MZA ACOUSTICS

# DAVID LLOYD HEALTH CLUB, BRISTOL WESTBURY

## Noise Impact Assessment

# Document History

**Project Document Reference: 1700996-RP-NIA-0001**

| Rev | Date | Comment | Author | Checked |
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| 3 | 02 August 2024 | Red line boundary update | KD | - |
| 2 | 15 July 2024 | Minor changes to site layout | KD | - |
| 1 | 11 April 2024 | Updated site layout | KD | CH |
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# Contents

# 1. INTRODUCTION

MZA Acoustics has been appointed by David Lloyd Leisure Limited (the Client) to undertake a noise impact assessment relating to the new external facilities at the David Lloyd Club Bristol Westbury, Greystoke Avenue, Westbury on Trym, Bristol BS10 6AZ (the Site).

This report has been prepared to support the full planning application to Bristol City Council (BCC), which is for the erection of an extension to the existing club to extend the internal spa facilities and the installation of a spa garden, including a hydro pool, sauna and plant room. As part of the proposed extension, the existing Battlebox area will be relocated to the north of the spa garden extension building.

This report aims to assess the potential for noise impact from the outdoor spa facilities, including noise from the spa garden and noise emissions from the proposed new items of fixed plant.

A baseline environmental noise survey has been undertaken at a location representative of the nearest noise sensitive receivers (NSRs) to the proposed outdoor spa extension of the existing David Lloyd Bristol Westbury site to establish the prevailing background and ambient noise levels.

As baseline noise monitoring occurred within the David Lloyd premises, to ensure measurements are representative of the NSRs, additional attended noise measurements at the front boundary of the nearest noise sensitive receivers have been carried out.

This report considers the operational aspects of the scheme only, and does not extend to an assessment of demolition, construction or other enabling works.

This report occasionally employs technical terminology. To assist the reader, a glossary of terms is presented in Appendix A.

# 2. SITE DESCRIPTION

## 2.1 Existing Site Location & Environment

The existing David Lloyd Bristol Westbury Club is located in Westbury-on-Trym, a suburban area to the north of Bristol.

The existing club building features a dedicated car park extending to the north, existing tennis courts to the south, and an outdoor swimming pool immediately to the west of the building.

The Site is bordered predominantly by residential use, with some commercial properties to the north, and is bounded on the north and west sides by Greystone Avenue. To the west, on the other side of Greystone Avenue, lies a school and residential area that extends to the south of the site. Playing fields, another school and a business centre bound the site to the east and south-east.

Further afield, the nearest major road network includes the M5 and M49 approximately 2.96 km to the north and north west of the site; the A4 roughly 3 km to the west of the site; and the A38 2 km to the east of the site.

The location of the existing site in context of the immediate surrounding area is shown in Figure 1.


**Figure 1:** Site location

## 2.2 Proposed Development

The proposal is for the erection of a single storey extension to the existing club to extend the internal spa facilities and the installation of a spa garden, which includes a hydro pool, sauna and plant room.

The proposed site for the additional facilities is all located immediately south of the club, adjacent to the existing tennis courts and battle box.

Figure 2 shows the location of the proposed extension and the nearest noise-sensitive receptors (NSRs) – the residential properties on Holmwood Gardens.


**Figure 2:** Proposed extension area and nearest noise-sensitive receptors

An excerpt taken from the proposed site plan drawing is provided in Figure 3.

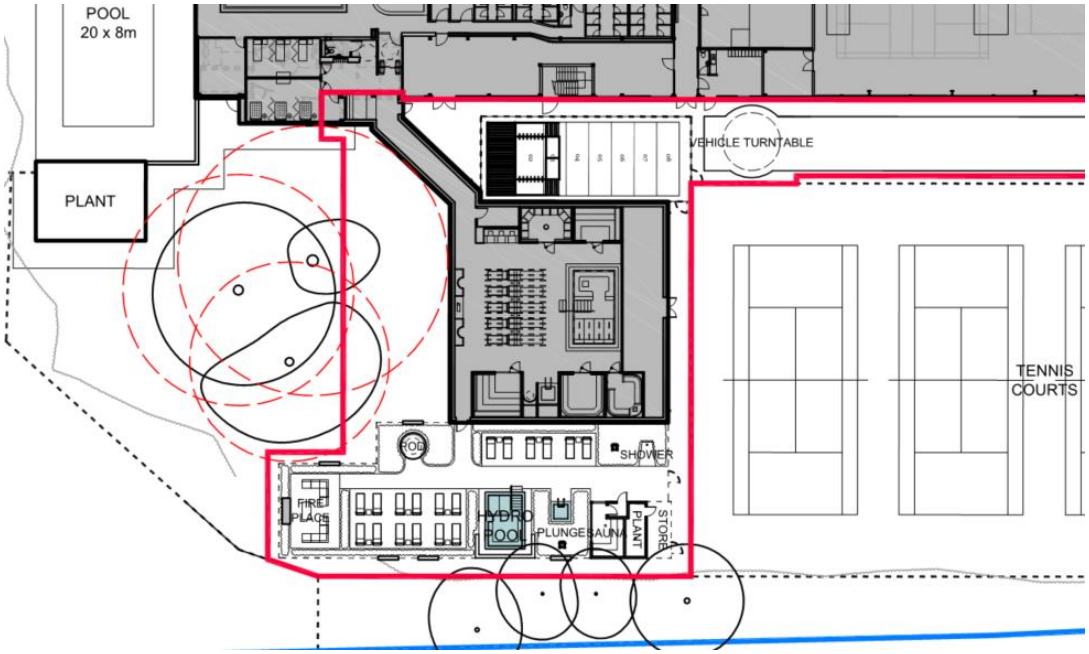


**Figure 3:** Excerpt from proposed site plan drawing

# 3. ASSESSMENT GUIDANCE

## 3.1 Introduction

This section details the guidance that will be used in the assessments undertaken in this report.

The adopted criteria for each element of the development will be included in the assessment section of the report.

