



WILTSHIRE COLLEGE TROWBRIDGE: SPORTS HALL REMODELLING

PLANT NOISE ASSESSMENT FOR PLANNING

Acoustics Report A2486 R01

24th July 2026

Report for: Wiltshire College & University Centre

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1 Introduction

Ion Acoustics is appointed by Wiltshire College and University Centre to provide specific acoustic advice for the remodelling of an existing sports hall to provide new teaching accommodation. Part of the scope includes providing a noise assessment to support a planning application for the scheme, which will include new external mechanical services including AHU units, a condenser and air source heat pumps (ASHPs) located outside the building. The nearest housing is adjacent to the eastern boundary. Therefore, it is expected that the local authority will require a planning noise assessment of the plant.

This report is prepared to document a baseline noise survey carried out at the site and set out the plant noise limits for the new plant. A noise assessment of the proposed plant will be provided when plant selections are available.

2 Scheme Details

2.1 Site Location

Figure 1 shows an aerial photo of the development site and the noise measurement position, MP1 which is representative of noise levels at the rear of the nearest housing on Beech Grove to the east. The sports hall is part of the general college campus site, located towards the eastern boundary. To the north is a large open grassy area, with other teaching buildings on the northern and western side.

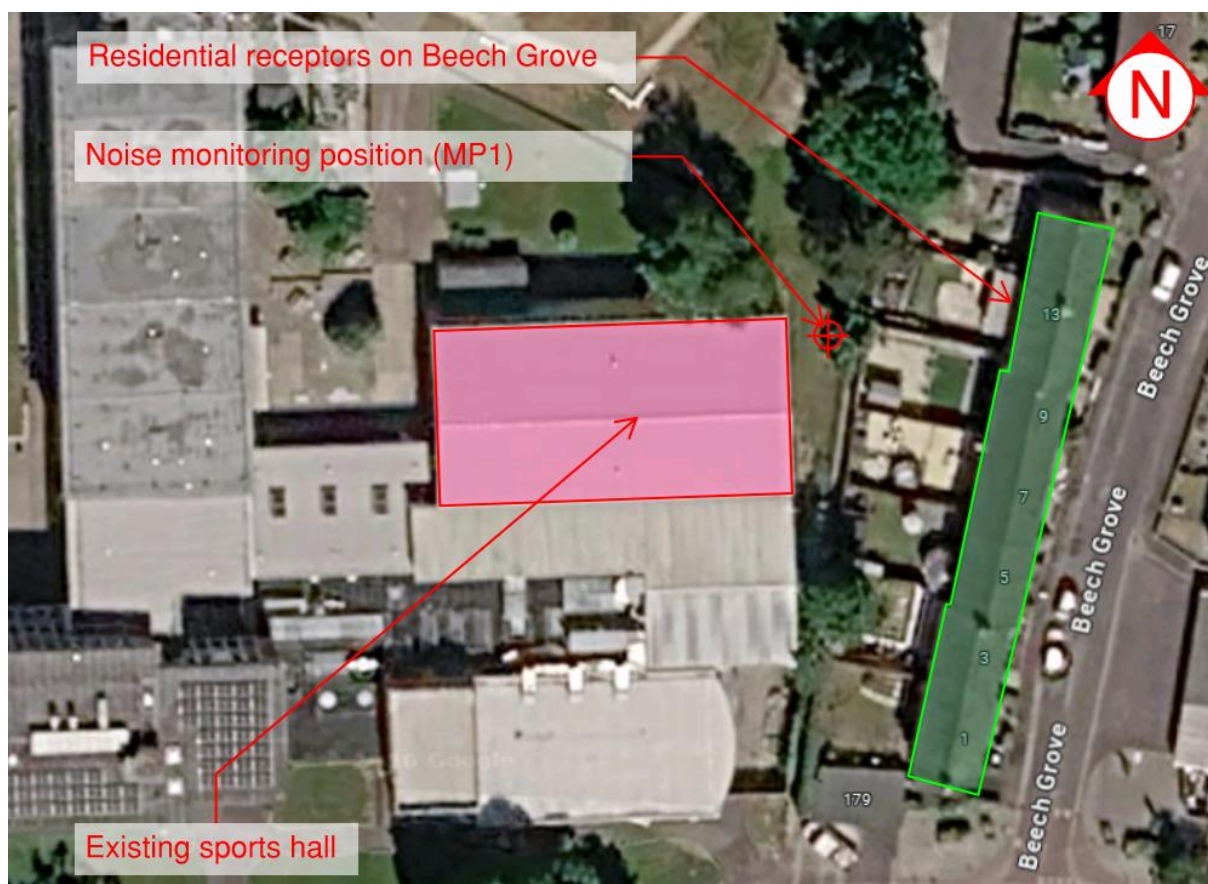


Figure 1: Aerial view of site with measurement and assessment positions displayed © Google

