

MILLER GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING

ENVIRONMENTAL NOISE ASSESSMENT

on behalf of

Conlon Construction Ltd

for development at

National Football Museum, Cathedral Gardens, Manchester M4 3BG

Report Number NA102567-3

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Summary

A noise assessment has been undertaken to assess the noise from the fixed plant at the National Football Museum, Cathedral Gardens, Manchester M4 3BG.

An attended sound survey was undertaken on 9 August 2026 to establish the existing acoustic environment and plant noise emissions. As the contribution of the plant could not be reliably isolated at the nearest receptors due to other environmental noise sources, and the secondary plant was not operational during the survey, compliance was assessed using a calibrated 3D noise model based on plant source noise measurements.

The assessment considered both the plant operating as measured and a conservative cumulative scenario with all primary and secondary plant operating simultaneously. The predicted rating sound levels comply with the adopted Manchester City Council (MCC) noise criteria at both noise sensitive receptors (NSRs), both for broadband levels and within each assessed frequency band. The assessment incorporates a number of conservative assumptions and indicates that plant noise would remain substantially below the prevailing residual sound environment.

On this basis, the assessment demonstrates compliance with the noise requirements of the relevant planning condition, and it is recommended that the condition is discharged.

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Advisory Note

The suitability of any recommended noise mitigation measures within this report should be approved by the relevant architects, structural engineers, building contractors, fire consultants and material manufacturers constituting the wider design team, prior to procurement and field application. This should ensure that when the recommended noise control measures are implemented on site, they will satisfy the requirements of all disciplines, therefore should not cause any health and safety issues.

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1 Introduction

1.1 Miller Goodall Ltd (MGL) has undertaken a noise impact assessment to accompany an application to discharge a planning condition for heat recovery units (HRUs) at the National Football Museum, Cathedral Gardens, Manchester M4 3BG. The site falls within the jurisdiction of Manchester City Council (MCC).

1.2 The scope of this report is to assess compliance with condition 5b of planning approval reference 131037/VO/2021 granted on 2 August 2021, which states;

> *5) The consent hereby granted is on the basis that:*
> *(a) The cumulative noise from the proposed HRUs, will not exceed MCC's standard noise criteria as detailed in Miller Goodall Plant Noise Assessment dated 23 07 21 and Miller Goodall e-mail 01 10 21.*
> *For the avoidance of doubt externally mounted ancillary plant, equipment and servicing, including plant, equipment and/or fans located behind louvres or grilles shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) in each octave band at the nearest noise sensitive location.*
> *b) Prior to the units being brought into use a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria have been met and any non compliance suitably mitigated in accordance with an agreed scheme prior to the units becoming operational. The approved scheme shall remain operational thereafter.*

1.3 The plant is currently installed and operational.

1.4 MGL attended the site on 09/08/2026 to undertake background sound measurements at the nearest noise sensitive receptors (NSRs) when the plant is on and off and source measurements of the plant.

2 Policy, Standards and Guidance

2.1 Whilst not explicitly mentioned within condition 5 of the planning approval, the definitions and methodology within BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS 4142) has been determined to measure and define rating levels and background noise levels. Further detail of BS 4142 is provided in **Appendix 1: Policy, Standards and Guidance**.

3 Assessment Methodology

3.1 A sound survey was undertaken on 09/08/2026 to measure background sound measurements at the nearest NSRs when the plant is on and off, and source measurements of the plant.

3.2 The measurements were undertaken on a Sunday morning period when the background sound levels are expected to be at their lowest during the normal operating hours of the plant.

3.3 Then the measured sound levels were used to undertake a BS 4142 assessment at the NSRs.

4 Site Description

4.1 The National Football Museum (NFM) is located within Manchester City Centre, surrounded by transportation systems, commercial premises and public gardens. The site location is indicated in the figure presented in **Appendix 2: Site Location, Monitoring and NSR Locations**.

4.2 To the south is Corporation Street, a well-used road that also carries Manchester Metrolink trams to Victoria Train Station to the east on the opposite side of Todd Street / Victoria Station Approach. Hotel Indigo is located on the opposite side of Todd Street and overlooks the NFM. To the north are Cathedral Gardens with a 5-storey apartment development on Long Millgate.

4.3 The hotel and apartments are the nearest NSRs to the site, at which road traffic, trams, and general urban noise are the existing main sources in the absence of any additional noise associated with the operation of the NFM.

5 Approved Development

5.1 The planning permission relates to the installation of HRUs and associated screening and security gate within the service ramp adjacent to Todd Street. The plant location and layout are presented in **Appendix 2: Site Location, Monitoring and NSR Locations**.

5.2 The HRUs do not operate during the night-time period. The NFM is open daily from 10.00 am to 5.00 pm and the HRUs operate from 7.30 am to 6.00 pm. In addition, they only operate when the ambient temperature within the specified temperature-controlled areas of the NFM rises above 18 °C.

5.3 The plant will likely have the greatest impact on NSRs during early morning periods when background sound levels are at their lowest and, thus, this assessment focuses on this time period.

6 Environmental Sound Survey

6.1 Measurements Procedure

6.1.1 Attended environmental sound monitoring was undertaken at two positions on Sunday, 09 August 2026 between around 06:00 to 08:30 hours. These monitoring positions are detailed in **Table 1** and indicated in the figure presented in **Appendix 2: Site Location, Monitoring and NSR Locations**. They are the same locations assessed in our previous report and are considered representative of the existing environmental sound climate at the nearest NSRs to the site.

Table 1: Description of noise measurement locations

Measurement Location	Location/ Description
MP1	3 m from front façade of the Long Millgate apartments.
MP2	1 m from front façade of Hotel Indigo. 1.5 m above local ground.
MP3	Within Plant area

6.1.2 At location MP1 the microphone was mounted in a free-field position at a height of 1.5 m above local ground level.

6.1.3 Measurements at locations MP2 and MP3 are not considered free-field as they were located less than 3 m away from a reflecting surface (except for the ground).

6.1.4 The calibration of the sound level meter was checked before and after the measurements, with negligible deviation (≤ 0.1 dB) recorded.

6.1.5 Details of the equipment used are set out in **Table 2**.

Table 2: Noise monitoring equipment

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Class 1[4],[5] Integrating Real Time 1/3 Octave Sound Analyser	XL2-TA	NTi Audio	A2A-11111-E0	29/10/2025	07414/1
Microphone	MC230A	NTi Audio	A14423	29/10/2025	07414/1
Pre-amplifier	MA220	NTi Audio	6908	29/10/2025	07414/1
Class 1 Field Calibrator	CAL 200	Larson Davies	14154	02/09/2025	07390/1
Outdoor Microphone Housing	WP30	NTi Audio	N/A	N/A	N/A
Class 1[4],[5] Integrating Real Time 1/3 Octave Sound Analyser	NL-52	Rion	520993	29/07/2026	07827/2
Microphone	NH-25	Rion	11840	29/07/2026	07827/2
Pre-amplifier	UC-59	Rion	21928	29/07/2026	07827/2
Class 1 Field Calibrator	SV 36	Svantek	123979	28/07/2026	07827/1

6.1.6 Measurements were undertaken in accordance with BS 7445-1: 2003[1].

6.1.7 Each measurement period consisted of sequential 100 ms samples. The data has been extracted using Nti Data Explorer software and Excel, and analysed using an in-house Excel processing sheet to analytically determine representative L_{Aeq} and L_{A90} sound levels. The 100 ms sound levels have not been presented in this report but are kept on file for future reference.

[1] BS 7445-1: 2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

6.2 Environmental Sound Climate

6.2.1 While the plant was not active, the existing sound climate at MP1 was noted to consist of pedestrians passing by, general road traffic noise (RTN) from nearby roads, occasional cars passing along Long Millgate and trickling water noise from a nearby water feature.

6.2.2 At MP2, the sound climate was noted to consist of vehicles passing along Todd Street, buses pulling up at a bus stop close to the monitoring position where passengers got on and off before setting off again, noise from a nearby vent on the façade of the hotel, other existing building services noise from the National Football Museum, pedestrians walking nearby, distant road traffic noise, distant tram noise, and some noise contributions from birdsong and the water feature in lulls.

6.2.3 While the plant was active, the sound climates at MP1 and MP2 were similar, but with increased frequencies of vehicles and pedestrians walking past, and noise from the active plant and existing plant was just audible at both locations consistently.

6.2.4 At MP3, the sound climate consisted mainly of the plant noise of the HRUs and noise break-out from the louvres of the NFM's plantrooms and to a lesser extent of road traffic noise, and tram movements. Based on the site observations, the same contribution to the noise climate was experienced from the HRUs and the noise break-out from the louvres of the internal plantrooms within the NFM.

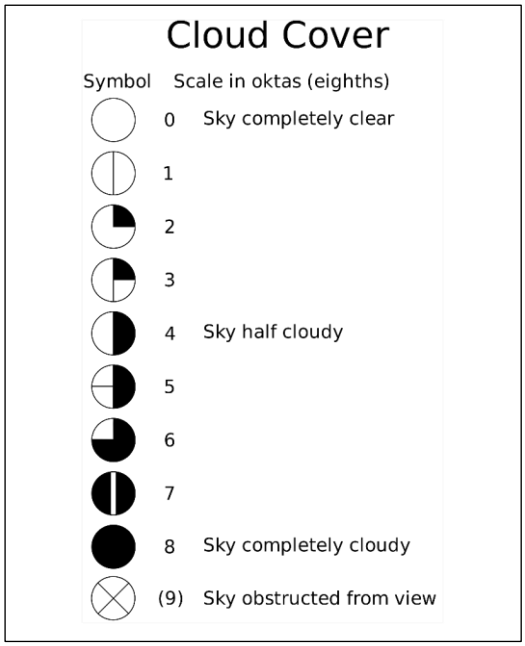
6.2.5 It should be noted that at the time of the survey, only the primary HRU was operational.

6.2.6 Between the time period of 07:24 and 07:28, recycling workers operating a refuse wagon were accessing Long Millgate to make a refuse collection.

6.3 Weather Conditions

6.3.1 Weather conditions were observed during sound monitoring. A summary of the conditions at the beginning and end of the surveys are provided in **Table 3**.

Table 3: Dates, times and weather conditions during noise measurements

Measurement Locations	Date/Time	Weather conditions Description	At Start of Survey	On Completion
All	09/08/2026 06:00 to 09/08/2026 08:00	Temperature:	15 °C	16 °C
		Precipitation:	None	None
		Cloud cover (oktas – see opposite):	4	4
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	No
		Wind speed:	<1 m/s	<1 m/s
		Wind direction:	S	S
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No

7 Monitoring Results, Discussion and Proposed Assessment Methodology

7.1 A summary of the broadband measurement data for the attended monitoring at MP1, MP2 and the plant is presented in **Table 4**.