## 3.2 Local Authority Criteria

A review of recent planning applications in the area of the David Lloyd Club has been undertaken to ascertain BCC's typical planning condition for plant noise emissions, which is understood to be as follows:

> *The rating level of any noise generated by plant & equipment as part of the development shall be at least 5 dB below the pre-existing background level at any time at any residential premises.*
>
> *Any assessments to be carried out and be in accordance with BS 4142:2014 Methods for rating and assessing industrial and commercial sound.*

Further to the above, other national guidance and standards are proposed to be referenced, as summarised below.

## 3.3 National Planning Policy Framework (NPPF), December 2023

The NPPF determines the government's planning policy for England. The document was first published in March 2012, revised in July 2018, updated in 2019, 2021 and 2023.

In response to the 'Levelling-up and Regeneration Bill: reforms to national planning policy consultation' the NPPF has been completely revised and the version published on 19 December 2023 completely replaces the previous NPPF document.

Planning policy, in relation to noise is considered in Chapter 15 - 'Conserving and enhancing the natural environment', specifically in terms of pollution.

Paragraph **191** states that:

*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 by 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 amenity value for this reason; and*
c. *Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Furthermore, Paragraph **193** continues:

*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.*

The guidance contained within the NPPF reference the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010).

## 3.4 Noise Policy Statement for England (NPSE, March 2010)

The NPSE attends to three types of noise;

- "Environmental noise" which includes noise from transportation sources;
- "Neighbour noise" which includes noise from inside and outside people's homes; and
- "Neighbourhood noise", which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

In line with the aims determined in the NPPF, the NPSE determines 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; and,
- 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.

The guidance detailed within the NPSE relates a number of key phrases with regards to adverse effects which can be applied to noise impacts as used by the World Health Organisation.

- **NOEL – No Observed Effect Level** - The level below which no health effect or detrimental impact on the quality of life is observed.
- **LOAEL – Lowest Observed Adverse Effect Level** - The level at which adverse effects on health and quality of life can be detected
- **SOAEL – Significant Observed Adverse Effect Level** - The level above which significant adverse effects on health and quality of life occur.

The guidance indicates that it is not possible to have a single objective noise-based measure that defines SOAEL, and as such the SOAEL is likely to be different for different noise sources and receptors. The document indicates that further research is required to establish what may constitute a significant adverse impact on health and quality of life from noise.

While the NPSE determines the NOEL, LOAEL and SOAEL descriptions, the document indicates that, unlike other environmental disciplines, there are currently no European or national noise limits which have to be met although the NPSE states that "there can be specific local limits for specific developments" allowing for negotiation.

## 3.5 Planning Practice Guidance – Noise

The Planning Practice Guidance for noise (published in March 2014 and updated July 2019) broadly considers the same issues as demonstrated within both the NPPF and the NPSE with regards to noise within the planning realm.

The information detailed within the PPG indicates that noise should be considered when:

- New developments may create additional noise; and/ or,
- New developments would be sensitive to the prevailing acoustic environment.

The guidance indicates that Local Planning Authorities should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and,
- Whether or not a good standard of amenity can be achieved.

The impact of noise is rated within the policy document in terms of the relative 'Observed Effect Level', defined in line with the guidance within the NPSE. Based upon this, the Planning Practice Guidance provides the following matrix of likely average response:

**Table 1:** PPG observed effect levels

| Perception | Example of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Not noticeable | No Effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| **Lowest Observed Adverse Effect Level** | | | |
| Noticeable and Intrusive | Noise can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| **Significant Observed Adverse Effect Level** | | | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/ or attitude, e.g. avoiding certain activities during periods of intrusion: where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area. | Significant Observed Adverse Effect | Avoid |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/ or an ability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/ awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory. | Unacceptable Adverse Effect | Prevent |

## 3.6 BS 4142:2014 Method for Rating and Assessing Industrial and Commercial Sound

BS 4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration.

The comparison will enable the impact of the specific sound to be concluded based upon the premise that typically “the greater this difference, the greater the magnitude of the impact”. This difference is then considered as follows:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

BS 4142 further states that “where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact” again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that “not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact”, thus implying that all sites should be assessed on their own merits and specifics.

The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

- Typical Daytime 07:00 – 23:00 1-hr assessment period
- Typical Night-time 23:00 – 07:00 15-min assessment period

The Standard also outlines methods for defining appropriate "character corrections" within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are:

d. the Subjective Method,

e. the Objective Methods for tonality; and,

f. the Reference Method.

It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

**Table 2:** PPG observed effect levels

| Level of Perceptibility | Tonal Correction dB | Impulsivity Correction dB | Correction for 'other sound characteristics' dB | Intermittency Correction dB |
|---|---|---|---|---|
| No Perceptibility | +0 | +0 | Where neither tonal nor impulsive but clearly identifiable +3 | If intermittency is readily identifiable +3 |
| Just Perceptible | +2 | +3 | | |
| Clearly perceptible | +4 | +6 | | |
| Highly perceptible | +6 | +9 | | |

The Standard and methodology will only be used to assess the impact of sound from any fixed plan associated with the proposed extension and outdoor spa facilities.

## 3.7 ANSI S3.5 1997 – American National Standard – Methods for Calculation of the Speech Intelligibility Index, (1997)

ANSI 3.5 is primarily used in relation to the calculation of speech intelligibility in spaces. However, in reference to this assessment, it also provides typical noise levels for speech at 1 metre from the mouth – which are used in the assessment of operational noise from the scheme.

The sound pressure levels at 1 m in front of a speaker's mouth are provided in Table 3.

**Table 3:** ANSI speech levels

| Vocal Effort | Sound Pressure Level (re $2x10^{-5}$ Pa) at 1 m from Mouth (dBA) |
|---|---|
| Normal | 60 |
| Raised | 67 |
| Loud | 74 |
| Shout | 82 |

# 4. BASELINE ENVIRONMENTAL NOISE SURVEY

## 4.1 Introduction

A noise survey has been undertaken at the site to establish the prevailing acoustic conditions against which the proposed noise generating activities will be assessed.

A long-term, unattended, measurement was undertaken at a fixed position over a period of 4 days between Friday 24th and Tuesday 28th November 2023. The choice of installation location was limited to finding a secure position to leave the equipment. However, upon collection of the equipment, it was found that the data was influenced by nearby plant, including a temporary generator that had been installed and operated constantly after the survey began. As such, this survey data has been disregarded.

