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ENVIRONMENT

MORGAN SINDALL CONSTRUCTION &
INFRASTUCTURE LIMITED

THOMAS TELFORD UTC
WOLVERHAMPTON

Noise Impact Assessment

MCA2118

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Notice

EXECUTIVE SUMMARY

BWB Consulting has been appointed by Morgan Sindall to undertake a noise assessment to support a planning application for Thomas Telford UTC in Wolverhampton. The proposed development consists of a new-build three storey teaching block, a new-build two storey sports hall block and refurbishments to the existing school building.

Drawing on the results of a baseline noise survey at the site, an assessment of noise emissions from the proposed external plant items has been undertaken. The assessment has identified that noise emissions from the external plant items can be controlled to meet the requirements outlined in the relevant planning conditions.

An assessment of the suitability of the proposed site for the proposed new-build three-storey teaching block and two-storey sports hall block has also been undertaken. Drawing on the results of the baseline noise survey, the assessment has found that the site is suitable for the proposed use and that the prevailing noise climate is unlikely to result in an adverse impact at the proposed development.

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1. INTRODUCTION

Appointment & Background

1.1 BWB Consulting has been appointed by Morgan Sindall to undertake a noise assessment to support a planning application at Thomas Telford UTC in Wolverhampton. The proposed development consists of a new-build three storey teaching block, a new-build two storey sports hall block and refurbishments to the existing school building.

1.2 This report presents an assessment of the suitability of the site for the proposed new-build teaching block and sports hall block.

1.3 The assessment has been undertaken with due consideration to relevant local and national planning policies and British Standards relating to noise.

1.4 This report is necessarily technical in nature. To assist the reader, a glossary of relevant acoustic terminology can be found in **Appendix A**.

Site Setting

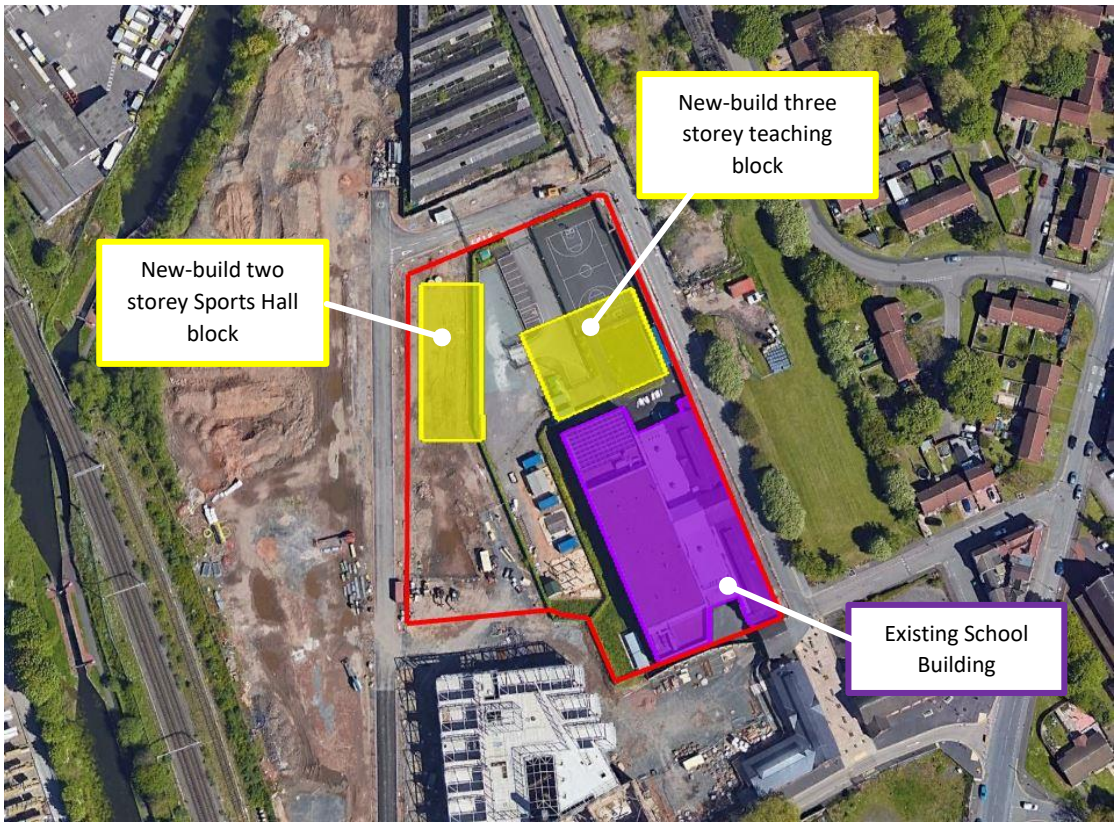
1.5 **Figure 1.1** identifies the existing school site in the context of its surroundings. The school is located in Wolverhampton and is accessed off Cambridge Street which runs from north to south directly to the east of the site. The site is bounded by residential dwellings along Yarwell Close and Hilton Street to the east. Typical school hours are assumed to be 08.30 to 17:00 Monday to Friday. The dominant source of noise incident on the site is road traffic from Cambridge Street.