Table 4: Summary of attended sound monitoring results on Sunday 9 August 2026

Monitoring Position	Period	Start - End Time hh:mm	$L_{Aeq,T}$ dB	$L_{A90,T}$ dB
MP1 - free-field	Without Plant	06:00-06:30	52	50
	With Plant	06:44-07:00	54	51
	Without Plant	07:00-07:30	55	50
	With Plant	07:30-08:04	54	51
MP2 - façade level	Without Plant	06:00-06:30	57 (54)**	47 (44)**
	With Plant	06:44-07:00	57 (54)**	53 (50)**
	Without Plant	07:02-07:32	59 (56)**	47 (44)**
MP3 - façade level	Plant Monitoring	07:45-08:00*	58	57

* During this measurement period five 1-minute source measurements were undertaken. As an average an $L_{Aeq,1min}$ of 58 dB was measured. The worst-case measured sound level during this period was 59 dB $L_{Aeq,1min}$.
**The values in each parenthesis have been converted to free-field; they were corrected by -2.5 dB to account for the façade reflection. The rounding results in a worst-case 3 dB correction.

7.2 The results of the environmental sound monitoring at locations MP1 and MP2 presented in **Table 4** show the ambient sound levels (i.e. the total sound level with the plant operating) with the residual sound levels (i.e. the sound level in the absence of the plant contribution) and with the specific levels (i.e. with the plant present) respectively at both measurement locations.

7.3 The worst-case one-third octave-band cumulative plant noise data as measured at location MP3 are given in **Table A3. 1** in **Appendix 3: Noise model input data**. These levels were assessed for tonality using the objective method set out in Annex C of BS 4142. The assessment did not identify any present tones. This is consistent with the subjective observations made during the site visit, during which no tonal characteristics were identified in the sound from the plant.

7.4 Overall, the measured ambient and residual sound levels do not indicate a clear or consistent increase in sound levels that could be directly attributed to the plant operation. This suggests that the plant had only a minor contribution to the overall acoustic environment during the survey. The general increase in measured sound levels as the survey progressed is therefore considered more likely to be associated with increasing road traffic activity in the surrounding area, rather than a significant contribution from the plant. It is likely that when the secondary unit operates as well, a more significant contribution might occur, but given the temperatures at the time when the survey was undertaken, this could not be measured.

7.5 In general, when undertaking ambient sound pressure level measurements, it can be difficult to isolate and quantify the contribution from a particular noise source where other environmental sources are present. In this case, road traffic noise appears to have had an influence on the measured levels, making it difficult to determine the plant contribution reliably from the ambient measurements alone.

7.6 Based on the above, it is not clear from the measurements at locations MP1 and MP2 alone whether the MCC noise criteria are met or not.

7.7 Based on the above, the following assessment methodology is recommended that to demonstrate compliance and support the discharge of planning condition 5b:

- Calibrate the 3D noise model of the plant to the cumulative plant noise emission levels as measured at location MP3 during the survey. These sound measurements were undertaken next to the plant, they are dominated by the cumulative plant noise levels and any contribution from other noise sources is insignificant.
- Predict the broadband and spectral specific sound levels at the nearest NSRs considering two assessment scenarios:
    - Assessment of the plant as measured, i.e., only primary HRUs and louvres noise break-out, and
    - Assessment of all plant, i.e., both primary and secondary HRUs and louvres noise break-out. For this assessment scenario an assumption should be made on the noise emission of the secondary units, based on the emission of the primary units.
- Undertake a BS4142 assessment of the two above scenarios, considering the lowest representative background sound levels that were measured during the survey at NSR1 and NSR2 when the plant was off, i.e., 50 dB L_{A90} at NSR 1 and 44 dB L_{A90} at NSR 2.

- Compare the rating levels at NSR1 and NSR2 against the respective representative background sound levels at each frequency band to ensure that the rating levels are at least 5 dB below background sound levels at each frequency.

7.8 The above approach will allow the plant contribution to be assessed independently of other environmental noise sources and provide a more robust basis for demonstrating compliance with the relevant noise criteria.

8 Noise Modelling Methodology

8.1 A 3D model has been assembled using CadnaA noise modelling software to predict the specific sound levels of cumulative noise from the plant.

8.2 The general horizontal plan information of the area surrounding and including the NFM and surrounding buildings were imported from Google Maps. This was used to determine road positions, building footprint areas and relative locations and is considered accurate to within 5%. Building height information was based on site observations, with topography adopted from design drawings.

8.3 The following parameters were assigned to the model:

- Propagation of noise using algorithms within BS ISO 9613-2:2024 *Acoustics - Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure levels outdoors*
- Three orders of reflection.
- Default ground absorption: 0.0 (equivalent to hard ground and consistent with the dominant ground cover within the area).
- No adverse meteorological effects
- Buildings are reflecting (façade, 0.5 dB reduction in reflected sound level).

8.4 It should be noted that two assessment scenarios were considered:

- **Assessment of plant as measured during the site visit**: The plant considered for this assessment included the primary HRUs (10 fans in operation) and noise-break-out from NFM's louvres, and

- **Assessment of cumulative plant**: The plant considered for this assessment included all HRUs (primary and secondary) and noise break-out from the NFM's louvres. In the absence of measured data of the secondary HRU, an assumption was made that both the primary HRU (10 fans) and the secondary HRU (5 fans) emit the same noise.

8.5 **Table 5** summarises the modelling methodology for the plant associated with these assessment scenarios.

8.6 As stated in paragraph 6.2.4 and 6.2.5 the measurement at location MP3 was inclusive of all cumulative plant which was operating at the time of the measurement and the same contribution to the noise climate was experienced from the HRUs in operation and the louvres noise break-out. Based on the above, the same noise level emissions were assigned to the HRUs and the louvres of the development and consequently the 3D noise model was calibrated to the worst-case noise level measured at location MP3 (see **Table A3. 1** in **Appendix 3: Noise model input data**).

8.7 It should be noted that embedded noise mitigation measures are incorporated within the HRUs enclosure design. These comprise galvanised perforated liner panels fitted to the sides of the enclosure, as shown on the relevant design drawings in **Appendix 2: Site Location, Monitoring and NSR Locations**, together with a curved galvanised liner panel fitted to the underside of the existing curved fins. These mitigation measures were not directly included within the 3D noise model as their effects cannot be accurately modelled within CadnaA software. To account for these mitigation measures 2 dB were included as attenuation only to the top of each HRU. The model, though, includes the 1.1 m high glass balustrade along the plant area on pedestrian level.

Table 5: Summary of baseline CadnaA modelling methodology for proposed plant

Plant	Methodology
Primary HRUs – 10 fans in operation during the measurements	• The broadband noise emission of the HRU was calibrated to the noise emission levels measured at location MP3. Spectral information was as measured at location MP3 and linearly adjusted for the calibration. See paragraph 8.5 for more details. • Modelled as 1 vertical area source with a sound power level of 60 dB L_{wA} and 1 top area source with a sound power level of 59 dB L_{wA} based on the plant layout with the drawings given in **Appendix 1: Policy, Standards and Guidance**. • Vertical directivity assigned to represent the fans' horizontal noise emission towards the NFM. • Dimensions of the HRU were taken from the drawings given in **Appendix 1: Policy, Standards and Guidance**. • On-time was set a 100%, assuming a continuous operation
Plantroom louvres - in operation during the measurements	• The broadband noise emission of the louvres was calibrated to the noise emission levels measured at location MP3. Spectral information was as measured at location MP3 and linearly adjusted for the calibration. • Modelled as 3 vertical area sources with a sound power level of 60 dB L_{wA} each, on the façade of FNM based on the plant layout with the drawings given in **Appendix 1: Policy, Standards and Guidance**. • No directivity was assigned to this source. • Louvres dimensions were taken from the drawings given in **Appendix 1: Policy, Standards and Guidance**.
Secondary HRUs - not in operation during the measurements	• As stated in paragraph 6.2.5 the secondary HRUs (5 fans) were not operational during the measurement period. Therefore, an assumption on their noise emission was made. • Modelled with the same broadband and spectral input as the primary HRU, i.e., as as 1 vertical area source with a sound power level of 60 dB L_{wA} and 1 top area source with a sound power level of 59 dB L_{wA} based on the plant layout with the drawings given in **Appendix 1: Policy, Standards and Guidance**. • Vertical directivity assigned to represent the fans' horizontal noise emission towards the NFM. • Dimensions of the HRU were taken from the drawings given in **Appendix 1: Policy, Standards and Guidance**. • On-time was set a 100%, assuming a continuous operation

8.7.1 Free-field cumulative specific noise levels from the HRU units have then been calculated at the façade of the nearest dwellings (NSR1) and hotel (NSR2), using the 'building evaluation' function,

as this provides the range of noise levels across the façade of the building of interest, rather than the noise level at one or more specific locations on the building elevation that may not reveal the highest predicted noise levels.

9 Results

9.1 The results of the noise model are given in **Table 6** and **Table 7** for the plant as measured during the site visit and the cumulative plant, respectively.

Table 6: Results – Plant as measured

NSR	Predicted Specific Sound Level
NSR1	29
NSR2	38

Table 7: Results – Cumulative Plant

NSR	Predicted Specific Sound Level
NSR1	31
NSR2	39

9.2 Based on the planning condition's requirement, the predicted free-field specific sound levels at NSR1 and NSR2 at each octave frequency band are given in **Table 8** and **Table 9** for the plant as measured during the site visit and the cumulative plant, respectively.

Table 8: Predicted Linear Specific Sound Levels – Plant as measured

Parameter	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
NSR 1 – Ls (dB)	36	35	31	28	26	25	21	15	2
NSR 2 – Ls (dB)	40	41	38	36	35	34	30	24	13

Table 9: Predicted Linear Specific Sound Levels – Cumulative Plant

Parameter	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
NSR 1 – Ls (dB)	37	36	32	29	27	27	23	17	4
NSR 2 – Ls (dB)	39	40	37	35	34	33	29	23	12

10 Noise Impact Assessment

10.1 BS 4142 Assessment

10.1.1 As discussed in Section 7, a BS 4142 noise impact assessment has been undertaken to assess the potential impact of plant noise as measured during the site visit and cumulative plant noise at NSR1 and NSR2.

10.1.2 Assessment of Plant Noise as measured on site

10.1.3 A BS 4142 noise impact assessment was undertaken for the primary HRUs (10 fans in operation) and the noise-break-out from NFM's louvres which is shown in **Table 10**.