Simultaneous short-term attended measurements were undertaken at various times of the day and night on Holmwood Gardens, the location of the nearest noise-sensitive receptor, in a location well screened from the operating plant at the club. The measurements were made on the following dates and times:

- Friday 24th November 2023 from 10:58 to 11:15
- Monday 27th at 22:44 to Tuesday 28th November 2023 at 00:25; and
- Tuesday 28th November 2023 from 09:57 to 10:42

## 4.2 Measurement Location

The short-term attended monitoring was undertaken outside of 11 Holmwood Gardens at the position shown in Figure 4.


**Figure 4:** Monitoring location

The microphone was mounted on a tripod approximately 1.5 m above the local ground height and was considered to be in a free-field position, therefore, no corrections have been applied to the measured data.

The location is also considered to be representative of the prevailing noise levels at the NSR (namely 8 Holmwood Gardens) in absence of any existing plant noise.

The noise climate at this position primarily comprised distant road traffic noise from the surrounding major roads, intermittent car movements on the local roads and community noise from the surrounding residential properties.

## 4.3 Equipment

The equipment used to undertake the noise surveys is listed in Appendix B.

The microphone and sound level meter have been calibrated at UKAS accredited laboratory within the preceding two years, while field calibrators have been laboratory calibrated within the preceding 12 months.

The equipment was field calibrated prior to, and on completion of, the measurement and no significant drift (< 0.5 dB) in calibration was detected.

## 4.4 Weather Conditions

From measurements on site during the attended survey, weather conditions were appropriate for the measurement of environmental noise, i.e. dry with wind speeds generally below 5 m/s.

It was noted that the prevailing winds were from the west and at their highest on Friday 24th November compared to Tuesday 28th November, which had noticeably calmer winds from the north.

## 4.5 Measurement Results

The free-field measured results, rounded to the nearest whole decibel, of the attended monitoring are presented as 15-minute periods in Table 4.

**Table 4:** Results of attended monitoring (free-field levels)

| Date | Start Time | Measurement Duration | Equivalent Continuous Sound Level (dB $L_{Aeq,T}$) | Background Sound Level (dB $L_{AF90,T}$) |
|---|---|---|---|---|
| **Morning** | | | | |
| 24/11/2023 | 11:00 | 15 | 43 | 40 |
| **Evening** | | | | |
| 27/11/2023 | 22:45 | 15 | 37 | 34 |
| **Night-Time** | | | | |
| 27/11/2023 | 23:00 | 15 | 36 | 35 |
| | 23:15 | 15 | 36 | 34 |
| | 23:30 | 15 | 36 | 35 |
| | 23:45 | 15 | 38 | 35 |
| 28/11/2023 | 00:00 | 15 | 35 | 34 |
| | 00:15 | 10 | 36 | 34 |
| **Morning** | | | | |
| 28/11/2023 | 09:57 | 15 | 44 | 34 |
| | 10:12 | 15 | 48 | 32 |
| | 10:27 | 15 | 49 | 33 |

# 5. NOISE IMPACT ASSESSMENTS

## 5.1 Introduction

This section presents the noise impact assessment of the proposed development.

Given there are different noise generating activities that are proposed, the following are addressed in turn:

- Speech noise from members using the outdoor spa garden;
- Amplified music from outdoor speakers
- Fixed plant noise emissions from new installations

Noise from the outdoor Battlebox exercise area is not considered in this report on the basis it is an existing element of the David Lloyd club and it is being relocated to the rear of the spa extension, where it will be significantly screened and further away from the nearest receptors. Therefore, pre-existing noise from the Battlebox is likely to be significantly quieter.

Except for plant, which is expected to operate any time of the day (07:00 to 23:00) or night (23:00 to 07:00), noise sources are assumed to be present between the club opening hours only. The current club times are as follows:

- Weekdays: 06:00 to 22:00
- Weekends: 07:00 to 21:00

## 5.2 Outdoor Spa Garden Noise Impact Assessment

The main source of noise from the proposed spa garden extension is likely to be from people talking whilst using the external seating areas or hydro pool.

### 5.2.1 Outdoor Spa Garden Occupancy

The assessment assumes the outdoor spaces will be at maximum occupancy as follows:

- Fire place seating area – 15no. people
- Sun lounger chairs – 18no. people
- Hydro pool – 5no. people

From discussions with the Club, it is understood that members are unlikely to use the outdoor areas in the late evening and are typically required to begin leaving the club 30-minutes before closing. Additionally, it is anticipated that members of the David Lloyd club will use these areas more so during the core/peak hours.

Therefore, the assessment compares speech noise to the range of $L_{Aeq,15\text{-}min}$ levels measured during a typical period. A 15-minute reference period during mid-morning hours has been selected (instead of a typical 1-hour) for a more robust assessment.

### 5.2.2 Speech Noise Sources

The calculations assume the outdoor areas are fully occupied, with each occupant speaking approximately 50% of the time.

Based on the speech noise levels in Section 0, occupants are assumed to use a vocal effort somewhere between normal (60 dBA) and raised (67 dBA) speech. As such, a level of 65 dBA, which presents a reasonable worst-case scenario, has been adopted. However, vocal effort and the subjectivity of speech noise are likely to be highly variable, so the following assessment should serve as an indication only.

### 5.2.3 Proposed Screening

A 2.4 m boundary comprising a mix of close boarded fencing and masonry walls is proposed to extend along the entire boundary of the spa garden which will provide significant screening between the seating area and partial screening to the sun loungers and the nearest NSR, which is taken to be the rear of 8 Holmwood Gardens.

### 5.2.4 Spa Garden Noise Assessment

Table 5 presents the assessment of speech noise from the proposed spa garden extension to the NSR, taken to be the rear windows of 8 Holmwood Gardens.