Figure 1.1– Site Location

Proposed Development

1.6 **Figure 1.2** identifies the area of proposed development within the school site. The proposed new-build teaching and sports hall blocks are highlighted in yellow. The teaching block will be circa. 70 m from the closest residential dwellings to the east. The sports hall block will be circa. 125 m from the closest residential dwellings to the east.

Figure 1.2– Proposed Development



2. STANDARDS AND GUIDANCE

Building Bulletin 93 (BB93), December 2014: Acoustic design of schools: Performance Standards

2.1 BB93 sets out minimum performance standards for acoustic conditions within school buildings and describes the means of demonstrating compliance with Approved Document E of the Building Regulations. The overall objective of the performance standards is to ensure that the design and construction of school buildings provide acoustic conditions that enable effective teaching and learning.

2.2 The document presents upper limits for Indoor Ambient Noise Levels (IANL) in teaching and learning spaces due to environmental noise break-in. The limits are specified in terms of the equivalent continuous sound pressure level over a 30-minute periods (dB $L_{Aeq,30min}$). The stipulated IANL limits are applicable within unoccupied teaching and learning spaces without contributions from plant or equipment, playgrounds and rainfall but with contributions from building services noise and external sources outside the school premises (e.g. road and air traffic noise).

2.3 **Table 2.1** sets out the recommended target internal noise level criteria to be achieved within school's premises.

Table 2.1– BB93 Internal Ambient Noise Level Criteria within Schools

Area	Upper limit for the indoor ambient noise level, dB $L_{Aeq,30mins}$	
	New Build	Refurbishment
Teaching classrooms, study rooms, interview / counselling rooms, medical rooms, conference rooms and meeting rooms	35	40
Resource Areas, Science Labs, D&T and Art Rooms, Indoor Sports Hall, Dance Studio, Gym, Offices*, Staff rooms*	40	45
Dining Rooms, Atria, Circulation and stairs*, Entrance Lobby*, Changing Rooms*, Learning Street	45	50
Kitchens*, WCs*	50	55

*For these areas the performance standards are for guidance only (Applied to under Part E - schedule 1 of the Building Regulation 2000)

BS 4142: 2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

2.4 This standard describes methods for rating and assessing the following:

- 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.

2.5 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The Standard advises the purpose of the methodology includes the assessment of sound from any plant and activities associated with existing industrial and/or commercial uses at proposed residential dwellings.

2.6 If appropriate, the specific sound level of the source (L_s) is corrected, by the application of one or more corrections for acoustic features such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,Tr}$). The Standard effectively compares and rates the difference between the rating level of the specific sound and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound.

2.7 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) when the source in question operates or is proposed to operate in the future.

2.8 Comparing the rating level with the background sound level, BS 4142 states:

> "Typically, the greater this difference, the greater the magnitude of impact.
>
> 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."