2.2 Proposed Scheme

The scheme consists of the internal remodelling of an existing sports hall, with a small single storey extension to form an entrance and store, with a small plant enclosure at the north side and an external AHU enclosure at the east end. The new facilities will include an art teaching studio and ICT teaching room on ground floor, and new media rooms on a new mezzanine comprising a media AV studio and two media classrooms.

In respect of operational noise emissions, there is no new significant internal noise sources and in any case these would all be expected to be quieter than sports use. No assessment of operational noise breakout is considered necessary.

There will however be new external plant and that will need to be assessed in respect of external noise emissions to the housing. It is expected that this will comprise:

- Two external AHUs in compound at east end of the sports hall.
- Two ASHPs in plant compound to east of new entrance area on north facade
- VRF Condenser in plant compound to east of new entrance area on north facade

The hours of operation are expected to be typically 0600hr to 1900 hrs. The ASHPs will potentially start to operate at around 0600 for heating, with the main plant operating once the building is occupied, potentially from around 0800 hrs. These timings will be refined, but it is understood that there is no night operation required.

3 Planning Guidance

3.1 Wiltshire Council

The scheme is within the Wiltshire Council area. They have published guidance on their website which sets out typical assessment requirements for noise from industrial and commercial sources affecting new residential developments (section 6.6)¹. This states:

"For most proposed industrial and commercial noise sources, an assessment in line with BS4142 should be carried out at the façade of noise sensitive premises. One of the indications of the impact of a BS 4142 assessment is 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.

New developments should contribute and enhance the area in which they are located and where possible i.e. prevent 'noise creep', contribute to the improvement of people's health and quality of life as per the NPSE. Therefore, the design objective should be:

The development should be designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location."

So the latter clause can be used to set plant noise limits. Note however that a limit at parity with the background sound level is a low impact according to BS4142:2014. We also note that where background sound levels are particularly low, BS4142 sets out that an absolute limit may be

¹ <https://www.wiltshire.gov.uk/article/8699/6-Specific-Guidance-for-Proposed-Developments>

preferable, especially at night. So it is not always appropriate nor necessary for the plant to be 5dB below the background. This is discussed further below.

3.2 BS 4142:2014

The standard method for assessing new plant noise affecting housing, is British Standard BS 4142². A BS 4142 assessment is typically made by calculating the difference between the noise under consideration and the background sound level as represented by the L_{A90} parameter, determined in the absence of the new plant noise. The L_{A90} parameter is defined as the level exceeded for 90% of the measurement time, representing the underlying noise in the absence of short duration noise events such as dog barks or individual cars passing.

The plant noise under consideration is assessed in terms of the ambient noise level, L_{Aeq} , but a character correction penalty can be applied where the noise exhibits acoustic characteristics such as distinguishable tones, impulsiveness, intermittency or other acoustically significant characteristics. The ambient noise level, L_{Aeq} is defined as the steady-state noise level with the same energy as the actual fluctuating sound over the same time period. It is effectively the average noise level during the period. The new plant noise level (L_{Aeq}) with the character correction (if necessary) is known as rating level, L_{Ar} , and the difference between the background noise and the rating level is determined to make the BS 4142 assessment.

The standard states:

- *"Typically, the greater the difference, the greater the magnitude of the impact.*
- *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5dB 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 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 also stresses the importance of considering the context in which a sound occurs. Factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the character of the area should be considered when assessing the noise impact.

The standard states that the objective of a noise survey *"is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods"*. A typical background sound level is usually derived by means of statistical analysis as opposed to, for example, simply selecting a mean average or the lowest. This is typically achieved by creating a frequency distribution histogram of the background sound levels measured, rounded to the nearest whole number.

