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Ref: P4171/L01/DMT (email attachment)

07 September 2021

To:	Michael Alderson	of:	Vinci Construction UK Ltd
Cc:	-	of:	-

Dear Michael,

Project RED, Stand-by Generator Compound – Plant Noise Assessment

A plant compound is proposed for two stand-by generators relating to the extension and refurbishment of Manchester Royal Infirmary ("Project RED"). The proposed plant compound is located close to the junction of Upper Brook Street and Grafton Street.

AEC undertook a baseline noise survey in September 2020 at the nearby residential receptors and reported the findings in a noise assessment report (Ref: P4171/R01a/DMT). These measurements and findings are summarised in this letter and used as the basis for this assessment.

This technical note presents a noise assessment of the proposed stand-by generators relating to Project RED, and the potential impact on the nearby residential receptors.

Proposed Development

The proposals are to construct a compound to house two stand-by generators and other ancillary equipment. The nearest residential receptors are located on the corner of Grafton Street. The site location and nearest residential receptors are indicated on Figure 1 below.

The generators are required in the case of power failure at the hospital. If a power failure was to occur then both generators would switch on for a short period (a matter of minutes) until the load was stabilised and then one generator would operate until the problem was resolved. This is highly unlikely to occur and would be considered an emergency situation if it was to occur.

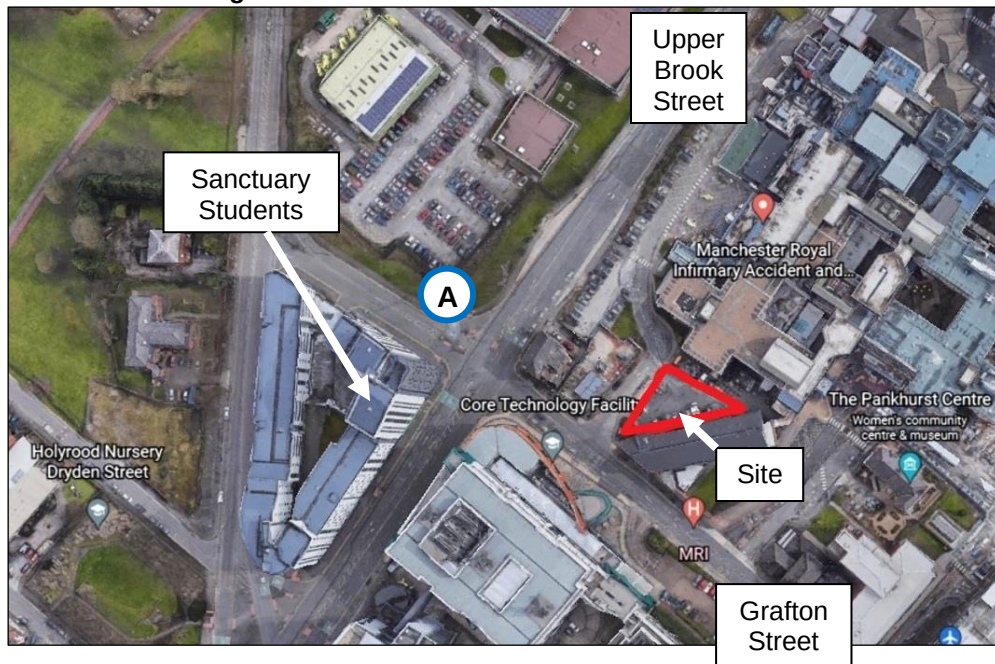
These stand-by generators would be tested every month for a period of 1-2hours maximum.

Baseline Noise Levels

The baseline noise levels were monitored at Location A (see Figure 1) by AEC in September 2020. The results are reproduced below with further details provided in Appendix A.

The average background noise levels measured at the Sanctuary Students buildings (Location A) were **57dBL_{A90,15mins}** and **49dBL_{A90,15mins}** during the daytime and night-time periods, respectively. This background noise was mostly due to road traffic noise on Upper Brook Street, and other surroundings roads, and building services noise from the existing nearby buildings.

Figure 1 – Site Plan and Measurement Location



Assessment Method and Criteria

BS 4142-2014

External noise from building service plant is typically assessed to the guidance in BS 4142-2014+A1-2019 '*Methods for rating and assessing industrial and commercial sound*' (BS4142).

In BS4142, noise impacts are assessed by comparing the calculated 'rating level' from the external plant against the existing baseline background sound level, as assessed at the nearest noise sensitive receptor(s).

When assessing the potential noise impacts, 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. BS4142 states that:

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

A 'rating level' ($dB_{L_{A_{f,T_r}}}$) is obtained by applying a character correction to the 'specific noise level' ($dB_{A_{eq,T_r}}$) of a noise source (e.g. plant noise). The correction is applied if the noise has a defined acoustic character such as being tonal, impulsive, distinctive or intermittent in nature.

The magnitude of the correction is dependent on the character of the noise source and its level of perceptibility at the receiver. A correction of between 0 to +6dB and 0 to +9dB can be applied if the noise source is tonal or impulsive, respectively. Where the specific sound has characteristics, which are neither tonal nor impulsive but are distinctive against the residual sound climate, a +3dB penalty can be applied.

In addition to the above, BS4142 states that *'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'*.

Whilst BS4142 may be the most relevant methodology in the assessment of noise from a generator, it may not be appropriate to assess the noise impact from an emergency / standby generator operating for limited duration during an emergency in the same way as an industrial unit operating 24 hours a day.

