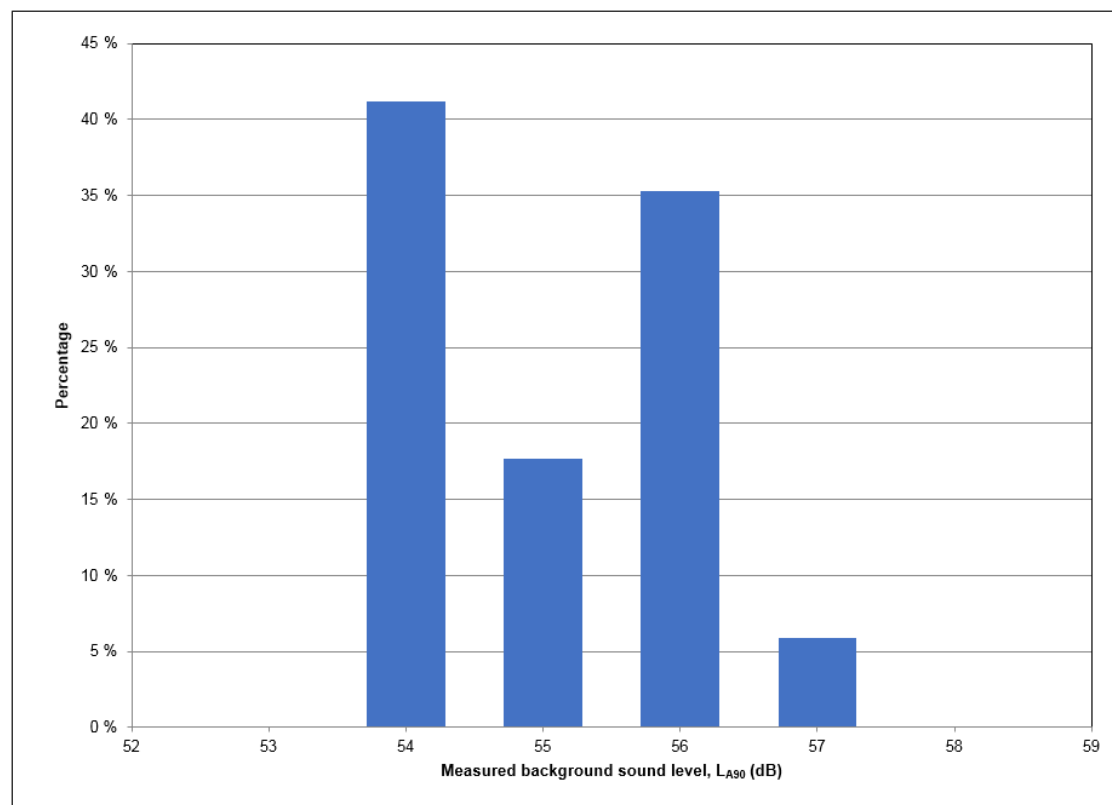
BS 4142 states that “the background sound level must be reliable and suitably represent the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.” Taking this into account, the following histograms have been created to show each sound level ( $L_{90}$ ) as a percentage for the day and night time periods.

The following table presents a summary of the typical (representative, ref. BS 4142)  $L_{A90}$  background noise levels used to inform plant noise limits.