10.1.4 In terms of tonal acoustic characteristics for the plant, based on paragraph 7.3, both the objective BS 4142 method and the subjective on-site observations did not identify any present tones. On this basis, no tonal acoustic feature correction has been applied within the assessment.

10.1.5 BS 4142 impulsive character relates to short-duration, high rate-of-change events. The plant does not involve impact mechanisms or impulsive operations. Plant operation is expected to be mostly continuous, rather than comprising impulsive events. Accordingly, no impulsivity correction has been applied.

10.1.6 BS 4142 intermittent character relates to sound that switches on and off, or otherwise varies in a manner that is readily distinguishable and attracts attention. The HRUs and internal NFM plant is expected to be controlled to modulate gradually in response to demand, with slow ramping up / down of fan speeds. This operational mode therefore typically produces a relatively steady acoustic output with gentle level changes, rather than distinct on/off cycling.

10.1.7 BS 4142 also allows for a correction where the specific sound contains other characteristics that are readily distinctive against the residual acoustic environment. The predicted plant noise levels are at least 9 dB below the residual sound levels and, on this basis, the specific sound would not be expected to be readily distinctive within the existing acoustic environment. Furthermore, no other readily distinctive acoustic characteristics associated with the plant were identified during the site observations. Accordingly, no correction for other sound characteristics has been applied within the assessment.

Table 10: BS 4142:2014+A1:2019 assessment of HRU plant

Receptor	Residual Sound Level (dBA)	Predicted Specific Noise Level (dBA)	Acoustic Character Correction (dB)	Rating Level (dBA)	Background Sound Level (L_{A90} dB)	MCC Noise Criteria L_{A90} – 5 dB	Excess of Rating Level over Background and MCC Criteria (dB)
NSR1	52	29	0	29	50	45	-21 / -16
NSR2	54	38		38	44	39	-6 / -1

10.1.8 Based on the results above, the predicted rating sound levels associated with the plant as measured are 21 dB below the background sound level at NSR1 and 6 dB below at NSR2. On this basis, the predicted plant noise is below the prevailing background sound level at both receptors.

10.1.9 The assessment has also considered the MCC noise criterion of 5 dB below the representative background sound level, corresponding to criteria of 45 dB at NSR1 and 39 dB at NSR2. The predicted rating level is 16 dB below the criterion at NSR1 and 1 dB below the criterion at NSR2. The proposed plant therefore complies with the MCC noise criterion at both NSRs.

10.1.10 **Assessment of Cumulative Plant Noise**

10.1.11 A BS4142 noise impact assessment was undertaken for the primary HRUs (10 fans in operation) and the noise-break-out from NFM's louvres which is shown in **Table 11**.

10.1.12 The same acoustic feature corrections apply as in the previous assessment.

Table 11: BS 4142:2014+A1:2019 assessment of HRU plant

Receptor	Residual Sound Level (dBA)	Predicted Specific Noise Level (dBA)	Acoustic Character Correction (dB)	Rating Level (dBA)	Background Sound Level (L_{A90} dB)	MCC Noise Criteria L_{A90} – 5 dB	Excess of Rating Level over Background and MCC Criteria (dB)
NSR1	52	31	0	31	50	45	-19 /-14
NSR2	54	39		39	44	39	-5 / 0

10.1.13 Based on the results above, the predicted rating sound levels associated with the cumulative plant are 19 dB below the background sound level at NSR1 and 5 dB below at NSR2. On this basis, the predicted plant noise is below the prevailing background sound level at both receptors.

10.1.14 With regards to the MCC noise criterion, the predicted rating level is 14 dB below the criterion at NSR1 and equal to the criterion at NSR2. The proposed plant therefore complies with the MCC noise criterion at both NSRs.

10.2 Assessment of spectral content

10.3 The difference between the rating level at NSR1 and NSR2 and the representative background sound level at each frequency band is given in **Table 12** and **Table 13** for the plant as measured during the site visit and the cumulative plant, respectively. It should be noted that as discussed in paragraphs 10.1.4 to 10.1.7, no acoustic corrections apply to this assessment. As such the rating level is equal to the predicted specific sound level.

Table 12: Predicted Linear Specific Sound Levels – Plant as measured

Parameter	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
NSR 1 – Ls (dB)	36	35	31	28	26	25	21	15	2
LA90 (dB) @ NSR1 (see paragraph 10.3.1)	54	54	54	49	46	45	41	36	34
Difference	-18	-19	-23	-21	-20	-20	-20	-21	-32
NSR 2 – Ls (dB)	40	41	38	36	35	34	30	24	13
LA90 (dB) @ NSR2	49	49	48	44	40	39	35	30	27
Difference	-9	-8	-10	-8	-5	-5	-5	-6	-14

Table 13: Predicted Linear Specific Sound Levels – Cumulative Plant

Parameter	Octave Band Centre Frequency, Hz								
	31.5	63	125	250	500	1000	2000	4000	8000
NSR 1 – Ls (dB)	37	36	32	29	27	27	23	17	4
LA90 (dB) @ NSR1 (see paragraph 10.3.1)	54	54	54	49	46	45	41	36	34
Difference	-17	-18	-22	-20	-19	-18	-18	-19	-30
NSR 2 – Ls (dB)	39	40	37	35	34	33	29	23	12
LA90 (dB) @ NSR2	49	49	48	44	40	39	35	30	27
Difference	-10	-9	-11	-9	-6	-6	-6	-7	-15

10.3.1 It should be noted that background octave band sound data were only measured at location MP2. Only broadband background sound levels were measured at location MP1. Therefore, to undertake the comparison of the spectral content at NSR1 against the background sound levels, in the absence of octave band data at location MP1, a spectral value from location MP2 was used, that corresponded to the broadband background sound level measured at location MP1, i.e., 50 dB L_{A90}.

10.3.2 The comparison given in **Table 12** and **Table 13** shows that the planning condition requirement that the rating level is 5dB below the typical background in each octave band at the nearest NSRs is fulfilled at both receptors and for both assessment scenarios.

10.3.3 Discussion of context

10.3.4 The results of both assessment scenarios should be considered in the context of the assumptions adopted and the existing acoustic environment. It should be noted that a number of conservative assumptions have been incorporated into the assessment, such that the predicted impacts are considered to represent a robust worst-case scenario.

Conservative background and residual sound levels

10.3.5 The background and residual sound levels adopted within the assessment are based on measurements undertaken during the early morning period on a Sunday, between approximately 06:00 and 07:30 hours. This period is earlier than the normal operating hours of the plant, which are 07:30 to 18:00 hours, and would generally be expected to represent a relatively quiet period within the local acoustic environment. The assessment therefore compares the predicted plant noise emissions against background and residual sound levels representative of a worst-case, quiet period, rather than the potentially higher sound levels that may occur during the plant's actual daytime operating hours.

Selection of representative background sound level

10.3.6 A conservative approach was also adopted in determining the representative background sound level. The typical background sound level was determined separately for each of the two 15-minute assessment periods, based on the available one-minute resolution data. Of the two derived representative background sound level values, the lower was selected for use in the assessment. This provides a precautionary basis for the assessment and results in a more stringent MCC noise criterion against which the predicted plant rating levels have been compared.

Assumptions for the non-operational secondary HRU

10.3.7 For the cumulative assessment of all plant operating simultaneously, it was necessary to make an assumption regarding the noise emissions from the secondary HRU that could not be directly measured. The primary HRU measured during the survey comprised 10 fans, whereas the secondary HRU comprises only five fans and has a smaller overall sound-emitting area as seen in the drawings in **Appendix 2: Site Location, Monitoring and NSR Locations**. Notwithstanding these differences, the assessment has conservatively assumed that the secondary HRU generates the same overall sound emission as the primary HRU. This is considered to represent a worst-case assumption, as the secondary plant would most likely generate a lower overall sound emission, subject to the individual fan specifications and operating conditions.

Plant Operating Conditions

10.3.8 The assessment also assumes that all plant operates simultaneously and continuously representing 100% on-time throughout the assessment period. In practice, continuous operation of all plant is unlikely, with plant operation expected to vary according to operational demand. The

predicted levels therefore represent a conservative operating scenario rather than necessarily representing typical conditions throughout the working day.

Consideration of embedded mitigation measures

10.3.9 Embedded noise mitigation measures are incorporated within the HRUs enclosure design. These comprise galvanised perforated liner panels fitted to the sides of the enclosure, as shown on the relevant design drawings in **Appendix 2: Site Location, Monitoring and NSR Locations**, together with a curved galvanised liner panel fitted to the underside of the existing curved fins. These measures are intended to provide some noise screening to the HRUs.

10.3.10 A conservative allowance has been made for the sound reduction provided by these measures within the noise model. A reduction of only 2 dB has been applied to the modelled plant sound levels to account for the combined effect of the perforated liner panels. This limited correction has been adopted as a precautionary basis for the assessment.

Compliance with MCC Noise Criteria

10.3.11 Regardless of these conservative assumptions, both assessment scenarios demonstrate compliance with the MCC noise criterion both when broadband rating sound levels and when spectral sound levels are considered.

Absolute Sound Levels – Existing Acoustic Environment

10.3.12 The results should also be considered in the context of the existing acoustic environment. For the assessment of the plant as measured, the predicted specific sound level is also substantially below the measured residual sound level, by approximately 23 dB at NSR1 and 16 dB at NSR2. For the assessment of the cumulative plant, the predicted specific sound level is also substantially below the measured residual sound level, by approximately 21 dB at NSR1 and 15 dB at NSR2. As a result, the contribution of the plant to the overall ambient sound level would be expected to be insignificant.

Conclusion and Discharge of Condition

10.3.13 On the basis of the assessment results presented above, and taking into account the conservative assumptions adopted throughout the assessment, the predicted rating sound levels with the plant as measured are demonstrated to comply with the applicable MCC noise criteria at both NSRs. This

remains the case for the cumulative assessment, which considers all plant operating simultaneously under the conservative assumptions described above.

10.3.14 The assessment is therefore considered to demonstrate that the plant can operate in accordance with the noise requirements of the relevant planning condition. On this basis, it is considered that the requirements of the condition have been addressed, and it is therefore recommended that the condition is discharged.

11 Summary and Conclusion

11.1 A noise impact assessment has been undertaken to verify that the noise from the installed HRUs at the National Football Museum, Cathedral Gardens, Manchester M4 3BG meets the criteria stipulated in planning condition 5 of the planning permission for the plant.

11.2 An attended sound survey was undertaken on site on Sunday, 09 August 2026 between around 06:00 to 08:30 hours to establish the existing sound conditions on site, i.e., the residual and ambient sound levels as well as the background sound levels at the nearest NSRs, as well as the noise emissions of the plant in operation.