The absolute sound level is of particular importance where the measured background sound levels are low, which is typically taken as around L_{A90} 30dB or below. In regard to low sound levels, the standard states:

² BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, British Standards Institute

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

Therefore, amenity can be protected with a absolute limit when background noise levels are otherwise low.

3.3 BS 8233:2014 and WHO criteria

British Standard BS 8233: 2014³ and the World Health Organisation (WHO)⁴ provide external and/or internal noise criteria to protect residential amenity. These are detailed in Table 1 below.

Table 1: WHO / BS 8233:2014 Guideline Noise Levels

Location	Critical Health Effect	07:00 to 23:00 hrs	23:00 to 07:00 hrs
Within Bedrooms	Desirable Value	35dB $L_{Aeq,16 \text{ hours}}^{**}$	30dB $L_{Aeq,16 \text{ hours}}^{**}$
Outside Bedroom Windows	Sleep Disturbance (Windows Open)	--	45dB $L_{Aeq, 8 \text{ hours}}^*$
Amenity Spaces (Gardens / Patios)	Moderate Annoyance Serious Annoyance	50dB $L_{Aeq, 16 \text{ hours}}^{**}$ 55dB $L_{Aeq, 16 \text{ hours}}^{**}$	--
Notes: *From WHO Community Noise Guidelines (1999) **BS 8233: 2014 and WHO Community Noise Guidelines			

The WHO guideline of 45 dB $L_{Aeq, 8 \text{ hr}}$ represents an 8-hour L_{Aeq} outside noise-sensitive rooms to prevent sleep disturbance. The WHO limit is a level at a position 1m from the façade.

3.4 Absolute Noise Limit Derivation

As previously stated, in instances of low background noise levels, BS 4142:2014 states that assessment in line with absolute noise limits might be *'as, or more, appropriate than'* a relative noise level assessment.

To ensure new development such as that proposed is not a significant or prohibiting factor in achieving the relevant WHO guideline values at sensitive receptors, noise generated by the development would need to be limited to 10dB below the BS8233 guidance levels in Table 1 above. This would equate to a limit of 35 dBA at a position 1 metre from the window of a bedroom at night (façade level). This is equivalent to 32 dBA as a free field incident noise level.

It is noted also that with plant noise limited to 32dBA outside an open window, the level inside, even with the window open, would still be no higher than 20dBA, which is a very low absolute noise level internally.

Therefore, we would generally not expect to set the rating level any lower than L_A 32dB to protect amenity.

³ British Standards Institution (2014) BS 8233:2014: Guidance on sound insulation and noise reduction for buildings

⁴ From WHO Community Noise Guidelines (1999)

4 Noise Survey

A baseline noise survey was carried out between Tuesday 14th July – Wednesday 15th July 2026. A sound level meter was set up at position MP1 as shown in Figure 1 at the rear of the existing sports hall with the microphone and windshield mounted on a pole 1.4m above the ground level. This position is representative of the noise climate for the nearest residential receptors adjacent to the site and allowed a free-field measurement to be made. The position is shown in the photograph in Figure 2.

A Rion NL52 sound level meter with a Type WS15 wind shield was used and calibrated with a Brüel & Kjær Type 4231 calibrator at the start and end of the survey. No significant drift in calibration was noted on collection. The meter was set up to log various noise indices (L_{Aeq} , $L_{Amax,F}$, L_{A90} , L_{A01} , L_{A10}) in consecutive 15-minute periods. The site was inspected by David O'Neill BEng CEng MSc MIOA and the noise monitoring carried out by Connal Heath BSc.

Weather conditions on set up were dry cloudy skies and a temperature of 22°C and slightly elevated wind speeds at 6 m/s at set. However, the forecast was for windspeeds to reduce for the duration of the survey, and observations made on the day in fact indicated that windspeeds were low at set up and were comfortably below 5 m/s and within BS4142 tolerances for the set up and then for the remainder of the survey period. On collection, the weather conditions were again dry with clear skies and a temperature of 23°C and winds below 5 m/s. The forecast throughout the survey throughout the evening and night indicated the weather conditions were suitable for monitoring.



Figure 2: Photo of MP1 taken looking south-east with the closest dwellings beyond

5 Noise Survey Results

5.1 Noise Levels Measured

Noise levels measured at MP1 are shown graphically in Figure 3 for the survey period in terms of the 15-minute L_{Aeq} , L_{AFmax} and L_{A90} noise levels. The survey data is tabulated in Appendix A.