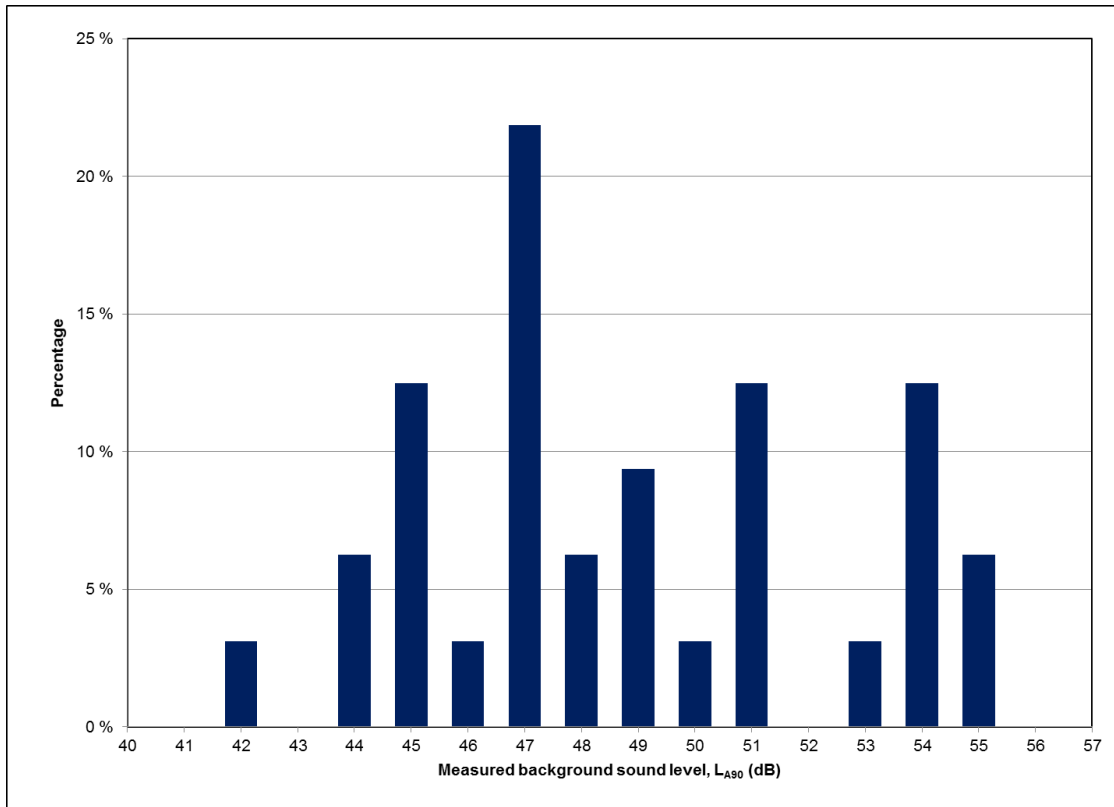
| Position | Daytime<br>(07:00 – 19:00) |                            | Evening<br>(19:00 – 23:00) |                            | Night-time<br>(23:00 – 07:00) |                            |
|----------|----------------------------|----------------------------|----------------------------|----------------------------|-------------------------------|----------------------------|
|          | $L_{Aeq,12h}$              | Typical<br>$L_{A90,15min}$ | $L_{Aeq,4h}$               | Typical<br>$L_{A90,15min}$ | $L_{Aeq,8h}$                  | Typical<br>$L_{A90,15min}$ |
| 1        | 68                         | 57                         | 67                         | 54                         | 66                            | 45                         |
| 3        | 65                         | 54                         | 58                         | 53                         | 63                            | 46                         |



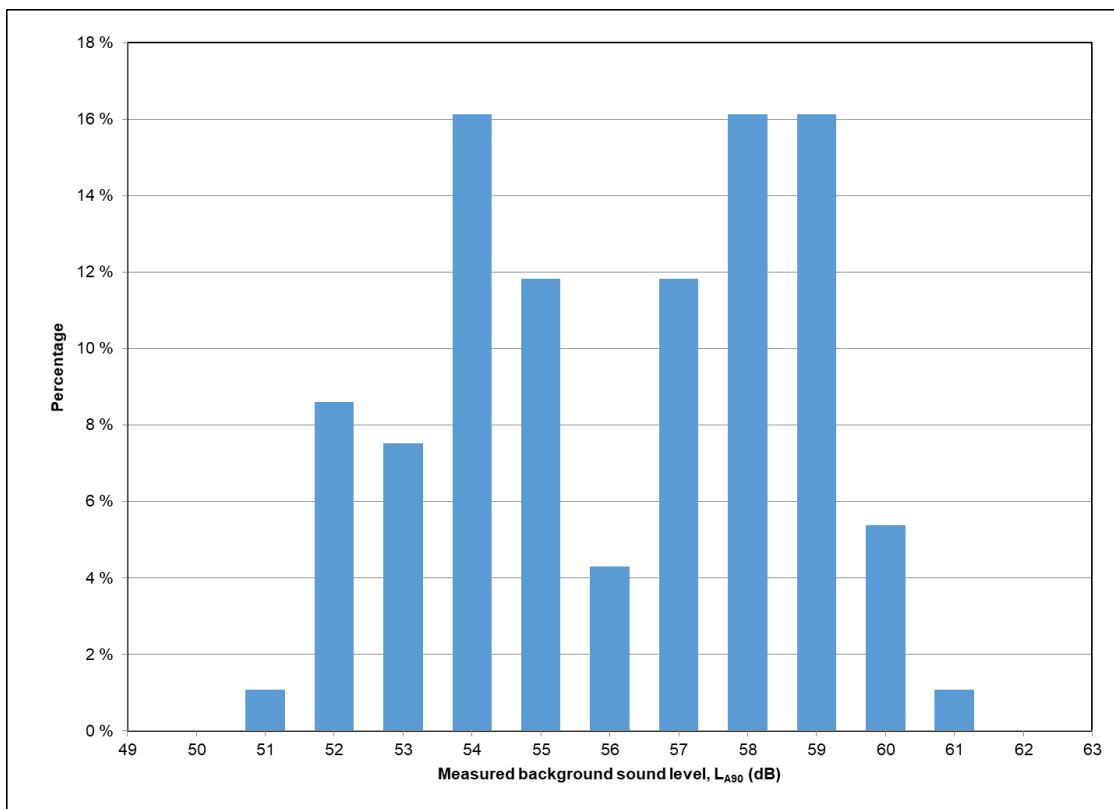
[MP1] Statistical Analysis of Daytime Background Noise Levels (07:00-19:00)