3. BASELINE NOISE DATA

Survey Methodology

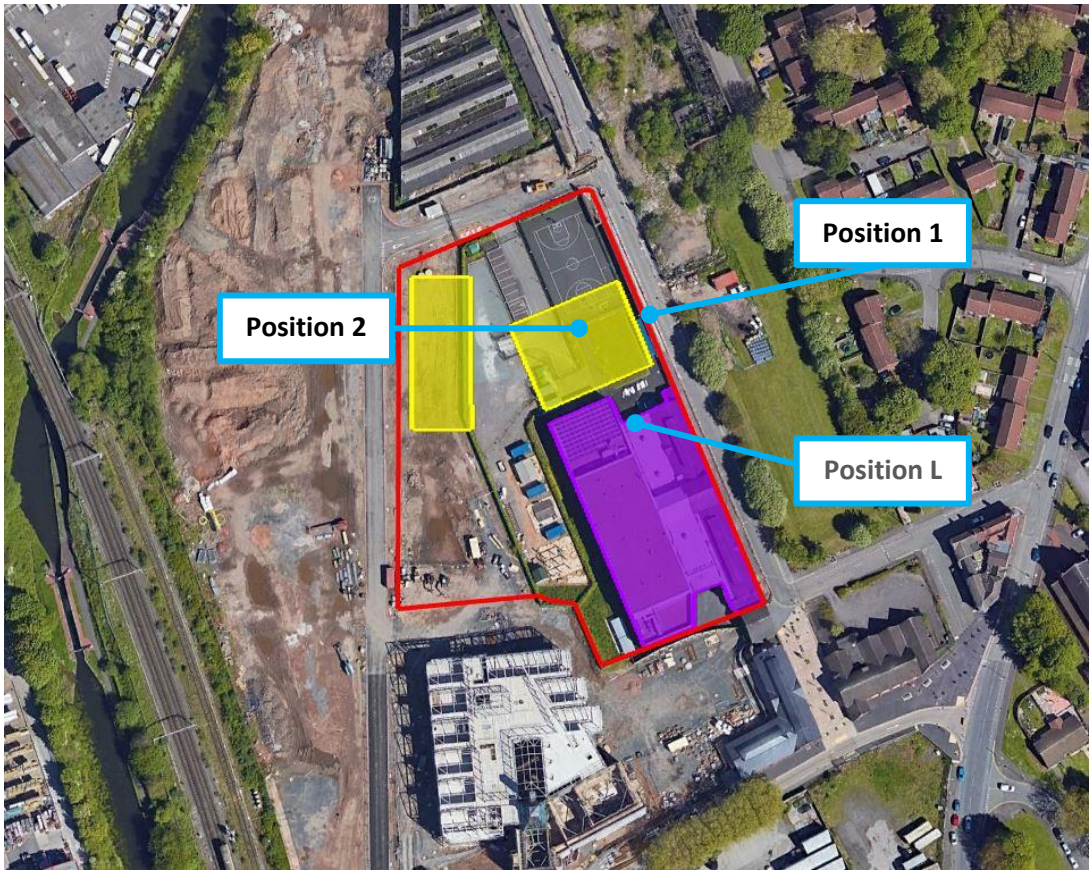
3.1 An environmental baseline noise survey could not be undertaken at the time of writing this report, on the grounds of public health and safety. However, a noise survey has previously been undertaken on the site by Sandy Brown Consultants (*ref: West Midlands UTC, Wolverhampton - Environmental noise assessment report – BB93, dated 24 March 2020*) between 11:30 on 13th March 2020 and 10:45 on 16th March 2020.

3.2 The baseline noise survey was undertaken to determine the prevailing noise climate at positions representative of:

- the closest noise sensitive receptors to the proposed teaching and sports hall blocks; and
- the façade of the proposed new-build teaching and sports hall blocks.

3.3 The measurement positions adopted during the survey are labelled in **Figure 3.1.** Details of monitoring undertaken at each position are included below and overleaf.

Figure 3.1- Measurement Positions



Position L – Long-term unattended

3.4 The long-term unattended location was installed on the roof of the existing school building overlooking Cambridge Street and is marked '*L*'. Measurement position L was

chosen to be reasonably representative of noise levels at the site and outside the nearest noise sensitive premises.

Position 1

3.5 Measurement location 1 was located on Cambridge Street, and was fully screened from construction noise to the east. This measurement position is considered indicative of background noise levels in the vicinity of the residential dwellings to the east, and ambient noise levels associated with this road. Measurements at location 1 were undertaken 1 m from the boundary wall separating the existing development from Cambridge street and are façade measurements.

Position 2

3.6 Measurement location 2 was located within the school driveway, in the approximate location of the proposed development. Noise levels at this location were screened from road traffic on Cambridge Street. Measurements at location 2 were undertaken at the school driveway, away from reflecting surfaces other than the ground, and are therefore considered to be free field measurements.

Observations

3.7 The dominant noise sources observed at the site during the survey consisted of distant construction noise and road traffic. Less significant noise sources included bird song, delivery trucks access to the construction site and pedestrians.

Measurement Results

3.8 A summary of measured noise levels at Positions L, 1 and 2 are presented below.

3.9 On analysis of the results gathered at Position L, it was determined that the background noise measurements for the daytime period were influenced by construction noise which is not representative of the expected noise levels in the development once occupied.

3.10 Furthermore, the consistent background noise levels measured during the night suggest that some plant serving the construction site was operational during this time period. As a result, background noise levels measured by the unattended logger are not considered to be representative of the background noise levels at the nearest noise sensitive receptors to the east. As such noise levels gathered at Positions 1 and 2 have been used in the assessment.

3.11 Noise levels and key sources recorded during the attended measurements as a result of sample road traffic measurements and as well as external school noise climate measurements are summarised in the tables from the Sandy Brown report below.

3.12 The measurements at position 1 were taken 1 m front facade and are representative of façade levels. Measurements at position 2 are free field measurements.

Table 5: Sound pressure levels from attended road traffic noise measurements

Position	Start time	Sound pressure level (dB)			Noise sources
		$L_{A1,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$	
1	11:05	72	59	44	Construction noise Road traffic Vehicle access to site car park Pedestrians Bird song
1	11:45	71	57	43	Construction noise Road traffic Pedestrians Bird song
1	12:23	71	58	44	Road traffic Idling engine Construction noise

3.13 The lowest background sound levels measured during the attended measurement at position 1 were $L_{A90,15min}$ 43 dB. This is considered representative of background levels at the nearest noise sensitive receptors on Yarwell Close to the east.