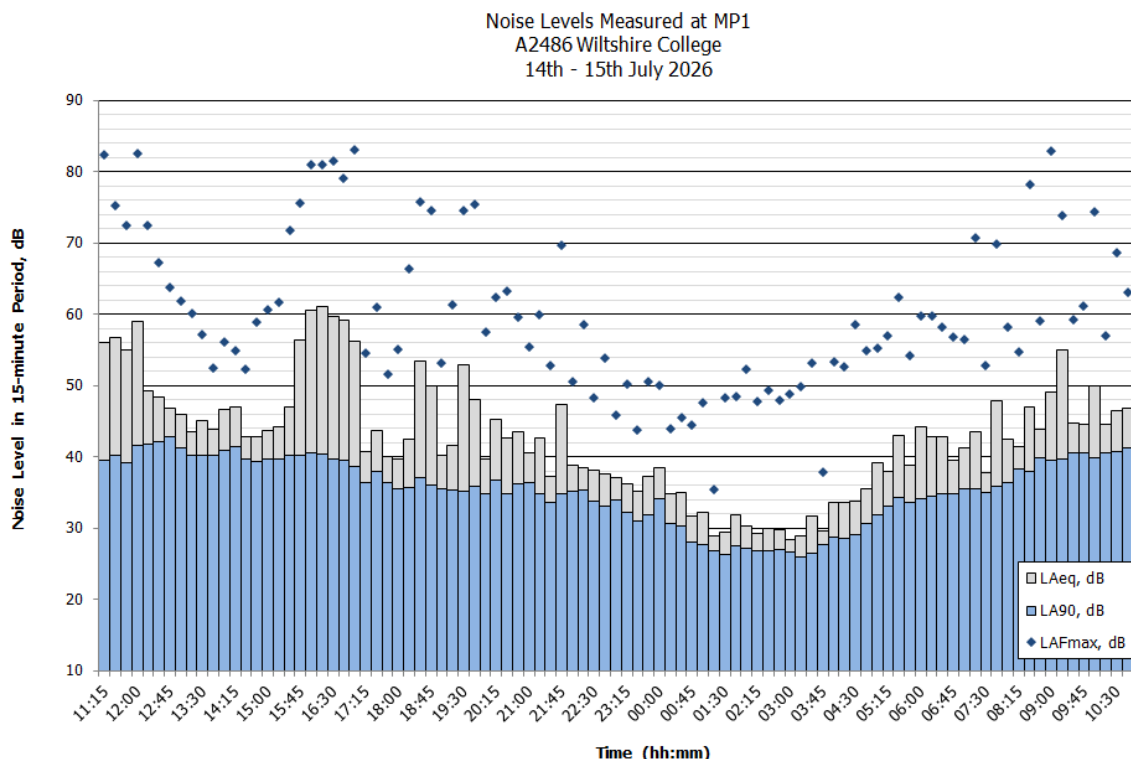


Figure 3: Time History Graph for MP1.

There are some periods with elevated levels during the first day and this is likely related to works in the nearby gardens or potentially some activity on the site. There is a small impact on the background level (L_{A90}) for the period 1545 to 1645 and this has been excluded from the L_{A90} assessment.

The background sound levels are moderate during the day at around L_{A90} 37-42 dB typically. The night levels however drops off quite significantly, with levels falling to below L_{A90} 30dB for much of the night.

5.2 Typical Background Noise Levels

BS 4142 requires the "typical" background noise level to be determined. To assess this, the survey data has been analysed to obtain the frequency distribution histogram of the integer L_{A90} values as discussed in BS 4142:2014. As the plant will only operate between the hours of 06:00 – 21:00 only this period has been considered. A histogram for these hours is presented in Figure 4. However, we have also provided the equivalent assessment for night for completeness, although at this stage no plant is expected to operate overnight until 6am.