**Table 5:** Spa garden speech noise assessment

| Calculation Step | Parameter |
|---|---|
| **Hydro Pool** | |
| Speech sound pressure level at 1 metre (allowing for normal to raised vocal effort) | 65 dBA |
| Correction for number of occupants (5no.) | +7 dB |
| Correction for all occupants speaking 50% of the time | -3 dB |
| Correction for distance attenuation (38 metres) | -32 dB |
| Correction for screening provided by solid boundary walls (no line of sight) | -10 dB |
| Total speech noise level at receptor | 27 dBA |
| **Fire Place Seating Area** | |
| Speech sound pressure level at 1 metre (allowing for normal to raised vocal effort) | 65 dBA |
| Correction for number of occupants (15no.) | +12 dB |
| Correction for all occupants speaking 50% of the time | -3 dB |
| Correction for distance attenuation (25 metres) | -28 dB |
| Correction for screening provided by solid boundary walls (no line of sight) | -10 dB |
| Total speech noise level at receptor | 36 dBA |
| **Lounger Chair Area 1 (12 Loungers)** | |
| Speech sound pressure level at 1 metre (allowing for normal to raised vocal effort) | 65 dBA |
| Correction for number of occupants (12no.) | +11 dB |
| Correction for all occupants speaking 50% of the time | -3 dB |
| Correction for distance attenuation (31 metres) | -30 dB |
| Correction for screening provided by solid boundary walls (no line of sight) | -10 dB |
| Total speech noise level at receptor | 33 dBA |
| **Lounger Chair Area 2 (6 Loungers)** | |
| Speech sound pressure level at 1 metre (allowing for normal to raised vocal effort) | 65 dBA |
| Correction for number of occupants (6no.) | +8 dB |

| Calculation Step | Parameter |
|---|---|
| Correction for all occupants speaking 50% of the time | -3 dB |
| Correction for distance attenuation (44 metres) | -33 dB |
| Correction for screening provided by solid boundary walls (partial line of sight) | -5 dB |
| Total speech noise level at receptor | 32 dBA |
| **Cumulative speech noise level at receptor from all outdoor spa areas** | **39 dBA** |
| **Prevailing noise level at receptor (range of $L_{Aeq,15min}$ measured between the hours of 10:00 and 11:15** | **43 – 49 dBA** |

### 5.2.5 Spa Garden Impact

Calculations above indicate that speech noise will be approximately 4-10 dB below the prevailing ambient noise level at the NSR.

It is prudent to consider that the absolute level predicted externally is also relatively low, around 10 dB lower than the WHO guidelines for noise levels in external spaces for environmental noise – a figure also adopted by Sport England for the assessment of noise from sports facilities.

Speech noise may, at times, be heard or noticeable, however, with an absolute level of 39 dBA, it is not expected to be intrusive or cause changes in behaviour.

The existing club includes tennis courts and the battle box adjacent to the proposed spa extension. Whilst noise from the Battlebox is likely to decrease based on its proposed relocation, operational noise from both of these activities is likely to comprise the same characteristics and, as such, replacement/additional vocal noise should not have a significant effect on the acoustic character of the area.

Furthermore, the internal level in residential properties would be considerably lower once accounting for a partially open for ventilation, and likely to be practically inaudible with closed windows.

It is reiterated that the assessment uses a worst-case scenario on the following basis:

- The spa garden is fully occupied in all areas simultaneously.
- The source level is based on a slightly raised vocal effort. In reality, given the nature of a spa garden, vocal effort is likely to be lower than this, so as not to disturb other users of the space.
- Each occupant would speak for 50% of the time. As above, this is unlikely to be the case given the nature of the spa garden and the intention for the area to be used for relaxation.
- It compares the speech level to the range of 15-minute $L_{Aeq}$ levels measured at the receptor. Average levels, particularly over a more typical daytime reference period of 1-hour would be higher than the lower end of the range of levels presented.

In conclusion, even with the worst-case assumptions made above, the noise level at the receptors is considered to correspond with PPG's LOAEL. However, on balance, it is more likely that operational noise from the spa garden will fall below this, and is more likely to correlate with PPG's 'No Observed Adverse Effect Level'.

## 5.3 Amplified Music in Outdoor Spa Areas

Gentle amplified music may occasionally be played in the outdoor spa garden areas, although it is understood this is likely to be for ambience only – especially in spa areas where the intention is for quiet contemplation and relaxation. As such, music is not considered likely to cause an impact on the nearest noise-sensitive receptor.

Reverse calculations have been undertaken to demonstrate the maximum noise level of music that would need to be generated before it would likely be considered intrusive at the residential receptor. The results are presented in Table 6.

**Table 6:** Spa garden amplified music limits (reverse calculation)

| Calculation Step | Parameter |
|---|---|
| Lowest measured 15-minute background level during typical spa garden use (taken from 10:15 in the morning) – $L_{A90,15min}$ | 32 dBA |
| Adopted noise limit from amplified music at receptors ($L_{Aeq,T}$) | 32 dBA |
| Correction for distance taken from central point of spa garden (37 metres) | 31 dB |
| Correction for screening (partial line of sight) | 5 dB |
| Maximum permitted sound pressure level at loudspeaker position ($L_{Aeq,T}$) | 68 dBA |

The above calculation is not intended to be used to determine an actual limit imposed on any such system, but to indicate the low risk of noise issues due to amplified music being played in the external spa areas.

A noise level this high is likely to cause annoyance to the David Lloyd club members occupying the outdoor spaces, by being intrusive to speech and relaxation, sooner than the off-site noise-sensitive receptors.

Source noise levels used for creating ambience commensurate to the proposed outdoor uses would result in a level that is significantly lower than the existing background level at the receptors.

It is acknowledged that the high-level assessment only considers a single speaker, whereas it is likely a music system would comprise multiple speakers distributed across the outdoor areas. Nevertheless, the assessment indicates that a significant cumulative noise level would need to be produced before the prevailing background level is exceeded. Additionally, most speakers would benefit from significant screening whereas, the assessment factors in a partial line of sight as a worst-case.

## 5.4 Fixed Plant Noise Emissions

This section presents the results of a BS 4142 assessment of fixed plant in accordance with BCC's typical planning condition.

The extension is to include a new plant room serving the general internal spa areas and a small plant room adjacent to the sauna. Both plant rooms will be fully enclosed and accessed via an external louvred door.

Figure 5 indicates the location of the proposed plant.