Table 6: Sound pressure levels from attended external school noise climate

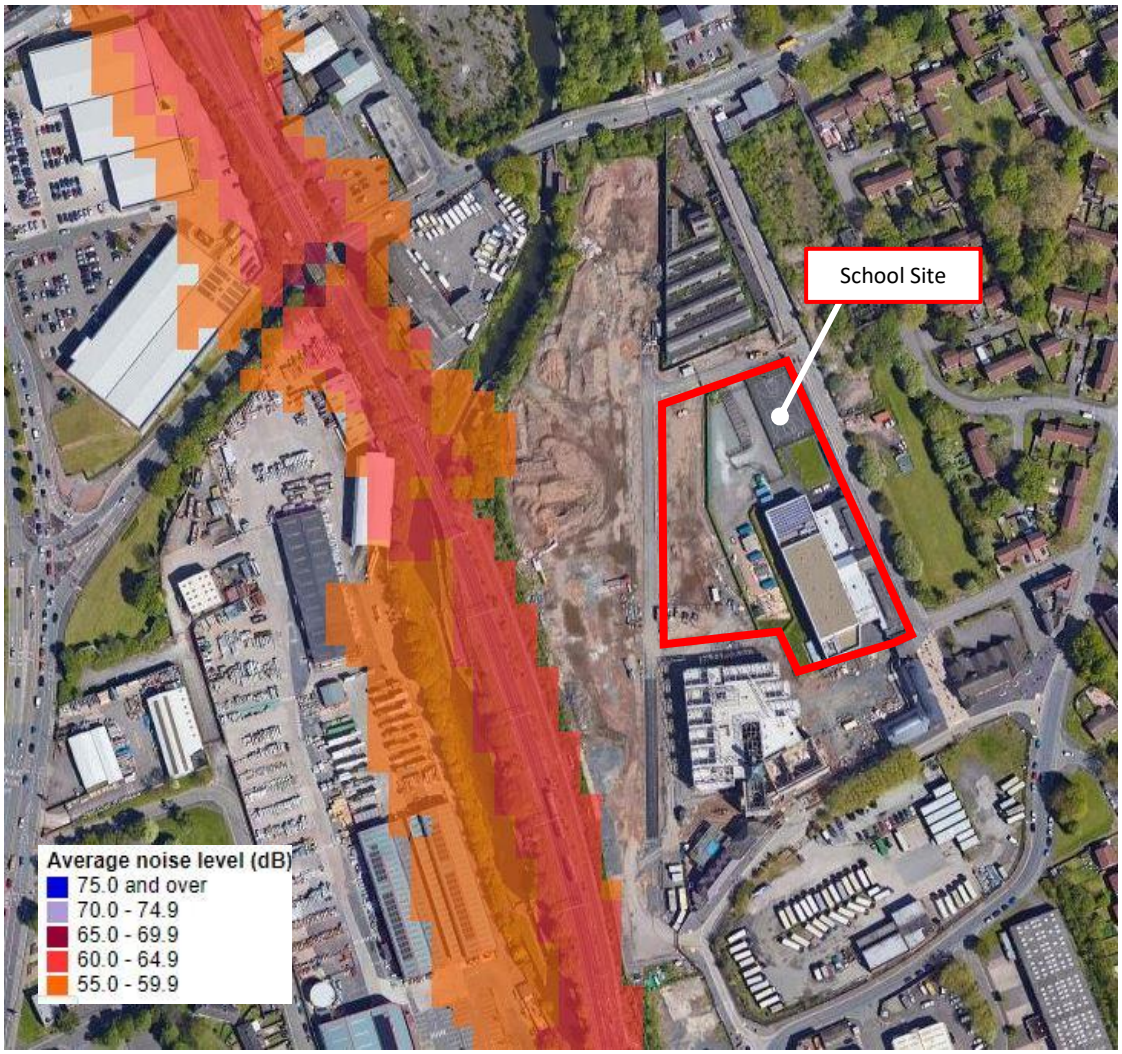
Position	Start time	Sound pressure level (dB)			Noise sources
		$L_{A1,15min}$	$L_{Aeq,15min}$	$L_{A90,15min}$	
2	11:25	60	54	51	Construction noise Rail noise Bird song
2	12:04	62	56	52	Construction noise Vehicle access to site Reversing vehicle alarm
2	12:44	63	55	52	Construction noise Generator noise Rail noise

Supplementary Data

3.14 Notwithstanding the above, supplementary data has also been sought using Defra noise mapping contours for rail noise during the daytime period.