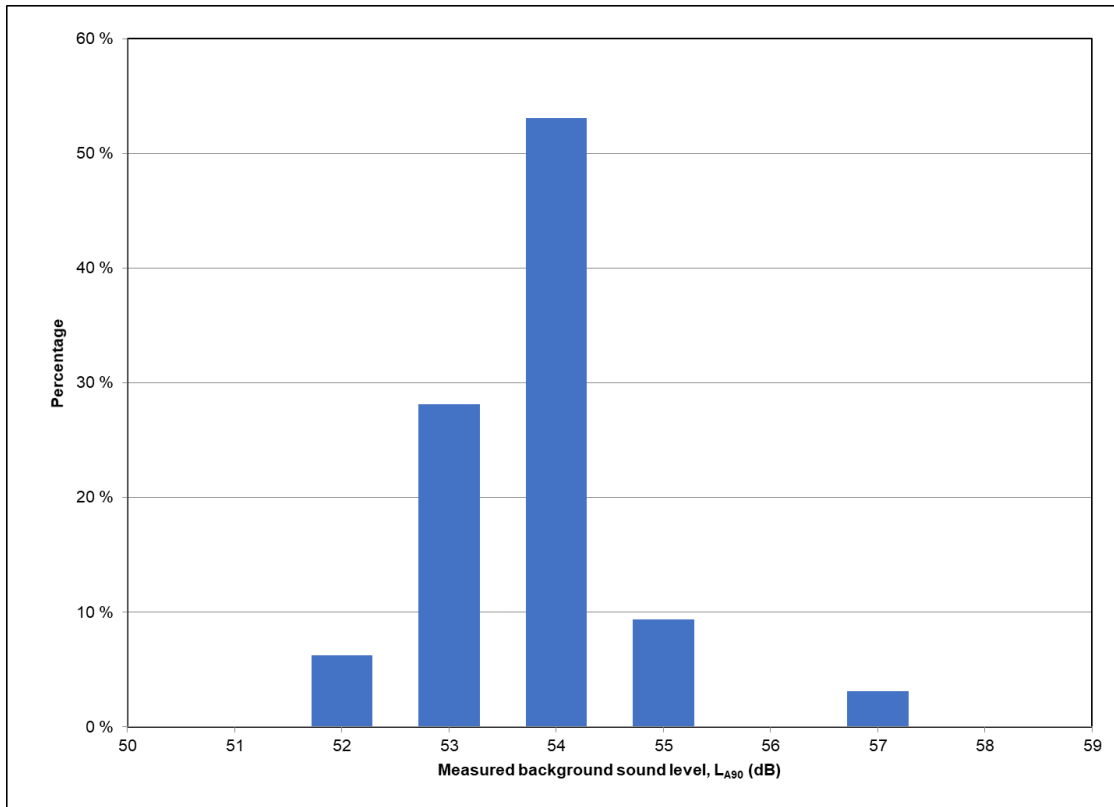
[MP1] Statistical Analysis of Evening Background Noise Levels (19:00-23:00)