11.3 Review of the measured ambient and residual sound levels indicated that the contribution of the plant could not be reliably isolated at the relevant measurement locations, principally due to the influence of road traffic noise within the existing acoustic environment. Furthermore, due to the temperatures experienced during the survey, the secondary plant was not operational and therefore the cumulative operation of all plant could not be directly measured.

11.4 Consequently, compliance with the MCC noise criteria has been assessed using a calibrated 3D noise model, based on source measurements of the plant in operation at the time of the survey. The assessment considered both the plant operating as measured (primary HRU and noise break-out from NFM's louvres) and a cumulative scenario incorporating both the primary and secondary HRUs as well as noise-break-out from the louvres. The resulting specific sound levels at the nearest NSRs were subsequently assessed in accordance with BS 4142, using the lowest representative background sound levels at the NSRs.

11.5 The assessment demonstrates that the predicted plant rating sound levels comply with the adopted MCC noise criterion at both NSRs under both assessment scenarios and that the criterion is met for the broadband rating levels and at each frequency band.

11.6 With regards to the assessment context, the predicted rating level at the NSRs falls at 15 dB or more below the prevailing residual sound environment. Furthermore, the assessment is based on background and residual sound levels measured during a particularly quiet period outside the plant's normal operating hours, the lowest measured background sound level has been adopted for the assessment, the secondary HRU was assigned the same noise emission as the primary HRU which features twice the number of fans, and simultaneous continuous operation has been assumed for all plant. All these assumptions provide a robust and precautionary assessment of the potential noise impact from the plant.

11.7 The assessment is therefore considered to demonstrate that the plant can operate in accordance with the noise requirements of the relevant planning condition. On this basis, it is considered that the requirements of the condition have been addressed, and it is therefore recommended that the condition is discharged.

APPENDICES

Appendix 1: Policy, Standards and Guidance

A.1 National Planning Policy Framework[2]

A.1 Current governmental guidance for the determination of planning applications is given in the "National Planning Policy Framework, Plan-making and decision-making polcies" (NPPF), published in August 2026. The NPPF sets out the government's policies for plan-making and decisions on development proposals in England.

A.2 The NPPF has three overarching objectives:

- **Economic** – help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure

- **Social** - support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well/designed, beautify and safe places, with accessible community facilities, public service infrastructure and open spaces that reflect current and future needs and support communities' health, social and cultural well-being

- **Environmental** - support efforts to mitigate and adapt to climate change, including moving to a low carbon economy; and to protect and enhance our natural, built and historic environment, including making effective use of land, improving biodiversity, using natural resources prudently, and minimising waste and pollution

[2] Ministry of Housing, Communities and Local Government (2018 to 2021) / Department for Levelling Up, Housing & Communities (current)– "National Planning Policy Framework – Plan-making and national decision-making polcies", published March 2012. Latest update August 2026

A.3 **Facilitating the sustainable use of minerals** – National decision-making policy M4: Considering the impacts of mineral development states:

"1. Proposal for mineral development should:

…

b. Ensure any unavoidable noise, dust and particle emissions and any vibrations from blasting will be controlled, mitigated or removed at source, and that appropriate noise limits are established for extracting in proximity to noise sensitive properties (recognising that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate mineral extraction); and

…"

A.4 **Promoting sustainable transport** - National decision-making policy TR7: Marine ports, airports and other aviation facilities states:

"2. All development proposals to which this policy applies should have an acceptable environmental effect in terms of noise, air quality, greenhouse gas emissions, the transport network, landscape, visual and marine impacts, taking into account any applicable standards and relevant nation decision making polices in this Framework."

A.5 **Pollution, public protection and security** - Plan-making policy P1: Planning for clean and safe places states:

"1. To support efforts to avoid and mitigate risks from natural and man-made hazards, minimise levels of pollution and create clean, liveable and safe places for people to live, work and visit, developments should:

…

b. Consider any wider opportunities to reduce air, water, soil, noise or other forms of pollution, and contribute to compliance with national and local environmental targets and objectives, though the spatial strategy and policies for specific parts of the plan area (such as by identifying opportunities for strategic nature-based solutions);"

A.6 **Pollution, public protection and security** - National decision-making policy P3: Living conditions and pollutions states:

"2. *Within this context development proposals should*:

a. *Provide healthy living conditions for occupiers and users in terms of adequate access to light and avoiding exposures to levels of air, noise and artificial light or other sources of pollution which could have an unacceptable adverse effect on health and the quality of life. Where necessary suitable mitigation measures should be incorporated to secure acceptable living conditions;*
b. *Not give rise to, or contribute to, an unacceptable level of access to daylight and sunlight for neighbouring residents and occupiers, or unacceptable levels of air, noise and artificial light, water, soil or other forms of pollution on the or beyond the site. Adverse impacts of this nature should be avoided where possible, or else mitigated to an acceptable degree. Where possible, opportunities should be taken to reduce pollution affecting the wider area (such as through traffic and travel management or improved external lighting);*

…

d. *Mitigate and reduce to a minimum potential adverse impacts resulting from noise, not result in levels of noise exposure which would have a significant observed adverse effect, and maintain the character of tranquil areas (those areas that have remained relatively undisturbed by noise from human sources and are prized for their recreational and amenity value for this reason);"*

A.7 **Pollution, public protection and security** – National decision-making policy P4: Impact of development on existing activities states:

"1. Existing businesses, community facilities, public services and defence and security activities should not have unreasonable restrictions placed on their current or permitted operation as a result of development being approved after they were established. This means that development proposals should be capable of being integrated effectively with existing business, community and public service activities and infrastructure in their vicinity (including, but not limited to, uses such as pubs, music venues, places of worship, sports clubs, blue light services, defence, electricity network infrastructure and industrial and waste sites).

2. Where the operation of an existing activity could have a significant adverse effect on a proposed new development in its vicinity, development proposals should:

a. *Identify the nature of the potential impacts, informed where necessary by early discussions between the applicant (o.e. the 'agent of change') and those existing uses which could be affected by the proposal to inform the scope for mitigation; and*
b. *Be able to demonstrate that suitable mitigation can be provided before first occupation of the development, if it is not to be acceptable. Planning conditions or obligations should be used to secure agreed mitigation measures.*

3. *This policy applies to new development involving changes of uses of land and property, as well as to new construction, and includes situations where new development may interfere with the operation of electronic communications networks. Both lawful current and permitted levels of operation of existing activities should be taken into account when applying this policy*."

A.8 **Pollution, public protection and security** – National decision-making policy P6: Land and operations for defence and public safety states:

"….

b. Proposals which could affect their operational activities and capability, including situations where other development should only proceed where it can make alternative of replacement provision for defence or public safety operations which would otherwise be affected, or where noise from operational activities should affect the proposed development (in which case policy P4 should also be applied)."

A.9 With regard to **'adverse'** impacts and **'significant adverse'** impacts, there are no direct definitions in the current NPPF. However, advice contained in DEFRA's "Noise Policy Statement for England" (NPSE) provides so guidance on the concepts of a "Significant Observed Adverse Effect Level" (SOAEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "No Observed Adverse Effect Level" (NOAEL), which are generally adopted. These are concepts aligned with toxicology outcomes derived from guidance given by the World Health Organisation.

A.2 Noise Policy Statement for England[3]

A.10 Whilst the intent of the Noise Policy Statement for England (NPSE) in relation to the NPPF is clear, the NPSE does not provide any quantitative threshold values for each identified level of "effect", but highlights that:

"*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.*"

A.3 National Planning Practice Guidance – Noise[4]

A.11 The application of national planning is amplified in the government's "National Planning Practice Guidance" (PPG-N) published in July 2019. This seeks to help clarify understanding the perception of noise effects, potential outcomes of noise exposure and actions that should be taken to align decision making with the NPPF.

A.12 Paragraph 001 (Ref. 30-001-20190722) outlines when noise should be considered in relation to planning, i.e., "*…when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced).*

…

Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the onset."

[3] Department for Environment, Food and Rural Affairs (DEFRA) – "Noise Policy Statement for England", March 2010

[4] Ministry of Housing, Communities and Local Government (2018 to 2021) / Department for Levelling Up, Housing & Communities (current)– "Planning Practice Guidance - Noise", published March 2014. Latest update 22 July 2019

A.13 In line with the NPPF concept of basing decision making on the identification of **'adverse'** or **'significant adverse'** impacts on health and quality of life, the PPG aligns its guidance with the NPSE. Specifically in relation to noise, the table overleaf summarises this guidance:

Table A14 : PPG-N Noise Exposure Hierarchy Table

Perception	Examples of Outcomes	Increasing Effect Leve	Action
No Observed Effect Level (NOEL)			
Not noticeable	No Effect	No Observed Effect	**No specific measures required**
No Observed Adverse Effect Level (NOAEL)			
Present not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. 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 (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life.	Observed Adverse Effect	**Mitigate and reduce to a minimum**
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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 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 acoustic character of the area.	Significant Observed Adverse Effect	**Avoid**
Present and	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to	Unacceptable Adverse Effect	**Prevent**

very disruptive	mitigate effect of noise leading to psychological stress or physiological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory		

A.14 Whilst the NPPF and the associated PPG-N outlines the framework to ensure the satisfactory development of land in relation to potential noise impacts, the policies and guidance do not provide any specific technical guidance defining what may be considered an "adverse" or "significant adverse" impact.

A.15 The guidance does, in Paragraph 015 (Reference ID: 30-015-20190722) of PPG-N, make reference to a number of 'industry standard' guidance documents, including but not limited to BS 8233:2014 and ProPG, to assist in quantifying when noise may have a particular effect. The paragraph does, however, clarify:

"*Some of these documents contain numerical criteria. These values are not to be regarded as fixed thresholds and as outcomes that have to be achieved in every circumstance*".

In some instances, noise can override other planning concerns. Paragraph 002 (Reference ID:30-002-20190722) states:

"*It can, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surrounds, as these can have an important effect on whether noise is likely to pose a concern.*"

A.16 In relation to protected areas paragraph 008 (Reference ID:30-008-20190722) states:

"*For an area to justify being protected for its tranquillity, it is likely to be relatively undisturbed by noise from human sources that undermine the intrinsic character of the area. It may, for example, provide a sense of peace and quiet or a positive soundscape where natural sounds such as birdsong or flowing water are more prominent than background noise, e.g. from transport.*

Consideration may be given to how existing areas of tranquillity could be further enhanced through specific improvements in soundscape, landscape design (e.g. through the provision of green infrastructure) and/or access."