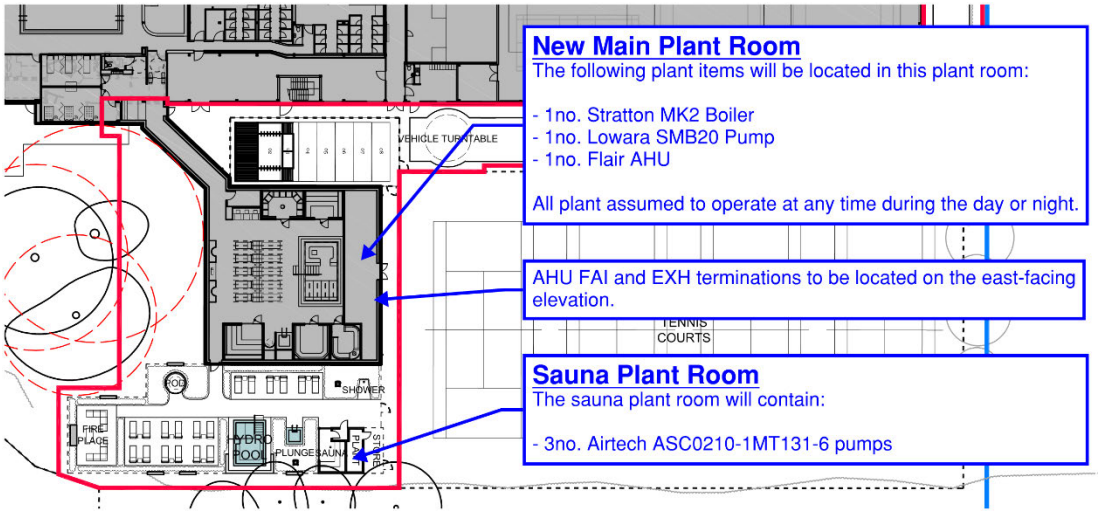


**Figure 5:** Proposed plant locations

### 5.4.1 Plant Details

It is understood the new main plant room within the extension building will house the following items:

- 1no. Stratton MK2 Boiler
- 1no. Lowara SMB20 Pump
- 1no. Flair AHU

The manufacturer sound pressure levels of the boiler and pump are provided in Table 7.

**Table 7:** Sound pressure levels of proposed equipment, as supplied by the manufacturer

| Equipment | Broadband Sound Pressure Level at 1 metre |
|---|---|
| Stratton MK2 Boiler at 1m | 61.6 dBA |
| Lowara SMB20 Pump at 1m | 70.0 dBA [1] |
| [1] Manufacturer data states <70dB, however for purposes of this assessment 70 dB has been used to assess the worst case. | |

The in-duct sound power levels of the AHU are in Table 8.

**Table 8:** AHU in-duct sound power levels, as supplied by the manufacturer

| Element | Sound Power Level (dB ref. 1x $10^{-12}$ W) at Octave Band Centre Frequencies (Hz) | | | | | | | | dBA |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| In-duct fresh air intake | 62 | 72 | 71 | 73 | 77 | 74 | 73 | 66 | 81 |
| In-duct discharge | 72 | 75 | 75 | 70 | 69 | 68 | 73 | 60 | 77 |

The sauna plant room is to house:

- 3no. Airtech ASC0210-1MT131-6 pumps

The noise levels of the sauna plant room pumps have been measured at an existing David Lloyd Club. The octave band reverberant sound pressure level of all three pumps operating simultaneously is presented in Table 9.

**Table 9:** Reverberant sound pressure level of sauna plant room

| Element | Sound Pressure Level (dB ref. 1x $10^{-5}$ Pa) at Octave Band Centre Frequencies (Hz) | | | | | | | | dBA |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| 3no. Airtech ASC0210-1MT131-6 pumps (reverberant level) | 74 | 70 | 80 | 78 | 76 | 78 | 74 | 72 | 83 |

The plant noise assessment will consider the cumulative effects of noise break-out from the plant rooms and the atmosphere fresh air intake and discharge at the noise-sensitive receptors.

### 5.4.2 Plant Operating Times

It is understood the proposed new plant will be required to operate at any time of the day or night

### 5.4.3 Noise Sensitive Receptors

The location of the noise sensitive receptors is indicated in Figure 2.

As a worst-case, the calculations are based on the first-floor rear windows of 8 Holmwood Gardens.

### 5.4.4 Plant Noise Emissions Limits

BCC's typical planning condition for plant noise emissions is copied in Section 3.2.

Based on this, and the measured background levels at the NSR, the rating level limits (the plant noise level including penalties for acoustic features, such as tonality, impulsivity and intermittency) are as shown in Table 10.

As noted in Section 4.4, the wind speeds and direction varied significantly between attended measurements on certain days. As a result, the background levels vary significantly at similar weekday times. As a worst-case, the lowest levels (measured on the calmest day) have been selected.

Additionally, BS 4142 recommends using a reference period of 1-hour during the day and 15-minutes at night-time. Due to the limited measured data, the lowest 15-minute measurements during the day and night have been selected to present a more robust assessment.

**Table 10:** Plant noise emission limits

| Measurement Period | Background Level dB $L_{AF90,15min}$ | Rating Plant Level Limit dB $L_{Ar,Tr}$ |
|---|---|---|
| Daytime | 32 | 26 |
| Night-Time | 34 | 26 |
| [1] Measured between 10:12 and 10:27<br>[2] Measured multiple times between 11:15 and 00:30 | | |

### 5.4.5 Proposed Mitigation Measures

The plant noise assessment includes the following mitigation measures. These are required to comply with the typical criteria of BCC.

In-line attenuators are required to be installed on the atmosphere side fresh air intake and discharge paths. The minimum dynamic insertion losses for each octave band are provided in Table 11.

In addition, to control noise break-out from the sauna plant room, the access door is required to be fitted with acoustic louvres meeting the minimum insertion loss values in each octave band provided in Table 11.

**Table 11:** Minimum requirements for mitigation measures

| Element | Minimum Dynamic Insertion Loss (dB) at Octave Band Centre Frequencies (Hz) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| AHU FAI | 0 | 0 | 2 | 6 | 14 | 12 | 11 | 2 |
| AHU discharge | 0 | 0 | 6 | 3 | 6 | 6 | 11 | 0 |
| Sauna plant room louvres | 3 | 3 | 3 | 6 | 8 | 10 | 12 | 9 |

### 5.4.6 Plant Noise Emissions

An assessment has been undertaken to assess the impact of noise upon the identified noise sensitive receptors against the established noise emission limits.