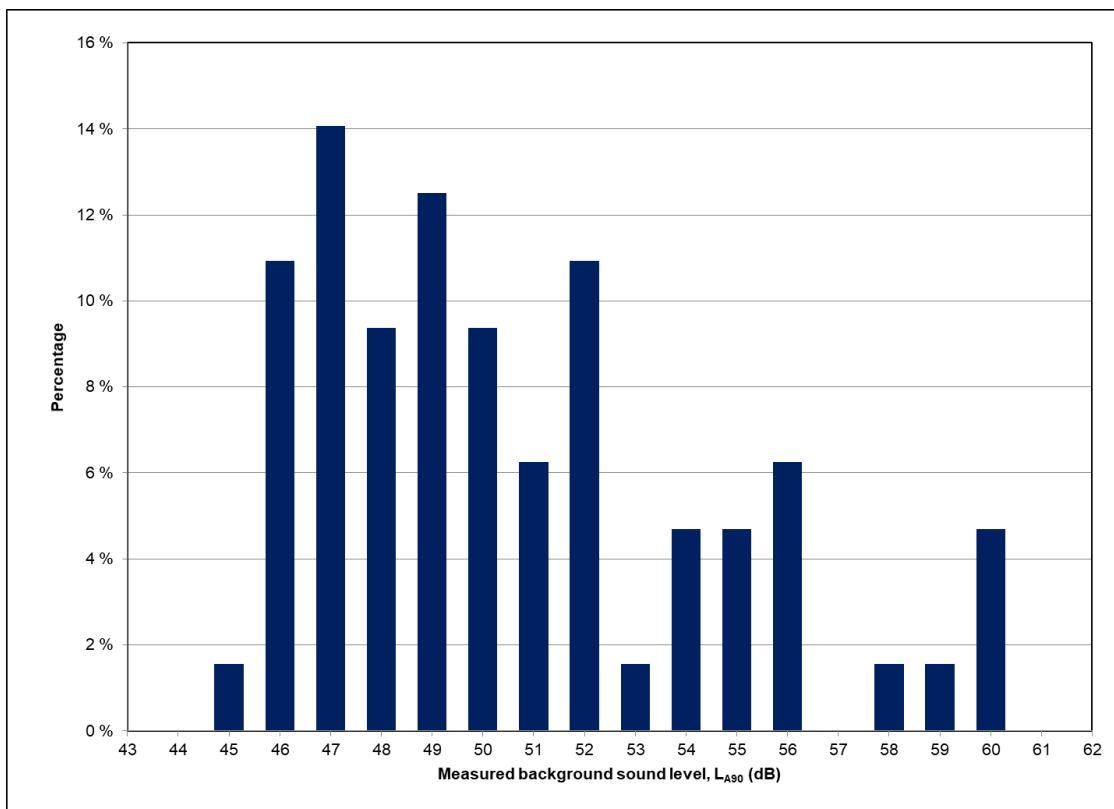
[MP1] Statistical Analysis of Night-time Background Noise Levels (23:00-07:00)



[MP3] Statistical Analysis of Daytime Background Noise Levels (07:00-19:00)



[MP3] Statistical Analysis of Evening Background Noise Levels (19:00-23:00)



[MP3] Statistical Analysis of Night-time Background Noise Levels (23:00-07:00)

**Positions 2 (Manned)**

A summary of the results from the manned noise level survey, as used to inform of the prevailing noise climate across the adjacencies of the site, is presented in the table below. All results are free-field levels.

| Position | Start Time (mm:ss) | Measured Sound Pressure Levels (dB) |                        |
|----------|--------------------|-------------------------------------|------------------------|
|          |                    | L <sub>Aeq,15min</sub>              | L <sub>A90,15min</sub> |
| 2        | 17:30              | 58 dB                               | 55 dB                  |
|          | 18:15              | 59 dB                               | 55 dB                  |
|          | 18:45              | 58 dB                               | 54 dB                  |

The above were undertaken in the absence of anomalous noise sources and from review of the trend in noise levels during the daytime at Position 1, have been considered representative of the entire daytime period (07:00 – 19:00 hours).