A.17 "Agent of Change" is addressed in paragraph 009 (Reference ID:30-009-20190722), which states:

"Development proposed in the vicinity of existing businesses, community facilities or other activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme.

In these circumstances the applicant (or 'agent of change') will need to clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a significant adverse effect on new residents/users. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made.

The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints."

A.4 BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

A.18 BS 4142:2014+A1:2019[5] provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. The standard presents a method of assessing potential noise impact by comparing the noise level due to industrial sources (the Rating Level) with that of the existing background noise level at the nearest noise sensitive receiver in the absence of the source (the Background Sound Level).

[5] BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

A.19 The Specific Noise Level - the noise level produced by the source in question at the assessment location - is determined and a correction applied for certain undesirable acoustic features such as tonality, impulsivity or intermittency. The corrected Specific Noise Level is referred to as the Rating Level.

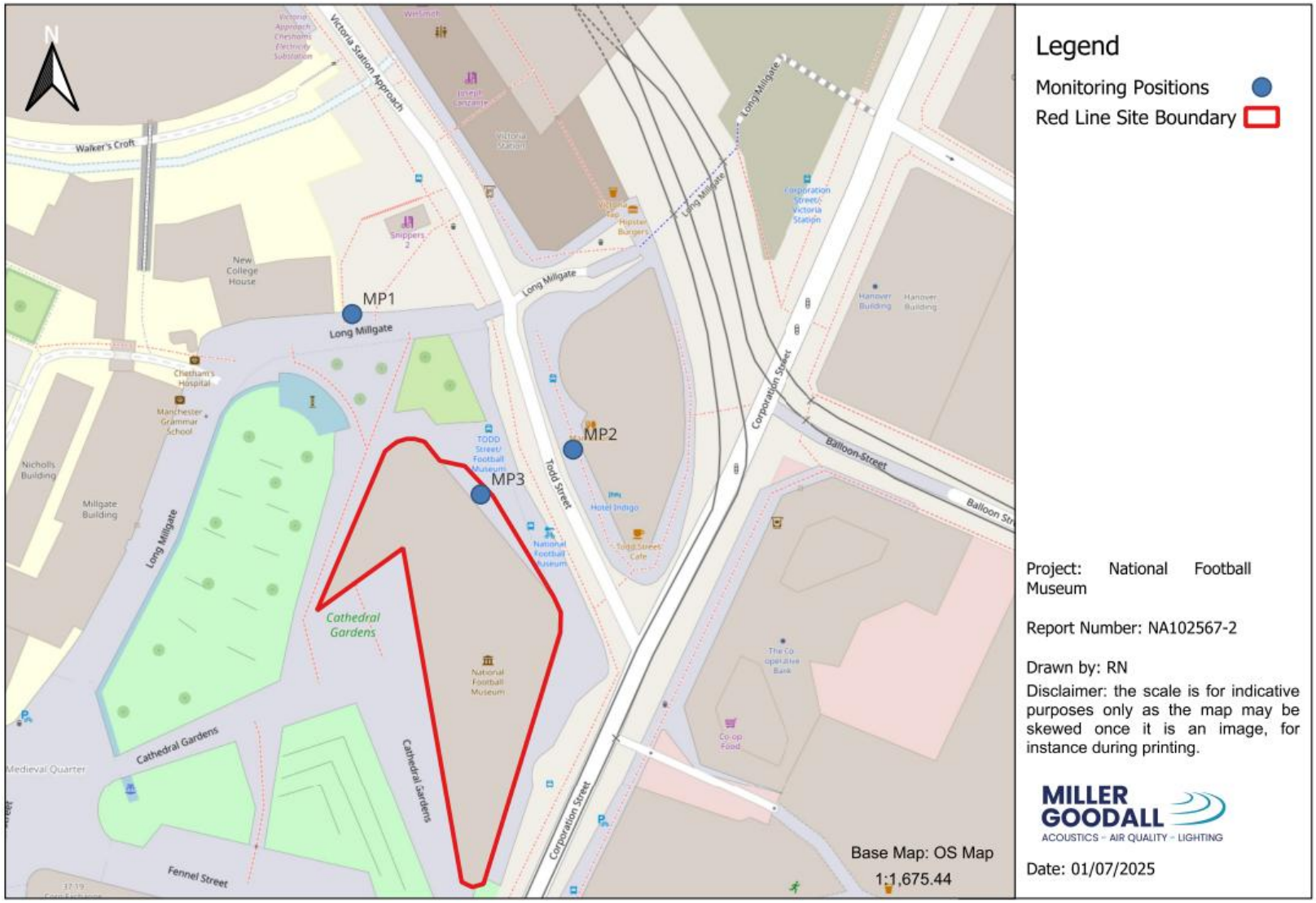
A.20 In order to assess the noise impact, the Background Sound Level is arithmetically subtracted from the Rating Level. The standard states the following:

- *Typically, the greater this difference, the greater the magnitude of the 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.*

A.21 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014+A1:2019 edition places emphasis upon an appreciation of the context, as follows:

> *An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.*

Appendix 2: Site Location, Monitoring and NSR Locations

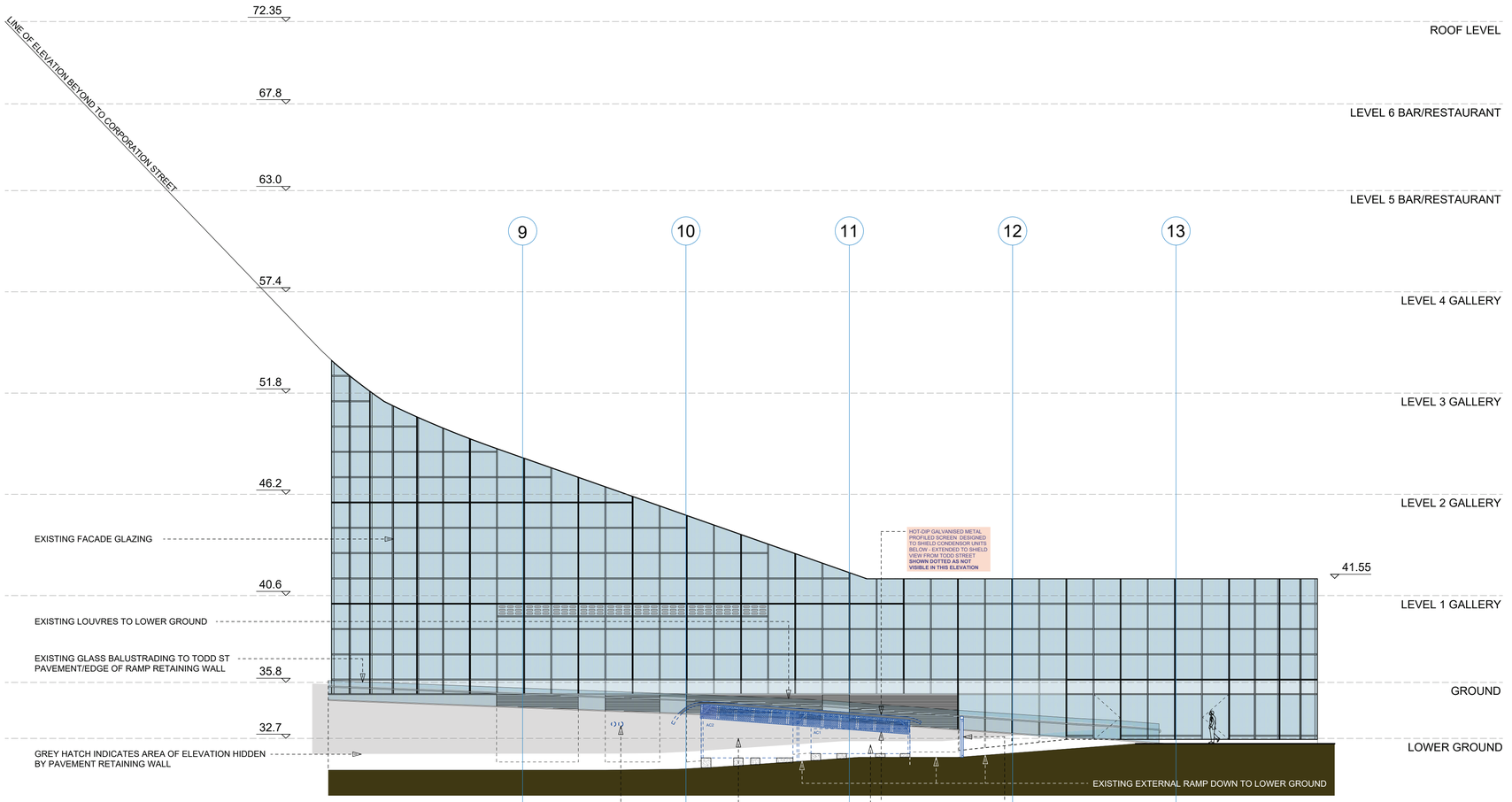

N
Victoria Station Approach
Walker's Croft
New College House
MP1
Long Millgate
Chetham's Hospital
Manchester Grammar School
Nicholls Building
Millgate Building
Long Millgate
Cathedral Gardens
Medieval Quarter
Cathedral Gardens
Cathedral Gardens
Fennel Street
TODD Street/ Football Museum
MP3
MP2
Todd Street
National Football Museum
Hotel Indigo
Todd Street Cafe
Corporation Street
Balloon Street
Hanover Building
The Co-operative Bank
Co-op Food
Corporation Street
Base Map: OS Map
1:1,675.44
Legend
Monitoring Positions
Red Line Site Boundary
Project: National Football Museum
Report Number: NA102567-2
Drawn by: RN
Disclaimer: the scale is for indicative purposes only as the map may be skewed once it is an image, for instance during printing.
MILLER GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING
Date: 01/07/2025