The results are summarised in Table 12, with detailed calculations provided in Appendix C. Note, as the measured levels on site are free-field, the results are presented as equivalent free-field levels 1 metre from the façade of the NSR.

Note, the calculations consider the proposed noise mitigation measures described in Section 5.4.5.

**Table 12:** BS 4142 assessment summary

| Calculation Step | Sound Level | Comments |
|---|---|---|
| Main plant room noise break-out level | 20 dB $L_{Aeq,T}$ | The free-field sound pressure level 1 m from the façade of the receptor from noise break-out from the main plant room, sauna plant room and AHU atmosphere termination points. Accounts for corrections such as distance, directivity and screening and mitigation measures. |
| Sauna plant room noise break-out level | 17 dB $L_{Aeq,T}$ | |
| AHU atmosphere terminations level | 18 dB $L_{Aeq,T}$ | |
| Cumulative specific sound level | 23 dB $L_{Aeq,Tr}$ | Cumulative free-field sound pressure level of all plant 1 m from the façade of the receptor. |
| Acoustic characteristic feature penalty | +3 dB | While tonality or impulsivity are not expected to be perceptible, a penalty has been applied for other potential acoustic features being perceptible. |
| Cumulative rating sound level | 26 dB $L_{Ar,Tr}$ | The specific sound level plus adjustment for acoustic features. |
| Daytime background sound level | 32 dB $L_{AF90,15min}$ | Lowest measured 15 min background level measured at NSR |
| Nigh-time background sound level | 34 dB $L_{A90,15min}$ | |
| Difference between rating and background | Daytime: -6 dB<br>Night-Time: -8 dB | Complies with BCC's criteria |

### 5.4.7 Discussion

As shown in the assessment table above, noise from the proposed new plant installation is calculated to be a level that is at least 5 dB below the prevailing background level and, therefore, complies with BCC's criteria. This is provided the noise mitigation measures outlined in Section 5.4.5 are implemented.

BS 4142 states that the likelihood of impact is dependent on the context of which the specific level is perceived. In this case, it may be more relevant to consider the absolute sound level of the plant, instead of relative to the background level.

Given the rating level is very low and predicted to be below the lowest measured background level over a 15-minute period, there is a low likelihood of the proposed plant installation causing a noise impact.

### 5.4.8 Uncertainty

Uncertainty is an unavoidable feature of measurements in the field, which can be subject to many factors; the weather typically being the most significant of which with respect to the measurement of sound.

Uncertainty is also unavoidable in the prediction of sound levels, where naturally, before the scenario being considered becomes a reality, a number of assumptions need to be relied upon. There is also the uncertainty of people's reactions, which can be influenced by several factors, not just the magnitude or character of the sound in question.

In keeping with the scale of each project, therefore, it is the aim of MZA Acoustics to minimise uncertainty as far as reasonably practicable. With this is mind, and where it is within the control of MZA Acoustics, control measures have been followed, which have been derived from the guidance within BS 4142:2014 and the experience of MZA Acoustics.

Crucially, it has been determined that environmental noise measurements have been undertaken by suitably qualified staff, using in calibration equipment at suitable and representative locations over key periods and avoiding adverse weather conditions.

The predictions have also been undertaken by suitably qualified staff, whilst using the best available information, industry standard calculation methods, and the most applicable calculation procedures.

Notwithstanding this, naturally some uncertainty remains. Given the sheer number of factors involved, however, it is not feasible to place a value on the level of uncertainty, without resulting in an unhelpful range of possible outcomes.

It is the professional position of MZA Acoustics that uncertainty has been kept to a realistic minimum and that the outcome of this assessment is sufficiently representative.

# 6. CONCLUSION

MZA Acoustics has been appointed by David Lloyd Leisure Limited to undertake a noise impact assessment relating to the new external facilities at the David Lloyd Club Bristol Westbury.

This report has been prepared to support the planning application to Bristol City Council.

A baseline environmental noise survey has been undertaken at a location representative of the nearest noise sensitive receptors to the proposed David Lloyd extension to establish the prevailing background and ambient noise levels.

The measured levels have been used to set noise emission limits from the proposed scheme at the nearest noise sensitive receivers and carry out assessments of plant noise and people using the outdoor spa garden.

## 6.1 Spa Garden Assessment

The assessment of the outdoor spa garden indicates noise from speech will be below the prevailing ambient level at the nearest noise-sensitive receptor. The assessment is considered to be worst-case as it assumes full occupancy with people talking 50% of the time with a slightly raised vocal effort.

As such, no noise impact is expected from activity noise within the Spa Garden.

A reverse calculation has been used to demonstrate that the use of any amplified music in the spa garden for relaxation purposes is not likely to be played at a level which would cause an impact at the residential receptors.

## 6.2 Plant Noise Assessment

Considering the manufacturer noise data and the proposed mitigation measures to the AHU and sauna plant room, the rating noise level for new items of fixed plant is expected to achieve the typical BCC criteria at the NSR (i.e. 5 dB below the background level) during the day and night-time.

In accordance with BS 4142, NPSE and PPG's effect levels, this is likely to correlate to a 'no observed effect level' (NOEL) and 'no observed effect', respectively. As such, no additional specific measures, beyond those that have been specified, are deemed to be required.

The limitations to this report are presented in Appendix D.

# Appendices

## Appendix A – Glossary of Acoustic Terminology

Acoustics is the branch of physics concerned with the properties of sound, including ultrasound, infrasound and vibration. A scientist or engineer who works in the field of acoustics is an acoustician or acoustic engineer.

Sound can be measured by a sound level meter or other measuring system. Noise is related to a human response, and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive. Care has been taken in this document to use the most relevant of these terms (whereby 'sound' is used predominantly); however, in most reference documents, and, indeed, generally, 'sound' and 'noise' are used interchangeably. Consequently, just because the term 'noise' is used doesn't necessary mean a negative effect exits or will occur, and the context of the accompanying text should be taken into account.

Human hearing is able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble), and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain).

The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify sound in a manner that approximates the response of the human ear, a weighting mechanism is used, which reduces the importance of lower and higher frequencies in a similar manner to human hearing.