## 7.0 Plant Noise Egress

### 7.1 Criteria

On the basis of the aforementioned acoustic standards and the results of our surveys, we propose that the following plant noise emission limits be achieved at 1 metre (incident) from the windows of the nearest noise sensitive receptors.

| Receptor Location          | Plant Noise Rating Limit L <sub>A,r,Tr</sub> (dB) |                               |                                  |
|----------------------------|---------------------------------------------------|-------------------------------|----------------------------------|
|                            | Daytime (07:00 – 19:00 hours)                     | Evening (19:00 – 23:00 hours) | Night-time (23:00 – 07:00 hours) |
| Oxford Road                | 52                                                | 49                            | 40                               |
| South (Entrance Courtyard) | 52                                                | 49                            | 40                               |
| North (York Street)        | 49                                                | 48                            | 41                               |

Noise shall be assessed in accordance with BS 4142:2014 with corrections applied for any plant emitting noise of a tonal or irregular quality.

### 7.2 Proposed Plant

We understand that 2No Air Source Heat Pumps (AHSPs) are proposed to be installed behind the Manchester Aquatics Centre. The cooling units will be either the CMAF 110SE XLN AC or the CMAF 110HE XLN EC models produced by Trane.



An Allaway Acoustics' AA306S-P enclosure for the ASHPs will be installed. This will be comprised of louvres on 2No sides of the enclosure and on the top. We understand that the noise levels produced by the ASHPs will be 46 dBA at a distance of 10 meters (when measured in semi-anechoic conditions) with the enclosure applied.

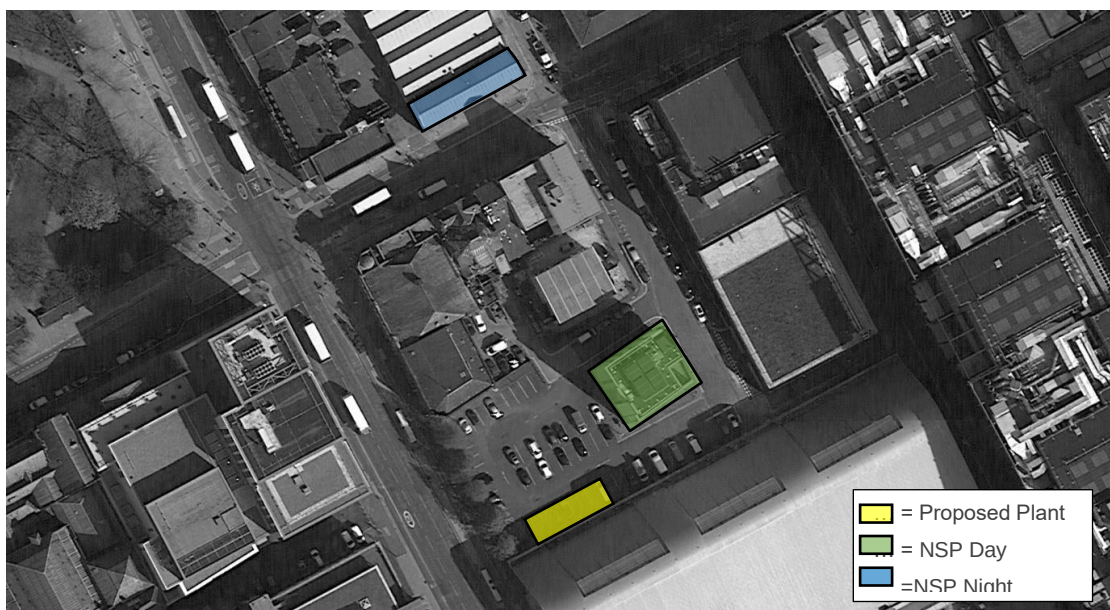
In terms of the operation of the plant, we understand that the hours of operation will be as follows:

- 2No ASHPs in operation at between 06:30 and 22:00 (Monday to Saturday) and 07:00 until 22:00 on Sundays.
- 1No ASHP in operation operating at a reduced duty between 22:00 and 06:30 (Monday to Saturday) and 22:00 and 07:00 on Sundays.

As the proposed plant is to be located in the existing carpark, the nearest noise sensitive receptor (NSP) during the day-time period is considered to be the Church of Jesus Christ and Latter-day Saints located 18.5 metres from the nearest corner of the ASHPs.