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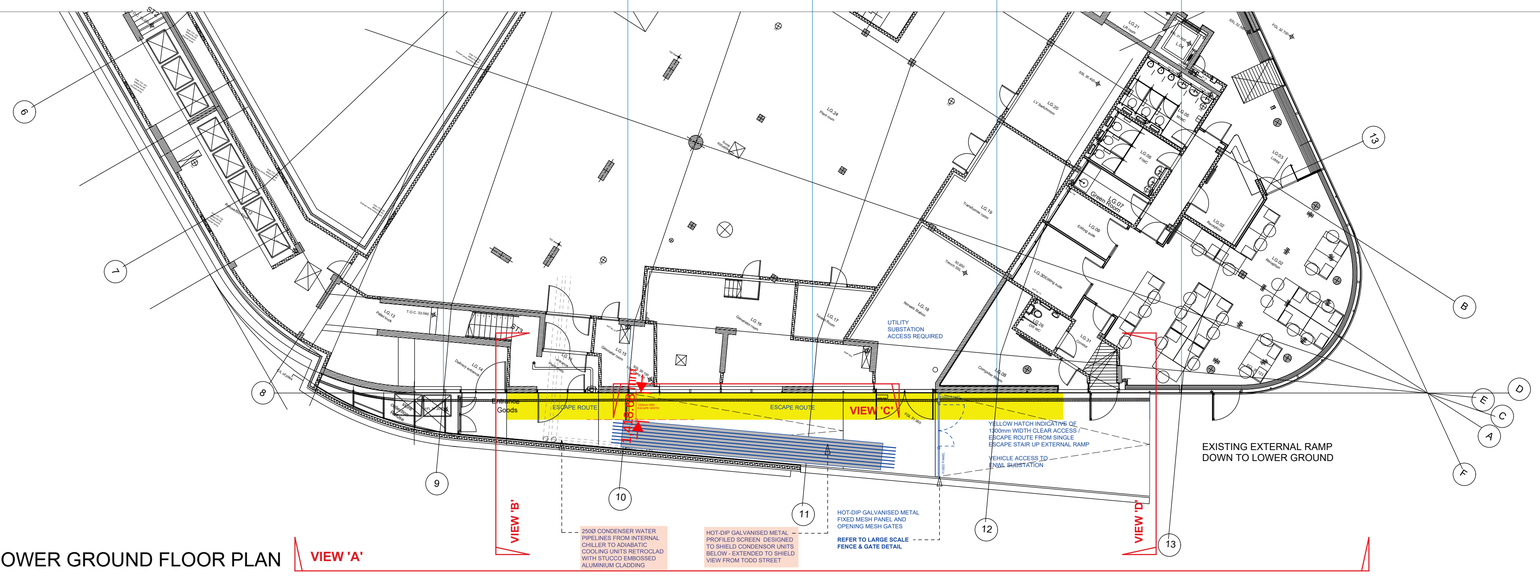
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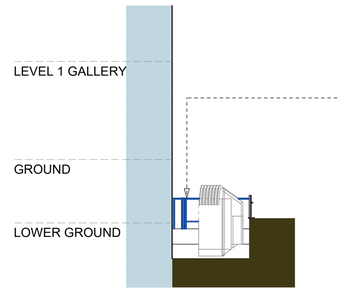
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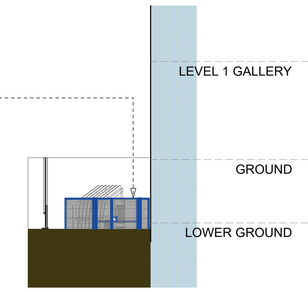
PROPOSED PART-ELEVATION TO TODD STREET - VIEW 'A'



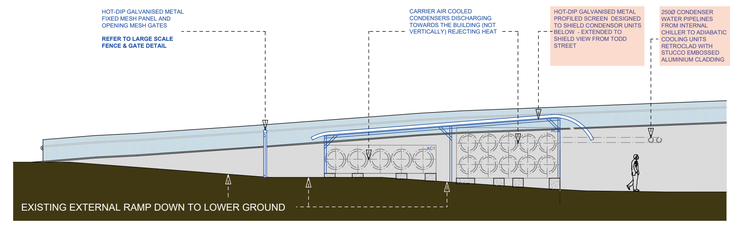
PROPOSED LOWER GROUND FLOOR PLAN



PROPOSED PART-ELEVATION
VIEW 'B'
NEW PERFORATED METAL SCREENS OMITTED FOR CLARITY

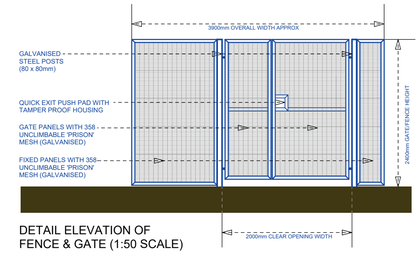


PROPOSED PART-ELEVATION
VIEW 'D'



PROPOSED PART-ELEVATION (OPPOSITE VIEW A) - VIEW 'C'
NEW PERFORATED METAL SCREENS OMITTED FOR CLARITY

REV	DATE	DRN		CHKD
A	MAR 2023	DL	DRAWING UPDATED TO SHOW PROPOSED RETROFIT ELEMENTS AS AGREED WITH PLANNING DEPT. READ WITH ACCOMPANYING VISUALS DWG 1100, 1101 & 1103	AS
A	NOV 2022	DL	DRAWING UPDATED TO AS-BUILT SHOWING REVISED DETAIL TO CANOPY AND GATE AS INSTALLED	AS



DETAIL ELEVATION OF FENCE & GATE (1:50 SCALE)



UNCLIMBABLE MESH SAMPLE

PROJECT
Installation of Heat Rejection Units at the National Football Museum (Urbis), Manchester City Centre

CLIENT
Conlon Construction

DRAWING
Proposed Plan & Elevation to Todd Street Indicating Proposed Gate/Fence

SCALE	SHEET SIZE	DRAWN	CHECKED	DATE
1:150 / 1:50	@A1	DL	AS	11.03.21

BOWKER SADLER**ARCHITECTURE**
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JOB No	DRAWING No	REVISION
21-023	1006	B

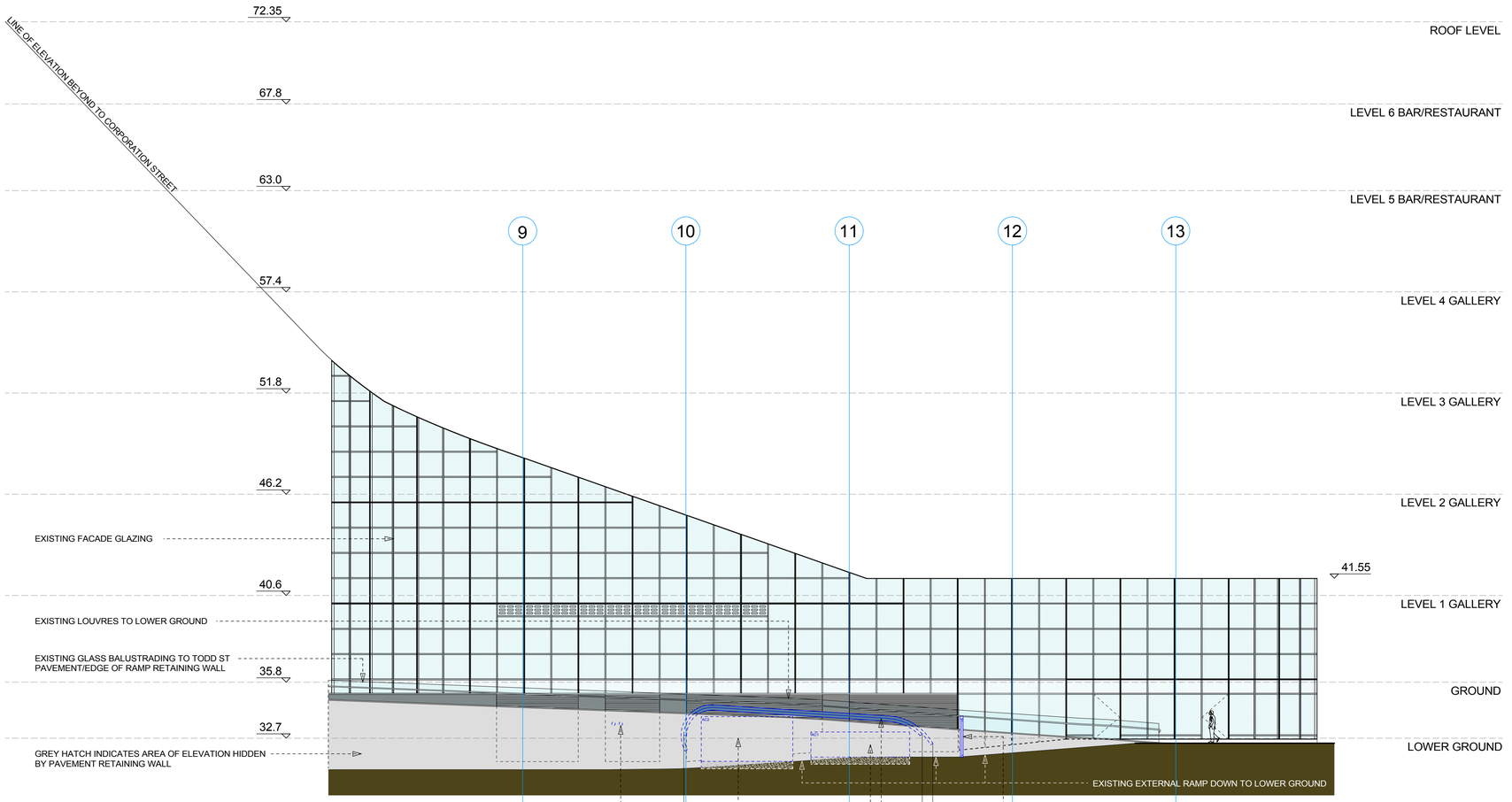
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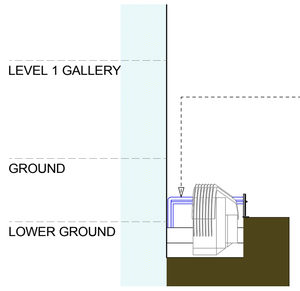
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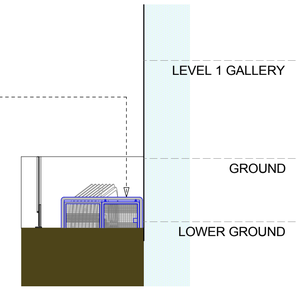
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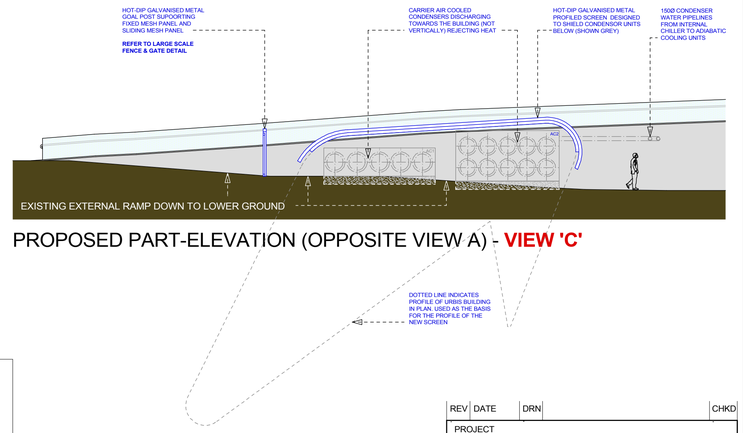
PROPOSED PART-ELEVATION TO TODD STREET - **VIEW 'A'**