3.15 The Wolverhampton railway line is located to the west of the school site, approximately 100m from the new Sports Hall block and 140m from the new teaching block. Consideration of Defra noise mapping contours for rail noise from the railway line during

the daytime period indicates that noise from the rail line will be less than 55 dB, $L_{Aeq,16h}$ at the nearest proposed school façades.



4. ASSESSMENT

Site Suitability

4.1 Ambient noise levels measured during the attended measurements have been used to assess noise ingress. Noise levels of up to L_{Aeq} 56 dB were measured at position 2, however this was influenced by construction noise, and therefore noise levels are likely to be lower once construction has been completed. Higher noise levels of up to $L_{Aeq,15min}$ 59 dB were measured at position 1, however these were measured at close proximity to Cambridge Street, in addition to being measured 1 metre from a vertical wall on the eastern boundary of the site. Assuming line source propagation of 3 dB per doubling of distance, in addition to a -3 dB correction for the presence of a facade, would result in a free field noise level of $L_{Aeq,15min}$ 50 dB at the nearest proposed façade to the road.

4.2 As part of the previous assessment undertaken by Sandy Brown, and on this basis, it was determined that the external noise levels at the proposed school façades were predicted to be no higher than L_{Aeq} 56 dB.

4.3 The report states that an initial assessment had been carried out to determine required acoustic performances for the façades and provide guidance on the ventilation strategy, which identifies the need for the glazed portions of the façade provide a minimum sound insulation performance of $R_w + C_{tr}$ 28 dB, in conjunction with Single sided natural ventilation, or hybrid ventilation systems.

4.4 If natural ventilation is provided, and the design capability supply rate of 8 l/s per person is used (with windows open), indoor noise levels are permitted to exceed the levels required by BB93 by 5dB $L_{Aeq,30min}$, in accordance with BB101. The indoor noise level limit for a standard classroom would therefore be 40dB $L_{Aeq,30min}$ during times when 8 l/s per person is being supplied. This should be capable of controlling internal temperature. This is however with the exception of SEN rooms.

4.5 The method of ventilation adopted at locations across the proposed development, assuming classrooms are oriented on the worst effected façade, as a result of the prevailing daytime noise levels indicate that a passive attenuating (Trickle) ventilation system with a minimum performance rating of 32dB $D_{n,e,w} + C_{tr}$ should be sufficient for all aspects of the building façades. It is considered that the above mitigation options would ensure that a suitable level is provided for all future students.

4.6 Notwithstanding the above, it should be noted that consideration should be given to the potential noise impact in terms of children playing within the school grounds. In the absences of any specific guidance that covers this, consideration should be made in terms of layout, screening, orientation etc. from the nearby sensitive receptors (NSR), located to the north of the proposed building.

4.7 Using Sandy Brown data and supplementing with Defra noise mapping, it is considered that a 28 $R_w + C_{tr}$ specification can satisfactorily protect from noise intrusion.

Building Services Plant Noise

4.8 Based on typical requirements of BS 4142:2014+A1:2019; '*Methods for rating and assessing industrial and commercial sound',* and the results of the noise survey, all plant must be designed such that the cumulative noise level at 1 m from the worst affected windows of the nearby noise sensitive premises does not exceed $L_{Aeq,15min}$ 43 dB during the daytime.

4.9 Significant building services plant use is not expected during night-time based on the nature of the development. However, in the event that considerable building services plant noise is anticipated at night, further assessment will be required.

4.10 The proposed plant for the new teaching block comprises a roof mounted enclosed air handling unit (AHU) for the Drama Studio and three external condensers to be located externally on the roof top of the teaching block.

4.11 The proposed plant for the new sports hall block comprises an AHU for the Sports Hall, located internally in first floor boiler toom, which is understood to be discharged through a weather louvre.

4.12 A third AHU is proposed to service the refurbished workspace to hall space, and will be located externally on the roof of the existing school building.

4.13 The proposed plant item layouts are presented in **Appendix B.** Technical details of the AHUs and external condensers are presented in **Appendix C**.

4.14 In the absence of manufacturer data for the AHU units, a conservative value of 87dBA sound pressure level at a distance of 1m has been used for assessment purposes. However, the reductions afforded by the casing sound attenuation (worst-case acceptable attenuation) have been included in the calculation to determine worst-case resultant sound pressure levels at a distance of 1m.

4.15 For the external condensers, a sound pressure level of 70 dB at a distance of 1m for each unit has been used for assessment purposes.

4.16 Noise break-out has been predicted from the principal noise sources associated with the proposed plant items, namely:

- Drama AHU casing sound breakout (using AHU in Plant Room data);
- External Condensers (3No.);
- Sports Hall AHU casing sound breakout (using AHU in Plant Room data); and
- Refurbished Hall Space AHU casing sound breakout (using External AHU data).