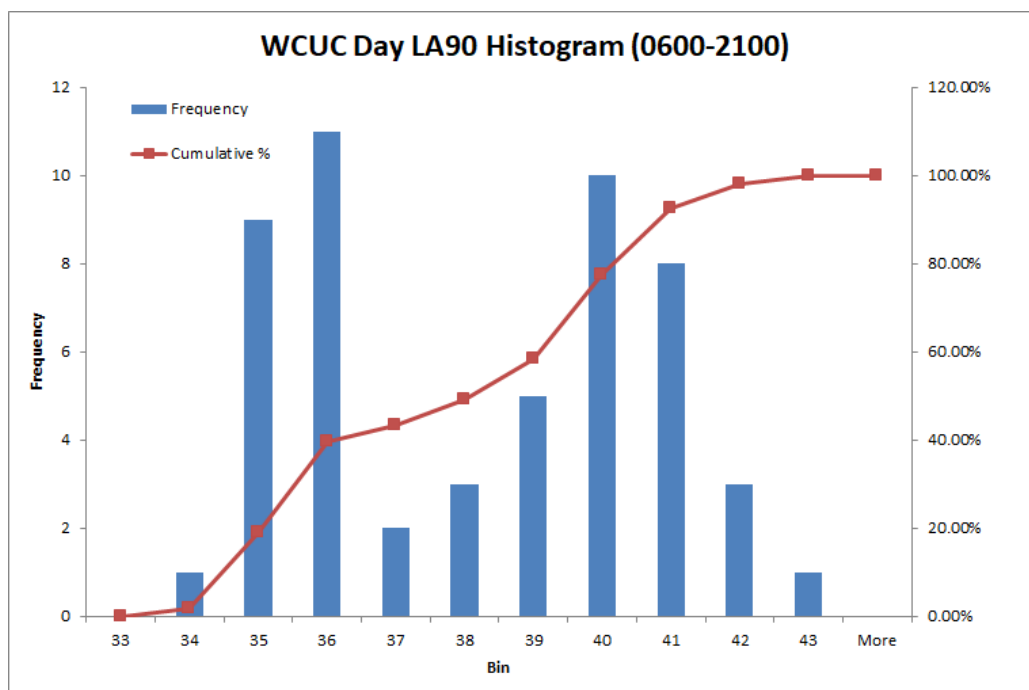


Figure 4: L_{A90} histogram for potential operational hours 06:00 – 21:00

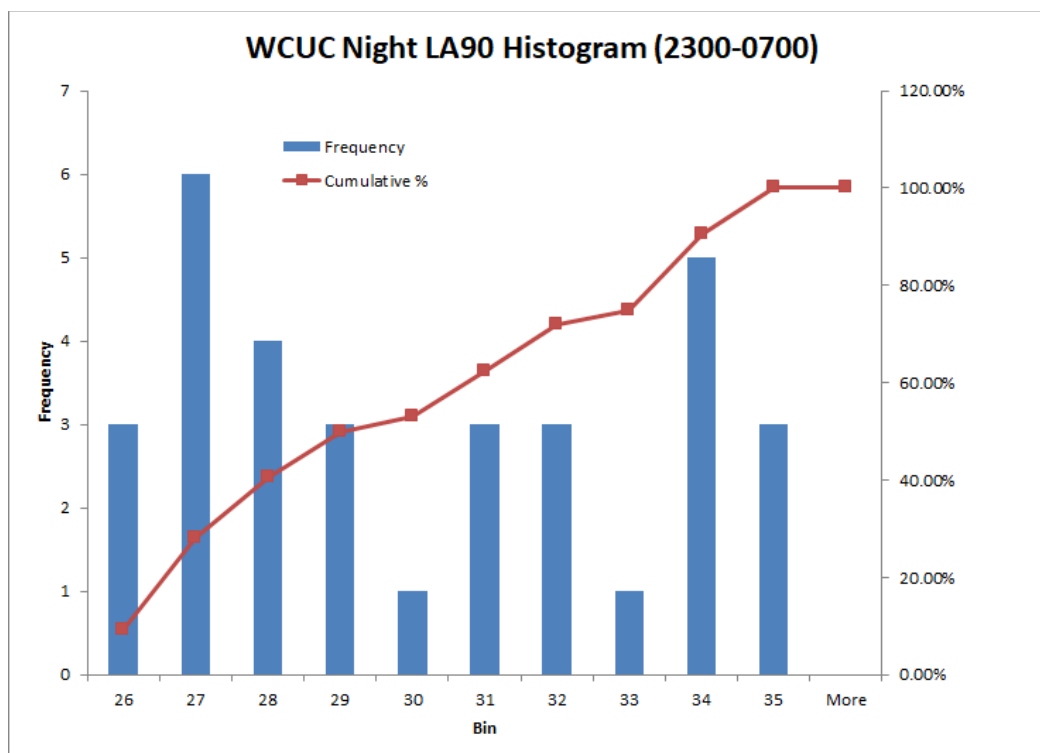


Figure 5: L_{A90} histogram for night hours 23:00 – 07:00

Based on this the typical background level over the likely operational hours is taken as L_{A90} 36dB. Noise levels only fall below this for 19% of the time. At night, the representative background level is L_{A90} 27dB, although BS 4142 would regard noise levels during the middle of the night to be less important.

6 Plant Noise Limit

As previously discussed, the new plant is expected not to operate outside of the hours of 06:00 and 21:00. Based on the criteria discussed above the limits is set at 5dB below the background noise level for each period, but with a lower limiting fixed value of L_{Ar} 32dB. The noise limit is set out in Table 3 below. The typical background over the operational hours is 36dB, and 5dB below that would be 31dB, which is below the proposed lower absolute limit. Therefore, we propose that the fixed limit of 32dB L_{Ar} would apply during the day, as it would at night where the background level is much lower. This would be a low impact in respect of BS 4142 and, in respect of planning, would be at the lowest observed adverse effect level (LOAEL) where noise may (just) be heard but does not cause any change in behaviour.

Table 3: Derivation of Noise Limits for Provisional Operational Period

Period	Background Level L_{A90}	Planning Criterion	Plant limit L_{Ar}
Operational 0600-2100	36dB	-5dB or min of 32dB L_{Ar}	32dB
Night 2300-0700	27dB	-5dB or min of 32dB L_{Ar}	32dB