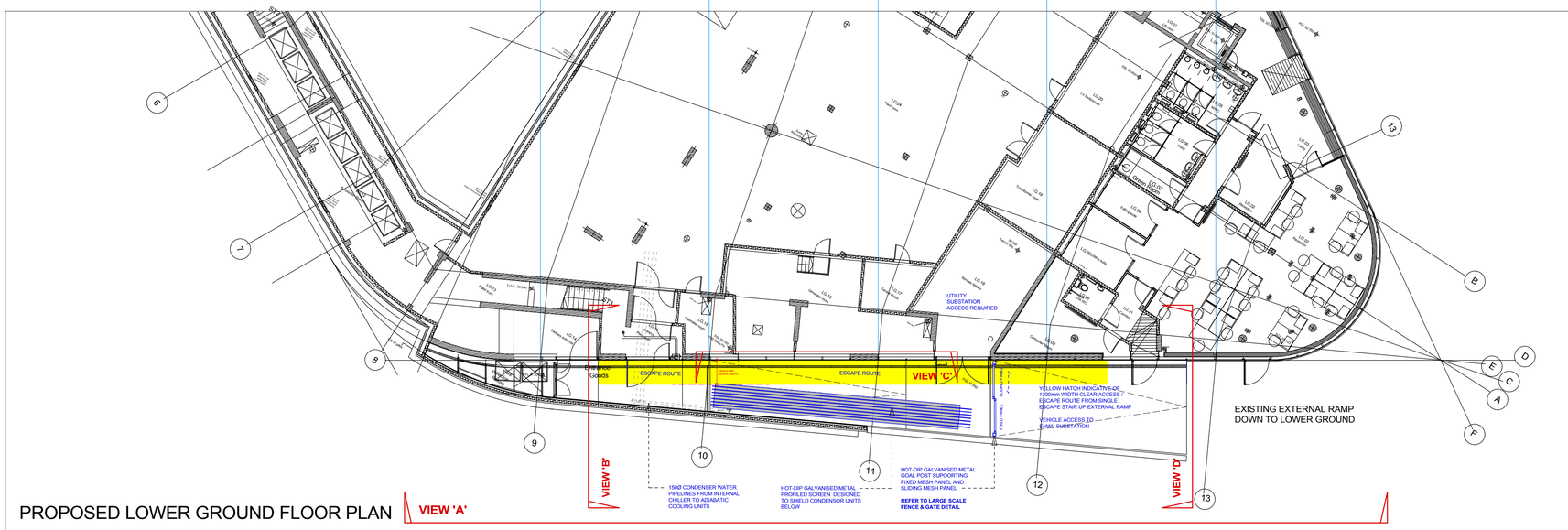
PROPOSED PART-ELEVATION
VIEW 'B'



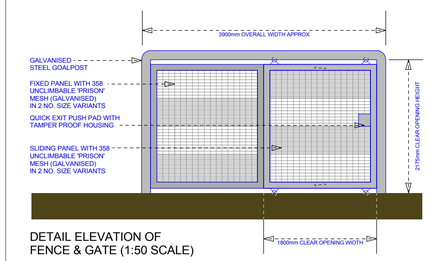
PROPOSED PART-ELEVATION
VIEW 'D'



PROPOSED PART-ELEVATION (OPPOSITE VIEW A) - **VIEW 'C'**



PROPOSED LOWER GROUND FLOOR PLAN



DETAIL ELEVATION OF FENCE & GATE (1:50 SCALE)



UNCLIMBABLE MESH SAMPLE

REV	DATE	DRN	CHKD

PROJECT
Installation of Heat Rejection Units at the National Football Museum (Urbis), Manchester City Centre

CLIENT
Conlon Construction

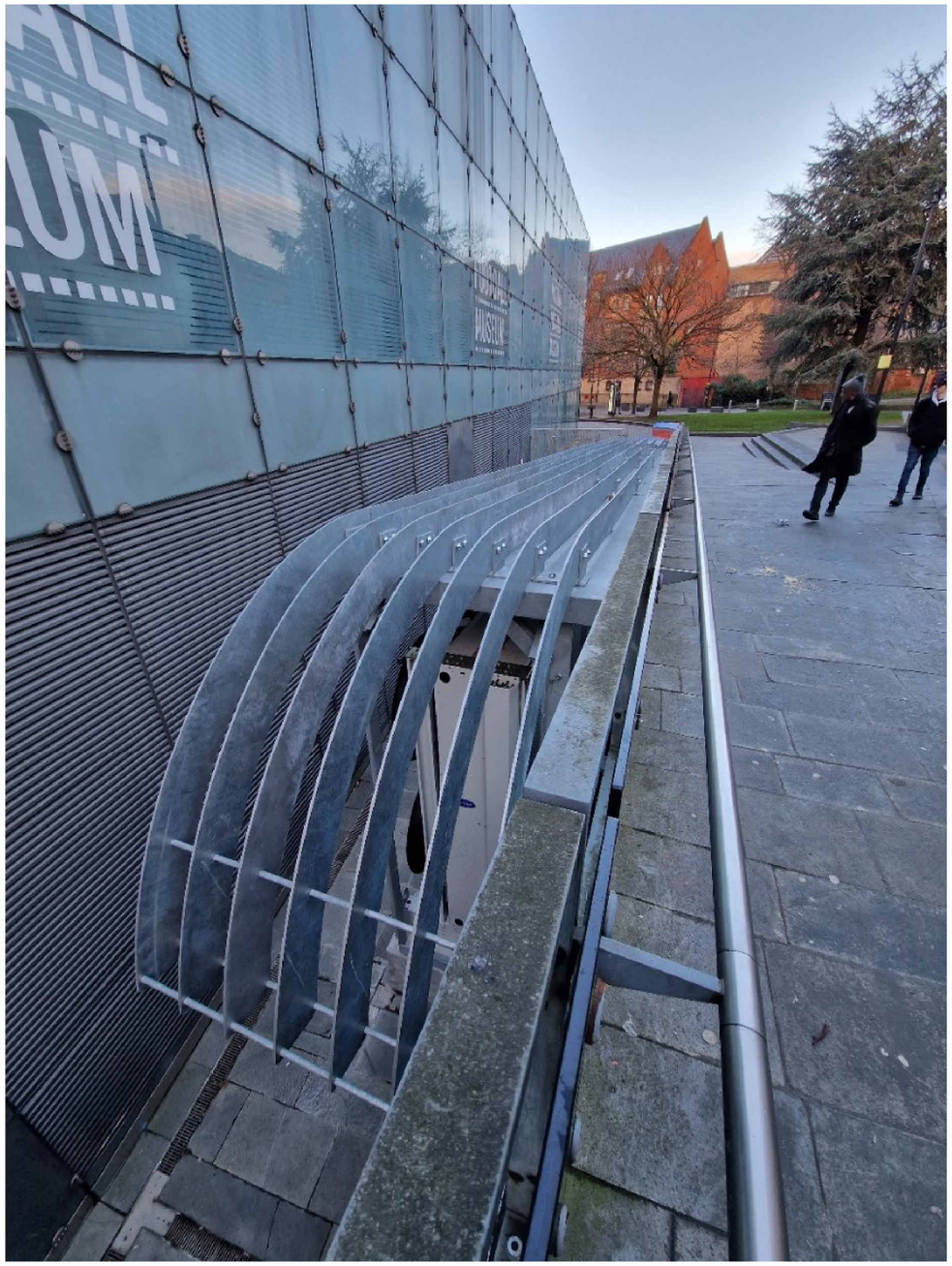
DRAWING
Proposed Plan & Elevation to Todd Street Indicating Proposed Gate/Fence

SCALE	SHEET SIZE	DRAWN	CHECKED	DATE
1:150 / 1:50	@A1	DL	AS	11.03.21

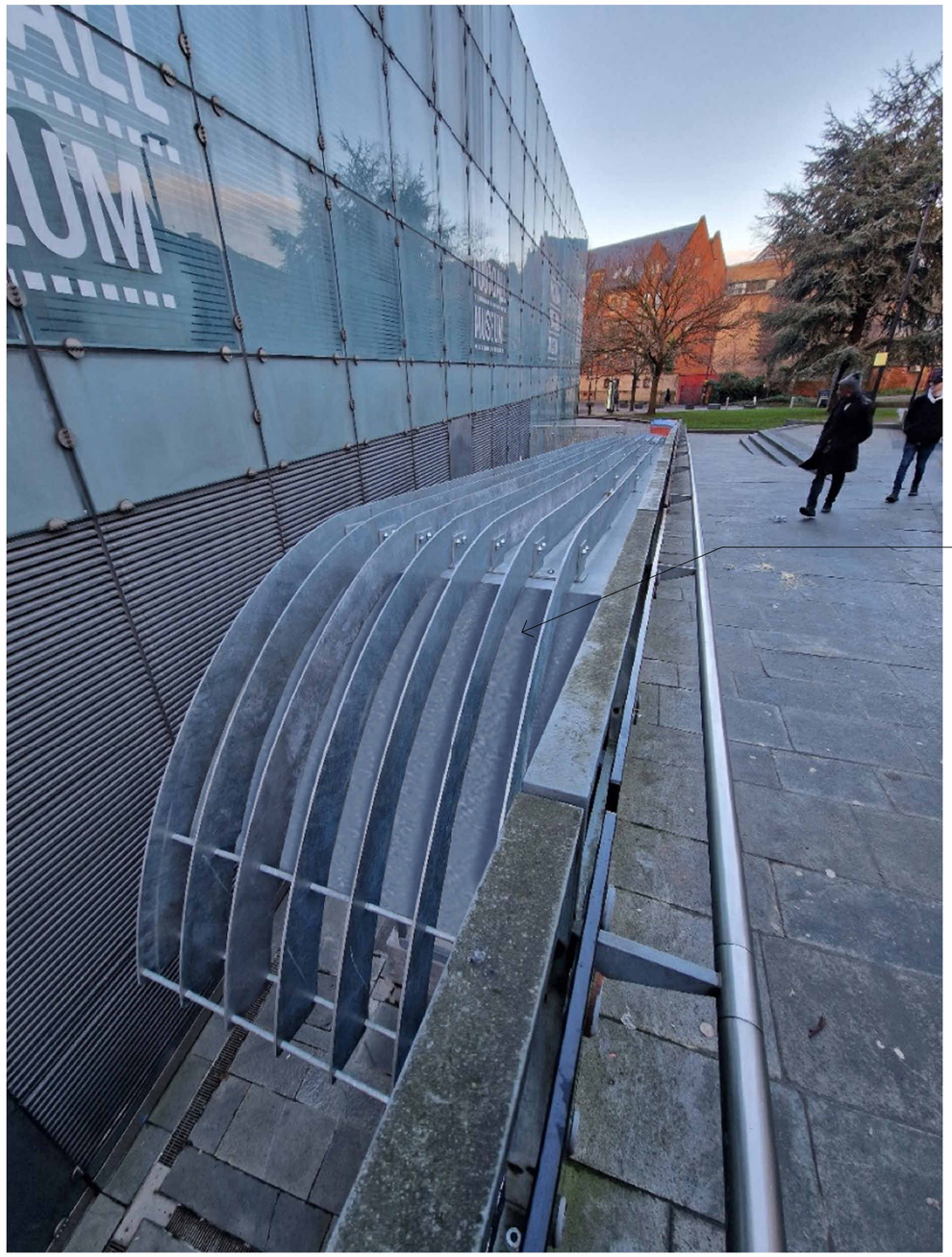
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JOB No	DRAWING No	REVISION
21-023	1006	

STATUS
Planning



Existing enclosure



Curved galvanised liner panel fitted to underside of existing curved fins to screen heat rejection units

Proposed enclosure

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Project
Installation of Heat Rejection Units at the National Football Museum (Urbis)

Client
Conlon Construction Ltd.