4.17 It should be noted that all ventilation air handling units shall be provided with attenuation on both the atmospheric and system sides. All plant will only operate during the occupied period of the school and will be isolated by the BMS out of hours. Furthermore, attenuator sizes can be selected to meet required external noise outbreak level for planning.

4.18 To assess the potential noise impact from the proposed plant items, an assessment has been undertaken based on manufacturer noise data provided and assumptions made as detailed above.

4.19 It is understood that the site is likely to operate during school hours only (08:30-17:00).

4.20 The nearest existing noise sensitive receptors are 10 Yarwell Close (NSR 1) and 9/11 Yarwell Close (NSR2) to the east.

4.21 Based on the above information, the predicted specific noise levels have been calculated at the closest existing dwellings NSR 1 and NSR 2 as seen in **Table 4.1**.

Table 4.1– Specific Sound Level Contributions of each Plant item at the NSRs

NSR	Fixed Plant	Sound Pressure Level L_p, Global dB(A)
NSR 1 – 10 Yarwell Close	Drama AHU 01	23
	Sports Hall AHU 02	18
	Existing Hall AHU 03	23
	External Condensers x3	38
	Combined SPL	**38**
NSR 2 – 9/11 Yarwell Close	Drama AHU 01	23
	Sports Hall AHU 02	18
	Existing Hall AHU 03	25
	External Condensers x3	38
	Combined SPL	**38**

4.22 The specific sound levels at each NSR have then been assessed in accordance with BS 4142 as outlined in **Tables 4.2** for the daytime period only.

4.23 It is expected that there may be tonal elements present and therefore an acoustic feature penalty of +2dB for just perceptible tonality has been applied, in accordance with the subjective method in BS4142.

4.24 The representative background sound levels of 43 dB LA90,T will be used in this assessment.

Table 4.2 – BS 4142 Assessment of proposed plant at NSR 1 and 2, Daytime

Description	Daytime Sound Levels (dB) at NSR 1	Daytime Sound Levels (dB) at NSR 2	Relevant BS 4142 Clause
Specific sound level	38 $L_{Aeq,1hour}$	38 $L_{Aeq,1hour}$	7.3.5
Acoustic feature correction	+2	+2	9.2
Rating level	40 $L_{Ar,1hour}$	40 $L_{Ar,1hour}$	9.2
Background sound level	43 $L_{A90,1hour}$[1]	43 $L_{A90,1hour}$[1]	8
Excess over background	-3	-3	-
BS 4142 impact	**Low impact**	**Low Impact**	-
Commentary	[1]based on the representative $L_{A90,1hr}$ level during the daytime period		

4.25 The above assessments indicate that noise generated by the proposed plant for the development is likely to give rise to a low impact at NSR 1 and NSR 2 during the daytime period.

4.26 Further consideration of mitigation is therefore not considered warranted.

4.27 It is also worth noting that the prediction calculations of the specific sound levels at each NSR have not included for any screening from the school buildings or the development itself. Therefore in reality the levels are likely to be lower than stated.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 BWB Consulting has been appointed by Morgan Sindall to undertake a noise assessment to support a planning application at Thomas Telford UTC in Wolverhampton. The proposed development consists of a new-build three storey teaching block, a new-build two storey sports hall block and refurbishments to the existing school building.

5.2 Drawing on the results of a baseline noise survey at the site, an assessment of noise emissions from the proposed external plant items has been undertaken. The assessment has identified that noise emissions from the external plant can be controlled to meet the requirements in accordance with BS4142.

5.3 Furthermore, an assessment of the suitability of the proposed site for the proposed new-build three-storey teaching block and two-storey sports hall block has also been undertaken. Drawing on the results of the baseline noise survey, the assessment has found that the site is suitable for the proposed use and that the prevailing noise climate is unlikely to result in an adverse impact at the proposed development.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears are 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 noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or LAeq, LA90 etc., according to the parameter being measured.

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(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