The noise limits relate to the BS 4142 rating level (dB L_{Ar}) of the plant including any character corrections. In this case, the targets apply at 1m from the window of any habitable room of a dwelling, but are based on a free field level, so the measured level at 1m from the window would be around 3dB higher for both background and plant noise.

6.1 Plant Noise Calculations

The plant scheme will need to be assessed against these noise limits for the operational period. It is expected that this will require attenuation to AHUs and the condensers to be full shielded from the residential receptors. The preliminary arrangement of the plant is indicated in Appendix B.

6.2 Context and Uncertainty

BS 4142 requires consideration of context and uncertainty. The context is that of new plant being introduced to an urban area where there will be other sources of plant. The background noise measurements are subject to uncertainty. To allow for uncertainty measurements were made over a 24-hour period. Periods of noisier nearby activity have been excluded from the assessment. The typical values have been set at below the lower end of the measured values.

7 Summary

Ion Acoustics has undertaken a baseline noise survey at Wiltshire College in Trowbridge in respect of determining background noise levels affecting nearby residential receptors. These have been used to set plant noise limits for new plant associated with the Sports Hall remodelling scheme. A noise assessment can be provided for planning once plant has been finalised.

Wiltshire College Trowbridge: Sports Hall Remodelling
Planning Noise Assessment
Appendix A – Tabulated Noise Survey Data