The weighting mechanism that best corresponds to the response of the human ear (though not necessarily perfectly) is the 'A'-weighting scale. This is widely used for environmental sound measurement, and the levels are denoted as dBA, dB(A) or LAeq, LA90 etc. according to the metric being measured or determined (see the Definitions over leaf).

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. Where other changes occur (associated with the change in sound level), such as additional vehicle movements on a road, which can be seen, then these may result in changes in sound level being more noticeable than they might otherwise be.

Further to such visual clues, and any other non-acoustical factors that affect people's response (such personal characteristics, and social, residential, or environmental factors), the subjective response to a sound is dependent not only upon the sound pressure level and component frequencies, but also its intermittency. Consequently, various metrics have been developed to try and correlate people's attitudes to different sounds with the sound level and its fluctuations. The metrics used in this document, as per the relevant guidance, are defined overleaf.

| | |
|---|---|
| **Airborne Sound** | Sound that reaches the point of interest by propagation through air. |
| **Ambient Sound:** | Sound from all sources at any given time, form both near and far. Usually measured in terms of $L_{Aeq}$. |
| **A-Weighting** | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies. |
| **Background Sound Level** | The A-weighted sound pressure level that can be considered the baseline in the absence of any noise from a specific source of sound under assessment. Measured in terms of $L_{A90,\,T}$. |
| **Calibration** | The measurement system/ chain should be periodically calibrated, within a laboratory, against traceable calibration instrumentation, to either National Standards or as UKAS-Accredited, as required. The calibration of the system should also be checked in the field using a portable calibrator before and after each short-term measurements, and periodically for longer term monitoring. |
| **Class 1** | The Class of a sound level meter describes its accuracy as defined by the relevant international standards – Class 1 is more accurate than Class 2. The older standard IEC 60651 referred to the grade as "Type", whereas the new standard IEC 61672 refers to it as the "Class". The most accurate meters used in the field (as opposed to a laboratory) are Class 1. Class 2 meters can be used in some instances; however, MZA Acoustics use Class 1 (or Type 1) meters by default, as required by BS 4142:2014, for example. |
| **Decibel** | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds (s1 and s2) is given by 20 log10 ($s_1/s_2$). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa. |
| **Fast time Weighting (F)** | Averaging time used in sound level meters. Defined in BS EN 61672-2:2013 Electroacoustics. Sound level meters. Pattern evaluation tests. |
| **Free-field / Façade** | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m away. |
| **$L_{AF90,\,T}$** | The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time fast time-weighting (F). Generally used to describe the 'background' sound conditions. |
| **LAFmax** | The maximum A-weighted sound pressure level during a given time period. Lmax is sometimes used for the assessment of occasional loud sounds, which may have little effect on the overall $L_{eq}$ noise level, but could still affect the sound environment. Unless described otherwise, it is measured using the fast time-weighting (F). |
| **Leq, T** | A sound level index called the equivalent continuous sound level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. Where the value is A-weighted, is will be presented '$L_{Aeq,T}$' or 'dBA $L_{eq,T}$', otherwise is should be an un-weighted (or linear) value. |
| **Lp** | See Sound Pressure Level. |
| **Noise** | Related to human response to sound. Unwanted sound, or sound that is considered undesirable or disruptive. |

| | |
|---|---|
| **Octave Band** | Frequency ranges in which the upper limit of each band is twice the lower limit. Octave bands are identified by their geometric mean frequency, or centre frequency. |
| **Sound Absorption Coefficient** | A measure of how effective a material is at absorbing sound incident to its surface. The index range is between 0 and 1, where 1 indicates a perfectly absorbent material and 0 indicates a perfectly reflective one. |
| **Sound Power** | In a specified frequency band, the rate at which acoustic energy is radiated from a source. In general, the rate of flow of sound energy, whether from a source, through an area, or into an absorber. |
| **Sound Power Level** | Of airborne sound, ten times the common logarithm of the ratio of the sound power under consideration of the standard reference power of 1 pW. Expressed in decibels. |
| **Sound Pressure** | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure. |
| **Sound Pressure Level** | The sound level is the sound pressure relative to a standard reference pressure of 20 Pa ($20x10^{-6}$ Pascals) on a decibel scale. |
| **Weighted Sound Reduction Index ($R_w$)** | A single-figure quantity which characterises the airborne sound insulating properties of a material or element over a range of frequencies. |

## Appendix B – Noise Survey Equipment

| Equipment | Type | Serial Number | Calibration Due Date |
|---|---|---|---|
| Sound Level Meter | 01dB Metravib FUSION | 14087 | 19/10/2025 |
| Pre-Amplifier | 01dB Metravib PRE22 | 2113049 | |
| Microphone | GRAS 40CD 1/2" Pre-polarised free-field | 446548 | |
| Calibrator | 01dB Metravib CAL31 | 87801 | 03/04/2024 |