As the plant is to operate at night, the NSP during the night-time period are considered to be the apartments above The Flour and Flagon Pub Grosvenor Street located 95 metres from the ASHPs. These apartments are completely screened from the proposed plant via existing building massing on Grosvenor Street itself.

The proposed plant location shown in relation to the NSPs is provided overleaf.



Mark-up showing NSPs and Proposed Plant Location



## 7.3 Assessment

### 7.3.1 Day-time Assessment

Based on the proposed plant, our assessment to the most affected daytime NSP is presented below:

| Description                                                             | A-Weighted Sound Pressure Level (dB) |
|-------------------------------------------------------------------------|--------------------------------------|
| ASHP 1, SPL @ 10m                                                       | 46                                   |
| Barrier Loss (Line of Sight)                                            | 0                                    |
| Distance attenuation                                                    | -3                                   |
| Feature Correction (BS4142)                                             | 0                                    |
| Façade Correction                                                       | 0 (limits given as free field)       |
| <b>AHSP 1 SPL @ worst affected noise sensitive receptor</b>             | <b>43</b>                            |
| ASHP 2, SPL @ 10m                                                       | 46                                   |
| Barrier Loss (Line of Sight)                                            | 0                                    |
| Distance attenuation                                                    | -5                                   |
| Feature Correction (BS4142)                                             | 0                                    |
| Façade Correction                                                       | 0 (limits given as free field)       |
| <b>AHSP 2 SPL @ worst affected noise sensitive receptor</b>             | <b>41</b>                            |
| <b>Cumulative Noise Level @ worst affected noise sensitive receptor</b> | <b>45</b>                            |
| <b>Plant Noise Rating Limit <math>L_{Ar,Tr}</math></b>                  | <b>48</b>                            |
| <b>Difference</b>                                                       | <b>-3 dB</b>                         |

Based on the above, the proposed plant should be 3 dB below the proposed plant limit.

### 7.3.2 Night-time Assessment

We understand that for 30 minutes in the early hours of the morning (ie between 06:30 and 07:00) 2No ASHPs could be in operation at design duty. This is understood to be the worst case night-time operation.

Based on the proposed plant, our assessment to the most affected night-time NSP is presented below:

| Description       | A-Weighted Sound Pressure Level (dB) |
|-------------------|--------------------------------------|
| ASHP 1, SPL @ 10m | 46                                   |
| No Correction     | +3                                   |
| Barrier Loss      | -15                                  |



| Description                                                 | A-Weighted Sound Pressure Level (dB) |
|-------------------------------------------------------------|--------------------------------------|
| Distance attenuation                                        | -15                                  |
| Feature Correction (BS4142)                                 | 0                                    |
| Façade Correction                                           | 0 (limits given as free field)       |
| <b>AHSP 1 SPL @ worst affected noise sensitive receptor</b> | <b>19</b>                            |
| <b>Plant Noise Rating Limit <math>L_{A,r,Tr}</math></b>     | <b>41</b>                            |
| <b>Difference</b>                                           | <b>-22 dB</b>                        |

Based on the above worst-case assessment, the proposed plant should be 22 dB below the proposed plant limit.

## 8.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the prevailing noise climate at the development site.

With the attenuation proposed by Allaway Acoustics, the sound level of the proposed plant is in line with the requirements set out by Manchester City Council.

## Appendix A

The acoustic terms used in this report are defined as follows:

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dB                | Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).                                                                                                                                                                                                                                                                      |
| dBA               | <p>The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The <sub>A</sub> subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted</p> <p>It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.</p> |
| L <sub>90,T</sub> | L <sub>90</sub> is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| L <sub>eq,T</sub> | L <sub>eq,T</sub> is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| L <sub>max</sub>  | L <sub>max</sub> is the maximum sound pressure level recorded over the period stated. L <sub>max</sub> is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L <sub>eq</sub> noise level.                                                                                                                                                                                                                                                                                                                                              |
| L <sub>p</sub>    | Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of $2 \times 10^{-5}$ Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).                                                                                                                                                                                                                                                                                                     |
| L <sub>w</sub>    | Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually $10^{-12}$ W).                                                                                                                                                                                                                                                                                                                                                      |