Time	L _{Aeq} dB	L _{Amax,F} dB	L _{AF90} dB	Time	L _{Aeq} dB	L _{Amax,F} dB	L _{AF90} dB
14/07/2026 13:45	43.9	52.4	40.2	15/07/2026 01:45	31.9	48.4	27.5
14/07/2026 14:00	46.6	56.0	40.9	15/07/2026 02:00	30.2	52.3	27.2
14/07/2026 14:15	47.0	54.9	41.4	15/07/2026 02:15	29.3	47.8	26.7
14/07/2026 14:30	42.7	52.2	39.7	15/07/2026 02:30	30.0	49.3	26.7
14/07/2026 14:45	42.7	58.8	39.3	15/07/2026 02:45	29.8	47.9	27.0
14/07/2026 15:00	43.7	60.6	39.6	15/07/2026 03:00	28.4	48.8	26.6
14/07/2026 15:15	44.2	61.6	39.6	15/07/2026 03:15	28.9	49.9	26.0
14/07/2026 15:30	46.9	71.7	40.1	15/07/2026 03:30	31.7	53.1	26.4
14/07/2026 15:45	56.4	75.5	40.1	15/07/2026 03:45	29.5	37.9	27.6
14/07/2026 16:00	60.6	80.9	40.5	15/07/2026 04:00	33.6	53.3	28.7
14/07/2026 16:15	61.1	80.9	40.3	15/07/2026 04:15	33.5	52.6	28.6
14/07/2026 16:30	59.7	81.5	39.7	15/07/2026 04:30	33.8	58.6	29.1
14/07/2026 16:45	59.1	79.0	39.4	15/07/2026 04:45	35.5	54.8	30.6
14/07/2026 17:00	56.2	83.1	38.6	15/07/2026 05:00	39.2	55.3	31.8
14/07/2026 17:15	40.7	54.6	36.4	15/07/2026 05:15	37.9	56.9	33.1
14/07/2026 17:30	43.6	61.0	37.9	15/07/2026 05:30	42.9	62.3	34.3
14/07/2026 17:45	40.0	51.6	36.4	15/07/2026 05:45	38.7	54.1	33.5
14/07/2026 18:00	39.7	55.0	35.5	15/07/2026 06:00	44.2	59.8	34.1
14/07/2026 18:15	42.4	66.4	35.6	15/07/2026 06:15	42.7	59.8	34.5
14/07/2026 18:30	53.4	75.7	37.0	15/07/2026 06:30	42.8	58.1	34.8
14/07/2026 18:45	49.9	74.6	36.0	15/07/2026 06:45	39.4	56.7	34.7
14/07/2026 19:00	40.2	53.1	35.4	15/07/2026 07:00	41.3	56.4	35.5
14/07/2026 19:15	41.6	61.3	35.3	15/07/2026 07:15	43.5	70.7	35.5
14/07/2026 19:30	52.9	74.6	35.2	15/07/2026 07:30	37.8	52.8	34.9
14/07/2026 19:45	48.0	75.4	35.8	15/07/2026 07:45	47.8	69.8	35.9
14/07/2026 20:00	39.7	57.4	34.7	15/07/2026 08:00	42.4	58.2	36.3
14/07/2026 20:15	45.2	62.4	36.7	15/07/2026 08:15	41.4	54.7	38.3
14/07/2026 20:30	42.6	63.3	34.8	15/07/2026 08:30	46.9	78.1	38.0
14/07/2026 20:45	43.4	59.6	36.1	15/07/2026 08:45	43.8	59.0	39.9
14/07/2026 21:00	40.6	55.4	36.4	15/07/2026 09:00	49.0	82.8	39.4
14/07/2026 21:15	42.6	59.9	34.7	15/07/2026 09:15	55.0	73.9	39.6
14/07/2026 21:30	37.3	52.8	33.5	15/07/2026 09:30	44.7	59.2	40.6
14/07/2026 21:45	47.3	69.6	34.7	15/07/2026 09:45	44.5	61.2	40.6
14/07/2026 22:00	38.8	50.6	35.1	15/07/2026 10:00	50.0	74.3	39.8
14/07/2026 22:15	38.4	58.5	35.3	15/07/2026 10:15	44.6	56.9	40.6
14/07/2026 22:30	38.1	48.2	33.8	15/07/2026 10:30	46.4	68.6	40.7
14/07/2026 22:45	37.6	53.9	33.0	15/07/2026 10:45	46.7	63.1	41.2
14/07/2026 23:00	37.0	45.8	33.9	15/07/2026 11:00	43.8	57.4	39.7
14/07/2026 23:15	36.2	50.2	32.2	15/07/2026 11:15	0.0	0.0	0.0
14/07/2026 23:30	35.1	43.8	30.9	15/07/2026 11:30	0.0	0.0	0.0
14/07/2026 23:45	37.2	50.5	31.8	15/07/2026 11:45	0.0	0.0	0.0
15/07/2026 00:00	38.4	50.0	34.1	15/07/2026 12:00	0.0	0.0	0.0
15/07/2026 00:15	34.7	43.9	30.6	15/07/2026 12:15	0.0	0.0	0.0
15/07/2026 00:30	35.0	45.4	30.2	15/07/2026 12:30	0.0	0.0	0.0
15/07/2026 00:45	31.6	44.4	28.0	15/07/2026 12:45	0.0	0.0	0.0
15/07/2026 01:00	32.2	47.6	27.7	15/07/2026 13:00	0.0	0.0	0.0
15/07/2026 01:15	28.8	35.4	26.8	15/07/2026 13:15	0.0	0.0	0.0
15/07/2026 01:30	29.4	48.3	26.2	15/07/2026 13:30	0.0	0.0	0.0