Appendix B

Plant Equipment Layouts

Figure B.1 – Proposed Drama Studio AHU layout – external plant room

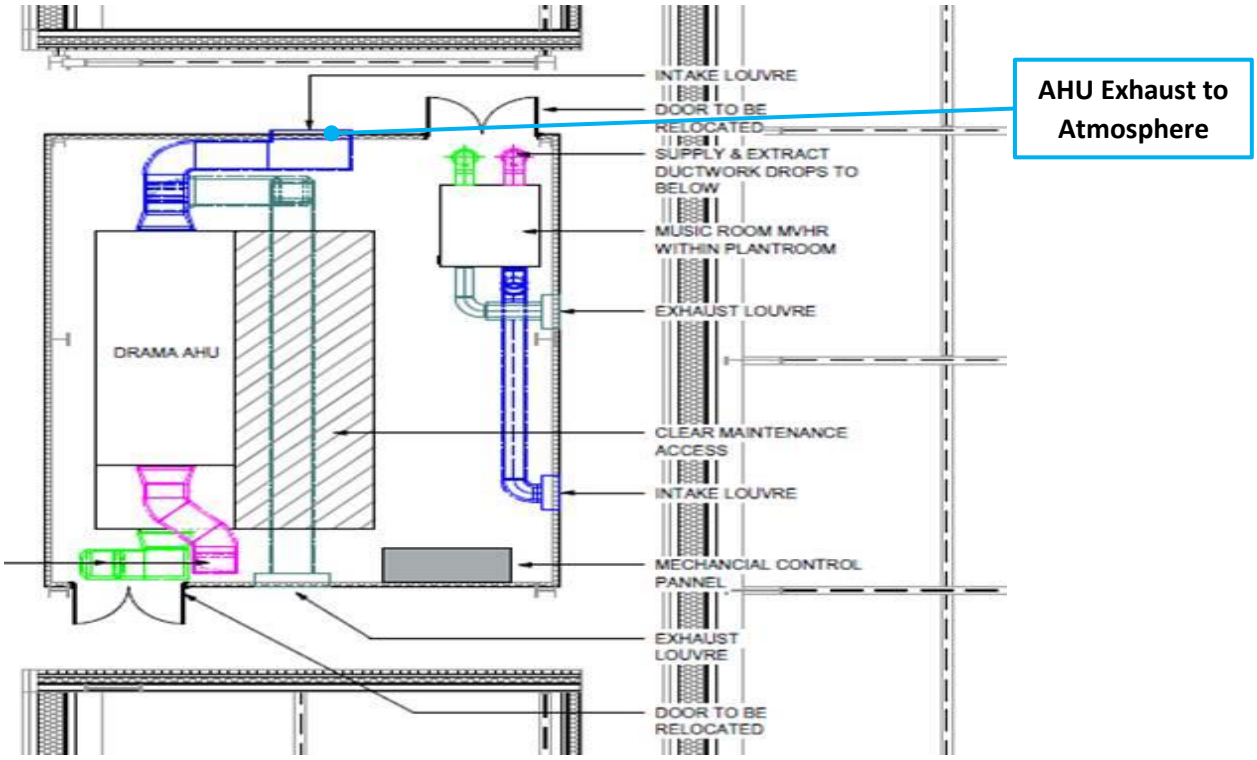


Figure B.2 – Proposed Sports Hall AHU layout – internal plant room

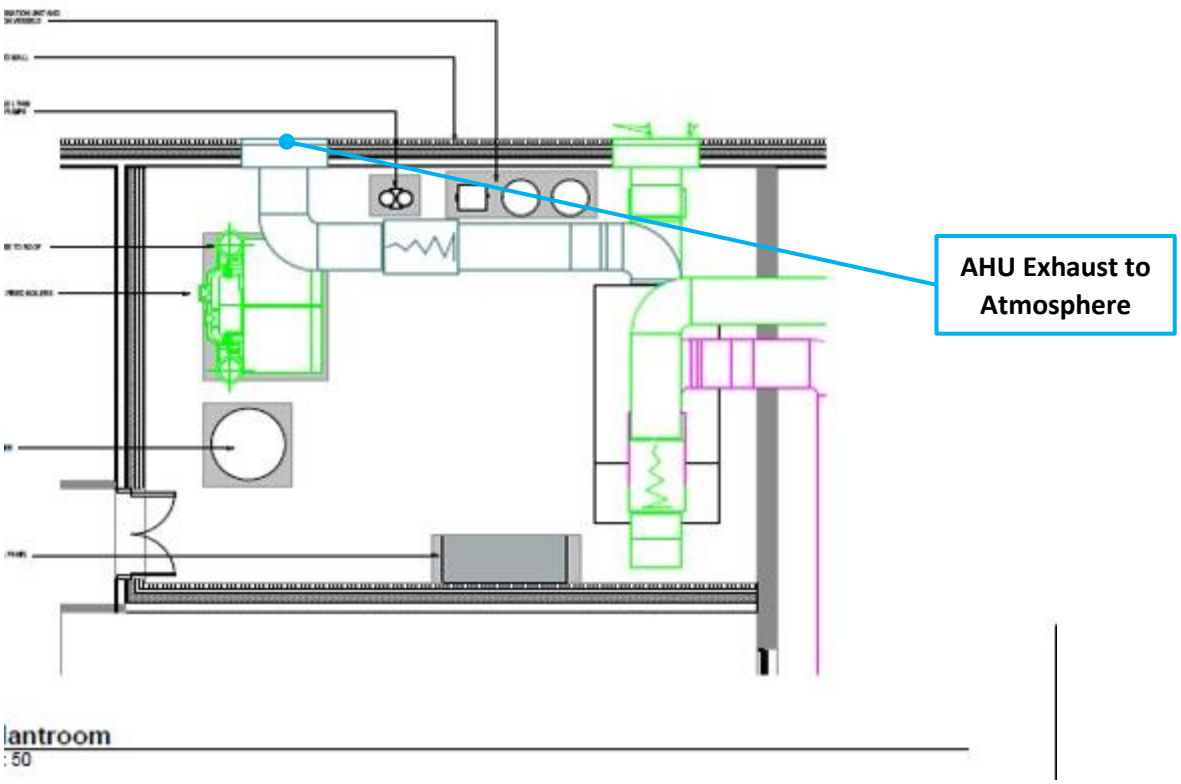
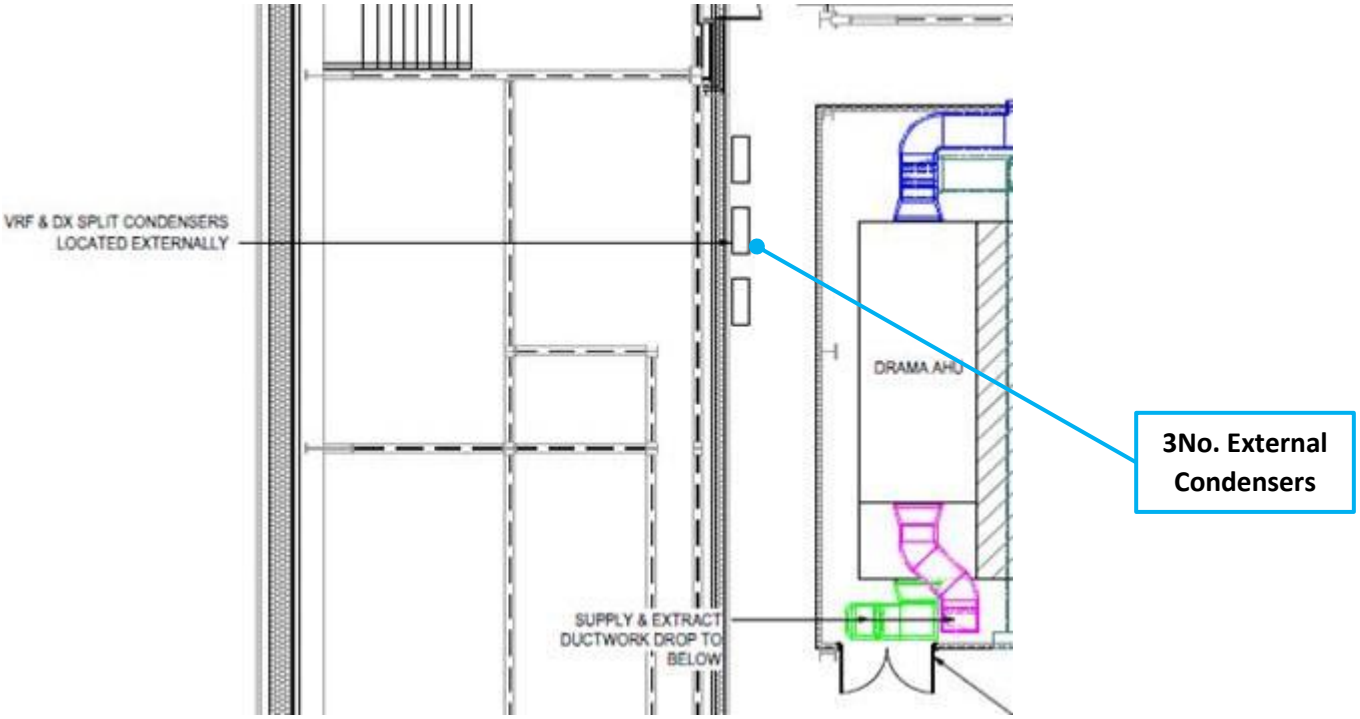


Figure B.3 – Proposed External Condensers layout – roof-top



Appendix C

Plant Equipment Details

Figure C1 – AHU Casing Sound Attenuation in Decibels (Worst acceptable Attenuation)

AHU CASING SOUND ATTENUATION IN DECIBELS (WORST ACCEPTABLE ATTENUATION)			
Frequency (Hz)	External AHU	AHU in Plant Room	All other cases
63	12	10	23
125	12	10	22
250	22	19	34
500	26	29	47
1000	26	31	49

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AHU CASING SOUND ATTENUATION IN DECIBELS (WORST ACCEPTABLE ATTENUATION)			
Frequency (Hz)	External AHU	AHU in Plant Room	All other cases
2000	26	28	50
4000	27	32	51
8000	29	33	54
Above shall be inclusive of access doors, fixings, pipework / electrical connections etc.			

Figure C2 – External Condenser Sound Level Data

SOUND PRESSURE LEVEL (dBA)	70.0
SOUND POWER LEVEL (dBA)	89.0

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