# Appendix C – Detailed Plant Noise Calculations

| Receptor: Rear first-floor windows of 8 Holmwood Gardens | Variables | | | | | Frequency, Hz | | | | | | | | | Operating Hours | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Element / Description** | **r (m)** | **area ($m^2$)** | **volume ($m^3$)** | **Q** | **No. Units** | **63** | **125** | **250** | **500** | **1k** | **2k** | **4k** | **8k** | **dB(A)** | **Daytime** | **Night-Time** |
| **Proposed Plant Room Equipment** | | | | | | | | | | | | | | | | |
| Manufacturer SPL at 1m of Stratton MK2 Boiler | | | | | | | | | | | | | | 61.6 | | |
| Manufacturer SPL at 1m of Lowara SMB20 Pump | | | | | | | | | | | | | | 70.0 | | |
| Calculation for reverberant level in proposed main plant room | | | | | | | | | | | | | | | | |
| Derived SWL of Stratton MK2 Boiler from manufacturer SPL | 1 | | | 1 | | | | | | | | | | 72.6 | | |
| Derived SWL of Lowara SMB20 Pump from manufacturer SPL | 1 | | | 1 | | | | | | | | | | 81.0 | | |
| *Total SWL of all plant in source room* | | | | | | | | | | | | | | *81.6* | | |
| Estimated reverberation time in plant room (s) | | | | | | | | | | | | | | 1.0 | | |
| Correction for plant room reverberation time (10*log(T)) | | | | | | | | | | | | | | 0 | | |
| Correction for plantroom volume (-10*log(V)+14 | | | 174 | | | | | | | | | | | -8 | | |
| **Main plant room reverberant sound pressure level** | | | | | | | | | | | | | | **73** | Y | Y |
| Calculation for reverberant noise break-out from proposed main plant room via louvred door | | | | | | | | | | | | | | | | |
| Correction for area of louvre (10*log(S)) | | 4.00 | | | | | | | | | | | | 6.0 | | |
| Minimum required insertion loss/SRI of louvres | | | | | | | | | | | | | | 0 | | |
| Correction for distance from radiating element to receiver (-20*log®-14) | 60 | | | | | | | | | | | | | -50 | | |
| Correction for hemispherical radiation (soft ground) | | | | | | | | | | | | | | 0 | | |
| Correction for screening by building envelope (no line of sight) | | | | | | | | | | | | | | -10 | | |
| **SPL of proposed main plant room noise breakout level 1m from NSR façade (free-field level)** | | | | | | | | | | | | | | **20** | Y | Y |
| **Proposed Sauna Plant Room** | | | | | | | | | | | | | | | | |
| Reverberant SPL inside sauna plant room measured at existing site (3no. Pumps operating simultaneously) | | | | | | 74 | 70 | 80 | 78 | 76 | 78 | 74 | 72 | 83 | | |
| Correction for internal reverberant field to external free-field | | | | | | -6 | -6 | -6 | -6 | -6 | -6 | -6 | -6 | | | |
| Correction for area of louvred door | | 1.7 | | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | | |
| Minimum required insertion loss/SRI of acoustic louvred door | | | | | | 3 | 3 | 3 | 6 | 8 | 10 | 12 | 9 | | | |
| Correction for distance from radiating element to receiver (-20*log®-11) (incl. reflection) | 50 | | | | | -45 | -45 | -45 | -45 | -45 | -45 | -45 | -45 | | | |
| Attenuation due to screening provided by building envelope (no line of sight) | | | | | | -10 | -10 | -10 | -10 | -10 | -10 | -10 | -10 | | | |
| **SPL of sauna plant room noise breakout at 1m from NSR façade (free-field)** | | | | | | **12** | **9** | **18** | **14** | **10** | **9** | **3** | **4** | **17** | Y | Y |
| **Air Handling Unit Façade Terminations** | | | | | | | | | | | | | | | | |
| AHU Fresh Air Intake (FAI) SWL | | | | | | 62 | 72 | 71 | 73 | 77 | 74 | 73 | 66 | 81 | | |
| SPL of unattenuated FAI 1m from the NSR façade (incl. distance & directivity corrections and duct losses) | 38 | | | | | 12 | 25 | 23 | 21 | 26 | 23 | 22 | 15 | 30 | | |
| Correction for screening by building envelope (partial line of sight) | | | | | | -5 | -5 | -5 | -5 | -5 | -5 | -5 | -5 | | | |
| Minimum required insertion loss of proposed attenuator | | | | | | 0 | 0 | 2 | 6 | 14 | 12 | 11 | 2 | | | |
| SPL of attenuated FAI 1m from the NSR façade (incl. distance & directivity corrections and duct losses) | | | | | | 7 | 20 | 16 | 10 | 7 | 6 | 6 | 8 | 15 | | |
| AHU exhaust (EXH) SWL | | | | | | 72 | 75 | 75 | 70 | 69 | 68 | 73 | 60 | 77 | | |
| SPL of unattenuated EXH 1m from the NSR façade (incl. distance & directivity corrections and duct losses) | 38 | | | | | 22 | 28 | 27 | 18 | 18 | 17 | 22 | 9 | 27 | | |
| Correction for screening by building envelope (partial line of sight) | | | | | | -5 | -5 | -5 | -5 | -5 | -5 | -5 | -5 | | | |
| Minimum required insertion loss of proposed attenuator | | | | | | 0 | 0 | 6 | 3 | 6 | 6 | 11 | 0 | | | |
| SPL of attenuated EXH 1m from the NSR façade (incl. distance & directivity corrections and duct losses) | | | | | | 17 | 23 | 16 | 10 | 7 | 6 | 6 | 4 | 15 | | |
| **Cumulative SPL of AHU terminations at 1m from NSR façade** | | | | | | **18** | **25** | **19** | **13** | **10** | **9** | **9** | **10** | **18** | Y | Y |
| **Specific Level at receptor due to cumulative daytime operating plant (dB)** | | | | | | | | | | | | | | **23** | | |
| **BS 4142:2014 Acoustic Feature Corrections** | | | | | | | | | | | | | | **3** | | |
| **Daytime Rating Level at receptor** | | | | | | | | | | | | | | **26** | | |
| **Lowest measured daytime background free-field level at receptor ($L_{AF90,15min}$)** | | | | | | | | | | | | | | **32** | | |
| **Difference (Rating - Background)** | | | | | | | | | | | | | | **-6** | | |
| **Complies with Local Authority criteria? (-5dB)** | | | | | | | | | | | | | | **Yes** | | |
| **Specific Level at receptor due to cumulative night-time operating plant (dB)** | | | | | | | | | | | | | | **23** | | |
| **BS 4142:2014 Acoustic Feature Corrections** | | | | | | | | | | | | | | **3** | | |
| **Night-Time Rating Level at receptor** | | | | | | | | | | | | | | **26** | | |
| **Lowest measured night-time background free-field level at receptor ($L_{AF90,15min}$)** | | | | | | | | | | | | | | **34** | | |
| **Difference (Rating - Background)** | | | | | | | | | | | | | | **-8** | | |
| **Complies with Local Authority criteria? (-5dB)** | | | | | | | | | | | | | | **Yes** | | |

## Appendix D – Report Limitations

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of MZA Acoustics Limited. MZA Acoustics Limited accepts no responsibility or liability for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/ or MZA Acoustics Limited and agree to indemnify MZA Acoustics Limited for any and all loss or damage resulting therefrom. MZA Acoustics Limited accepts no responsibility or liability for this document to any other party other than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. Opinions included therein are based on information gathered during the study and from our experience. If additional information becomes available which may affect our comments, conclusions or recommendations MZA Acoustics Limited reserve the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

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