# Aquatics Centre

## Position 1

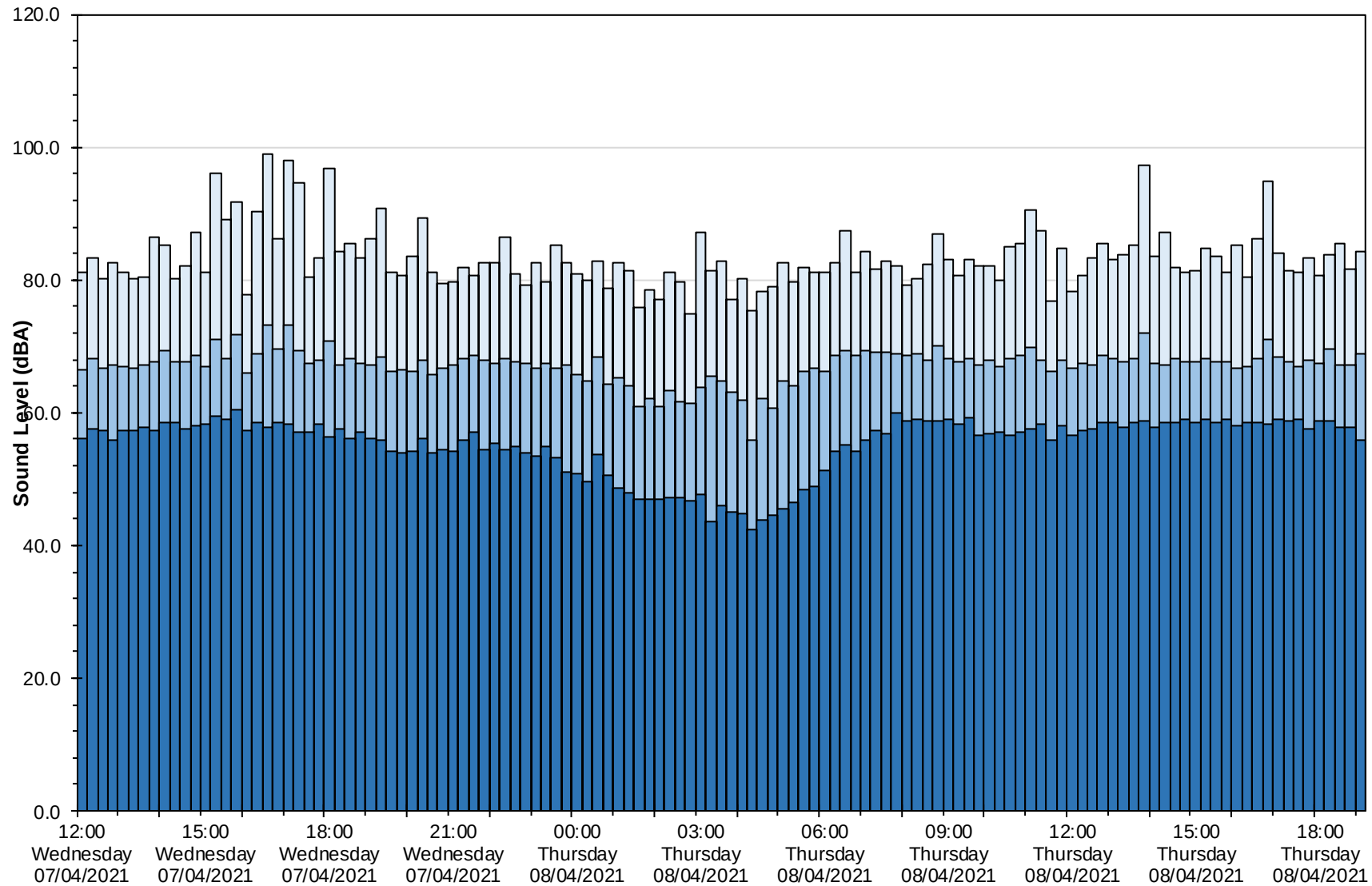
$L_{eq}$ ,  $L_{max}$  and  $L_{90}$  Noise Levels

Wednesday 7 April 2021 to Thursday 8 April 2021

□  $L_{Amax}$

▒  $L_{Aeq}$

■  $L_{A90}$



# Aquatics Centre

## Position 3

$L_{eq}$ ,  $L_{max}$  and  $L_{90}$  Noise Levels

Wednesday 12 May 2021 to Friday 14 May 2021

□  $L_{Amax}$

■  $L_{Aeq}$

■  $L_{A90}$