Manchester City Council's Noise Policy Guidance

Section 3.6.1.5.1 of the Planning & Noise Technical Guidance (PNTG) document issued by Manchester City Council (MCC) in December 2015 states the following:

"Any noise assessment needs to consider not only the overall level of noise emitted but also its particular characteristics. The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that:

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

By designing the sound pressure level of any plant items to generate a noise impact of at least 5dB below the existing background level, any plant noise impact should be of a negligible level which should not give rise to complaints from users or occupiers of existing noise-sensitive usages."

However, as the proposed generators are stand-by (emergency) plant only, a +10dB correction can be applied to the above acceptable noise limit for planning purposes.

Therefore, the proposed noise limit for the generators is that **the rating noise level from the proposed generators is controlled to not exceed +5dB above the existing background noise level at the nearest noise sensitive receptors.**

This should ensure the specific sound has a low impact and should satisfy the Local Authority requirements.

Noise Assessment

The generators will have outlet attenuators and are enclosed in a container which helps limit noise levels. The free-field noise level at 1 metre from each generator is understood to be 85dBA.

The nearest residential receptors are approximately 80 metres away from the generators, therefore, a distance attenuation of 38dBA can be applied. There will be a small amount of additional attenuation due to directivity i.e. the receptors are not directly in line with the outlets, however, this has not been factored into this assessment.

The resulting noise level at the nearest receptor, when a single generator is operating, will be approximately 50dBL_{Aeq,T}. Due to reflective surfaces near to the generators there could be a +1 to +2dB uplift in noise levels due to reflected sound contributing to the total sound at the receptors i.e. **52dBL_{Aeq,T}**.

Although, the generator noise level is not expected to be tonal or intermittent, a +3dB rating correction could be applied for general acoustic character, in line with BS4142. This is a cautious approach.

Therefore, the resulting rating noise level at the nearest noise sensitive receptors could be up to **55dBL_{Ar,T}**.

This level is -2dB below the existing daytime background noise levels and +6dB above the existing background noise level at night. If the generators are tested at the same time (concurrently rather than consecutively), then noise levels quoted above would increase by +3dB.

Based on the above assessment, generator noise levels would comfortably meet the suggested noise level criteria of +5dB above background during the daytime (0700-2300h).

At night the criteria may just be exceeded by 1dB, which is a negligible difference (+/-3dB is typically the smallest detectable change in environmental noise level that can be perceived).

The generator noise levels will be lower at other residential receptors located further away from the new plant.

There is relatively low uncertainty in this assessment. Several worst-case assumptions are made in terms of highest operating duty and no directivity attenuation. If generators with a lower sound pressure level at 1 metre is selected e.g. 83dBA or 80dBA, then this would also meet the suggested noise level criteria for planning.

It is recommended that generators are tested during daytime hours only (0700 to 2300h). If there are concerns about night-time noise levels then a generator with a free-field noise level of 83dBA at 1 metre, or lower, should be selected.

Summary

Based on the above assessment and including the mitigation measures discussed, noise from the generators will not exceed +5dB above background when tested on a monthly basis. This should ensure a low impact on nearby residential receptors and noise should not be considered a limiting factor with regarding to planning permissions being sought.

I trust the above is clear and of assistance at this stage.

Yours sincerely,



David Terry

Checked by: WJK

APPENDIX A – Noise Survey Details

Date & Time of Survey:	Thursday 10 September 2020, 2300 to 0100h. Friday 11 September 2020, 1100 to 1400h.					
Personnel:	Michael Ridley (AEC).					
Equipment Used:	B&K 2250 lite Real Time Analyser (AEC Kit 4).					
Calibration:	The sound level analysers, which conforms to BS EN 61672-1: 2003 <i>'Electro acoustics – sound level meters - Part 1 Specifications'</i> for Class 1 Type Z meters, was in calibration and check calibrated before and after the measurement periods using a Brüel & Kjær type 4231 (94dB) calibrator. There was no significant drift of calibration. Calibration certificates are available on request.					
Weather Conditions:	Date	Period	Wet/Dry	Temp°C	Wind Speed & Direction	Cloud Cover
	10/09/2020	Night	Dry	10°C	Northerly and 0-2m/s (negligible)	20%
	11/09/2020	Day	Dry	18°C	Northerly and 0-3m/s (negligible)	70%
Measurement Locations:	Attended measurements were undertaken at Location A, as indicated on Figure 1 and described below. A – 8m from nearest edge of Grafton Street.					
Measurement Details:	Measurements were undertaken over various periods in terms of L_{eq} , L_{10} , L_{90} , and L_{max} .					
Façade / Free-Field:	Free-field					
	Full results for the attended measurements are given in Tables A1 and A2.					
Measured Data:	Full octave band centre frequency data was obtained for all measurements.					

TABLE B1 – Measured Daytime Noise Levels

Location	Period, h	Noise Level, dB				Comments
		L _{Aeq}	L _{A10}	L _{A90}	L _{Amax, F}	
A	1136 – 1151	63.5	67.3	56.8	74.6	Road traffic dominant. Max from road traffic 74.7dB L _{Amax} .
	1238 – 1253	64.1	67.9	56.6	74.7	
	1335 – 1350	64.9	67.9	56.9	84.5	

TABLE B2 – Measured Night-Time Noise Levels

Location	Period, h	Noise Level, dB			Comments
		L _{Aeq}	L _{A90}	L _{Amax, F}	
A	2331 – 2341	60.7	49.4	74.2	Road traffic dominant. Maximum levels due to road traffic.
	0010 – 0020	60.4	49.8	74.3	
	0048 – 0058	58.4	47.8	71.0	

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