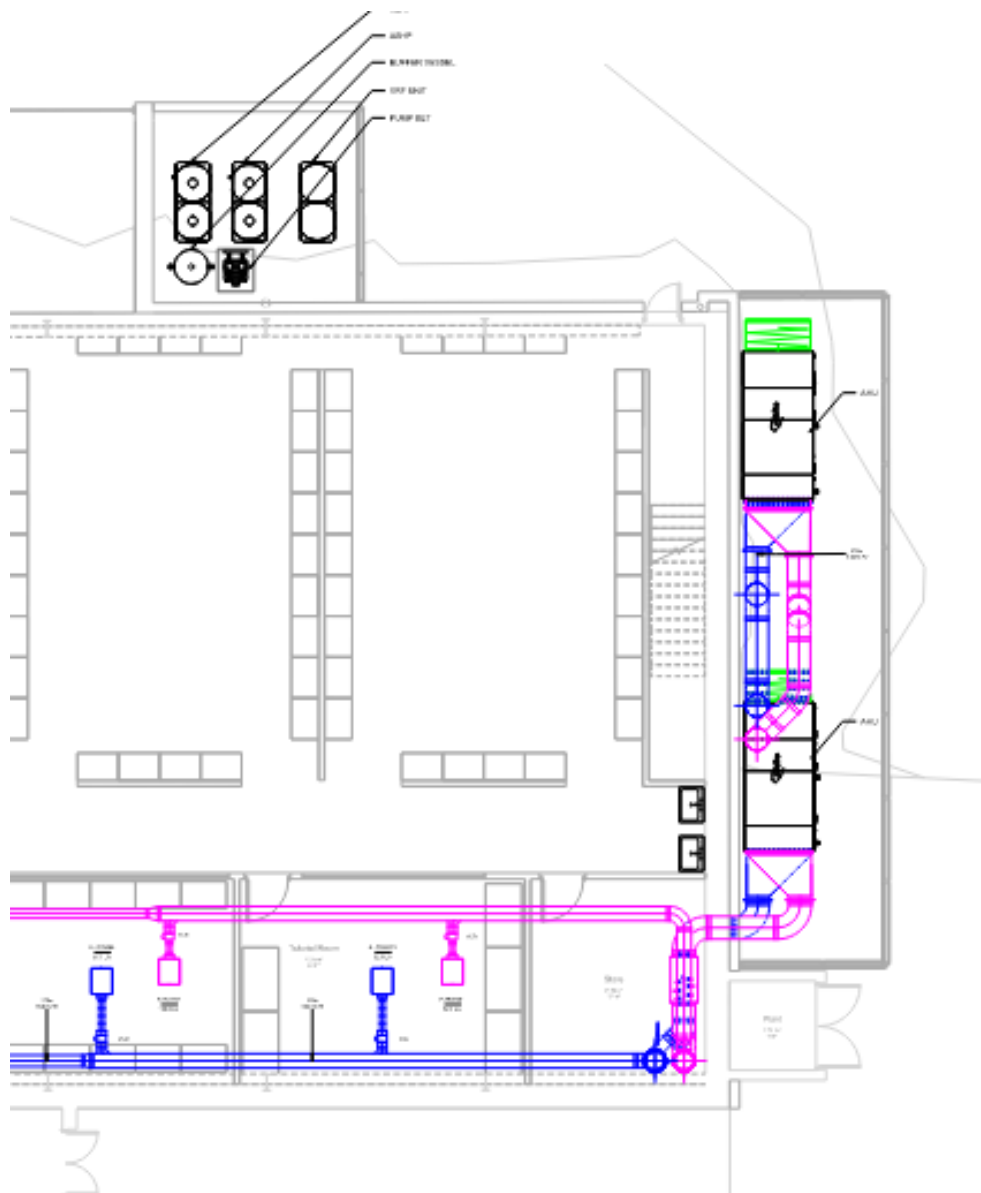


Figure B1: Preliminary Arrangement of external plant at east end of Sports Hall