Drawing
Proposed Enclosure Visualisation - 01

Scale	Sheet Size	Drawn	Checked	Date
	@ A3	KS	DL	01/02/23

Project No.	Originator	Zone	Level	Form	Discipline	Number	Revision
21-023 -						**1100**	

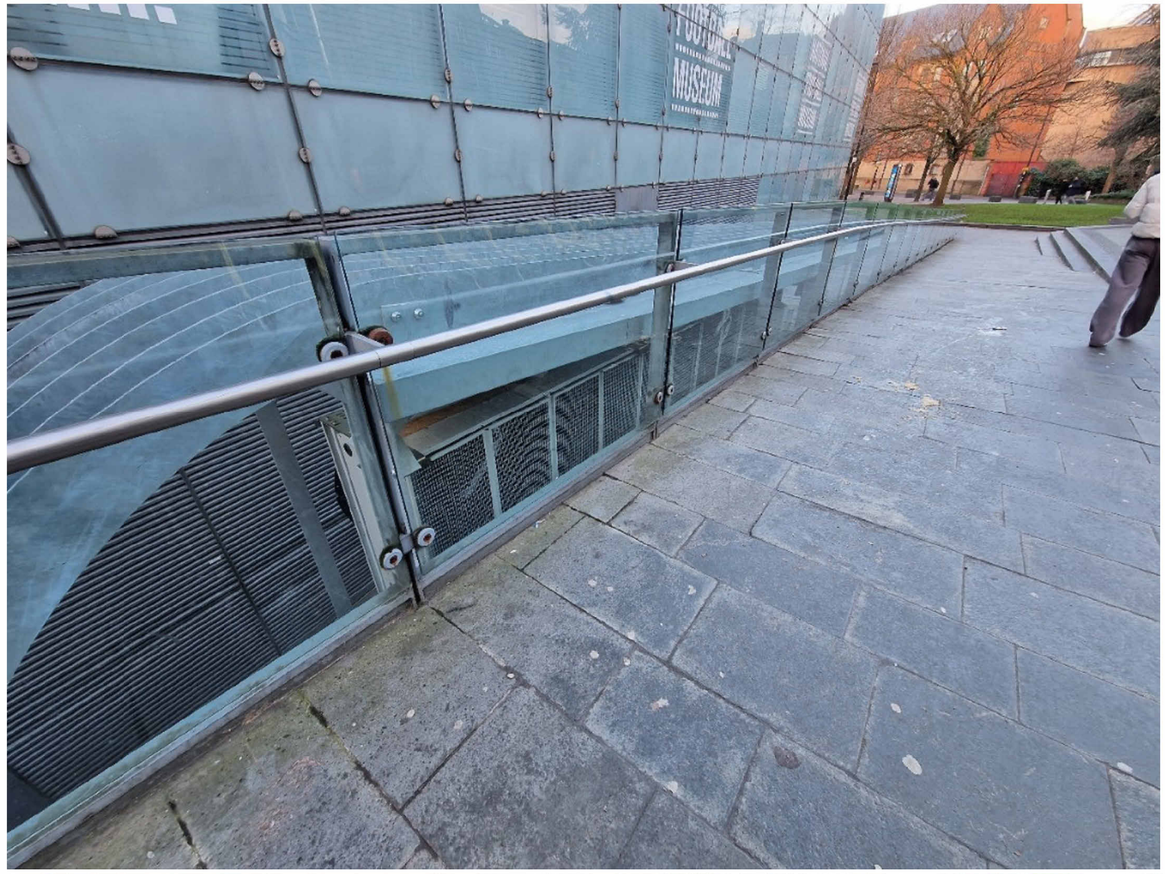
Status

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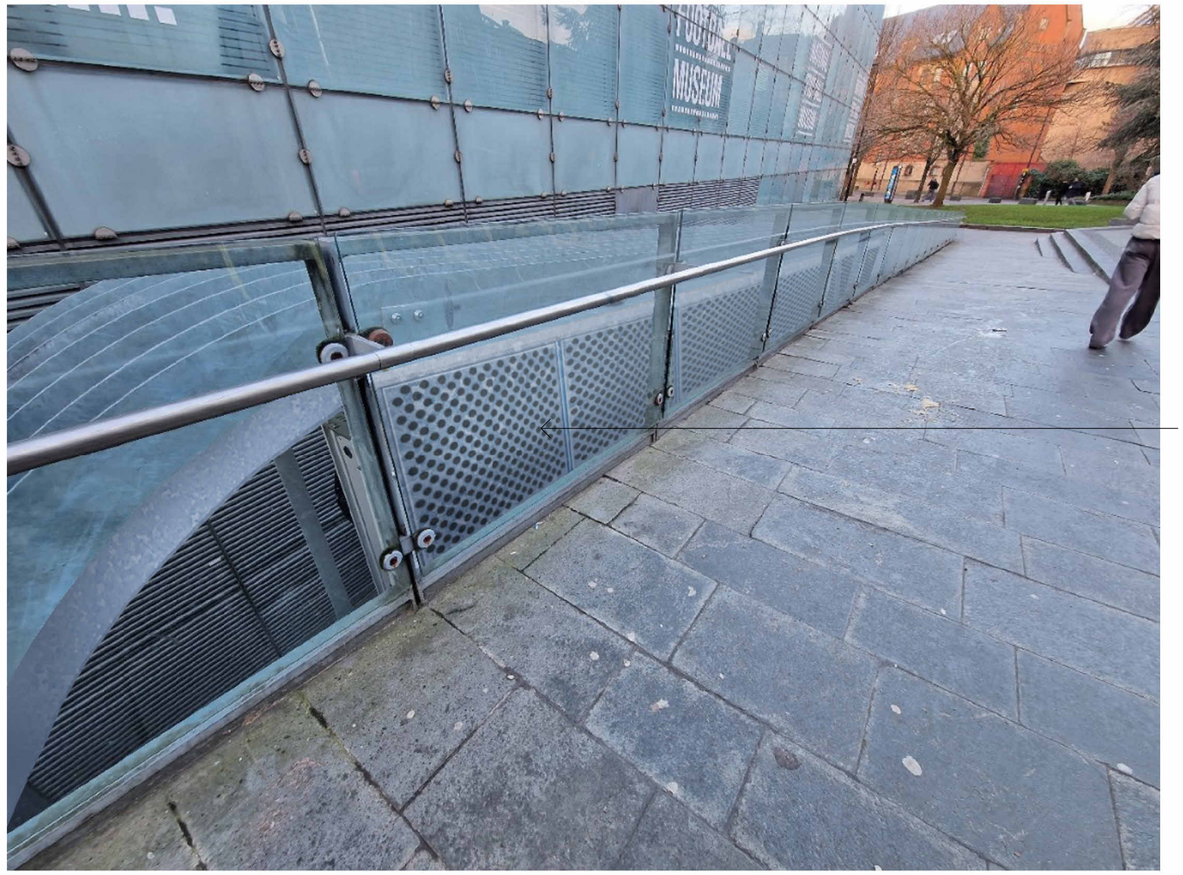
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Existing enclosure



Galvanised perforated liner panels fitted to side of enclosure to screen heat rejection units

Proposed enclosure

Rev.	Date	Drn.	Chkd.

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Project
Installation of Heat Rejection Units at the National Football Museum (Urbis)

Client
Conlon Construction Ltd.

Drawing
Proposed Enclosure Visualisation - 02

Scale	Sheet Size	Drawn	Checked	Date
	@ A3	KS	DL	01/02/23

Project No.	Originator	Zone	Level	Form	Discipline	Number	Revision
21-023 -						**1101**	

Status

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Existing



Proposed

Curved galvanised liner panel fitted to underside of existing curved fins to screen heat rejection units

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Project
Installation of Heat Rejection Units at the National Football Museum (Urbis)

Client
Conlon Construction Ltd.

Drawing
Proposed Enclosure Visualisation - 04

Scale	Sheet Size	Drawn	Checked	Date
	@ A3	KS	DL	21/02/23

Project No.	Originator	Zone	Level	Form	Discipline	Number	Revision
21-023 -						**1103**	

Status

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Appendix 3: Noise model input data

A3.1 The $L_{Aeq,\,1\,minute}$ 1-3 octave band measurements at location MP3 are given in **Table A3. 1** below. The broadband level for this measurement was 59 dB $L_{Aeq,1min}$, which was the highest plant measured levels of the total measurement period at location MP3.

Table A3. 1 Worst-case cumulative plant noise measurement at location MP3

Parameter	Octave Band Centre Frequency, Hz																									
	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz
$L_{Aeq,\,1\,minute}$	61.1	60.2	60	62	57.5	58.3	57.2	54	54.7	53.5	53.7	51.4	50.8	50.9	51.5	51.9	50.4	49.1	48.6	46.1	44.2	42.2	40.3	38	34.2	31.2	25.4

Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under laboratory conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A-weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A.

$L_{A90,T}$ The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014+A1:2019 it is used to define background noise level.

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

$L_{AF,max}$ The highest A-weighted noise level recorded during the time period using a Fast time-weighting. It is usually used to describe the highest noise level that occurred during the event.


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