

NOISE ASSESSMENT

on behalf of

DAY PROJECT MANAGEMENT LTD

for the site at

FAIRFIELD GENERAL HOSPITAL, ROCHDALE OLD ROAD, BURY, BL9 7TD

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Summary

A noise assessment was undertaken to predict the potential impact of a proposed extension at Fairfield General Hospital, Rochdale Old Road, Bury, BL9 7TD to the existing A&E Department, involving the introduction of rooftop mechanical services plant. This was requested by the Local Authority to support a planning application for the development.

Measurements were made at a location representative of the nearest residential dwellings to the proposed site to identify the pre-development background sound levels. Measurements were also made of sound levels within the hospital grounds. This data was subsequently used to predict the potential impact of noise from the mechanical services plant.

A noise model has been assembled for the proposed development site, the results from which are provided within this report.

Record of changes

Prepared By: Jo Lacy AMIOA

Reviewed By: Michael Rickard MIOA

Signed:



Signed:



Date:

14 April 2023

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14 April 2023

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1	14 April 2023	First issue	JL

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Contents

Summary	2
Contents	4
1 Introduction	5
2 Site Description	5
3 Proposed Development	5
4 Policy Context	6
4.1 Noise Policy Statement for England.....	6
4.2 National Planning Policy Framework.....	7
4.3 Planning Practice Guidance – Noise.....	8
5 Local Authority Consultation	10
6 Acoustic Standards and Guidance	10
6.1 BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’	10
7 Noise Survey.....	11
7.1 Measurements of Existing Noise Sources.....	11
7.2 Monitoring Results	13
8 Impact of Noise from the Proposed Development	14
8.1 Noise Modelling	14
8.2 Noise Levels at On-site receptors.....	15
8.3 BS 4142:2014+A1:2019 Assessment of Night Time Noise at Dwellings on Rochdale Old Road	16
9 Conclusions.....	17
APPENDICES	19
Appendix 1: Measurement Positions	21
Appendix 2: Measurement Data – 15 min periods	23
Appendix 3: Predicted plant noise levels	26
Glossary of Terms	28

1 Introduction

- 1.1 This noise assessment is submitted in support of a proposed planning application for expanding the Accident and Emergency Department at Fairfield General Hospital, Rochdale Old Road, Bury, BL9 7TD. The site lies within the administrative boundary of Bury Council.
- 1.2 The report provides a review of the existing noise sources in the area and assesses the potential impact of the proposed development on the local noise environment.

2 Site Description

- 1.3 The site is located toward the north of the larger Fairfield General Hospital site, and is an extension to the existing Accident and Emergency department. Across an access road at the north of the A&E department are the Facilities and Estates offices, with the Fairfield General Hospital: Education Centre beyond to the north. The nearest residences to the development are beyond this building to the north, across Rochdale Old Road.
- 1.4 The Facilities and Estates offices are only in use during the daytime period, and are therefore the nearest noise-sensitive receptors at this time. During the night time period, the nearest off-site noise-sensitive receptors are at the north of Rochdale Old Road.

3 Proposed Development

- 1.5 It is proposed to extend the existing A&E department at Fairfield General Hospital, which will involve the introduction of a number of new mechanical services plant items on the new roof. It is understood that there will be a single air handling unit and seven condenser units being installed at the site.

4 Policy Context

4.1 Noise Policy Statement for England

4.1.1 The Noise Policy Statement for England (NPSE¹), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse effects on health and quality of life;
- mitigate and minimise adverse effects on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.”

4.1.2 The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and the quality of life occur.

4.1.3 The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the Statement). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case:

“...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development”.

4.1.4 Importantly, the NPSE goes on to state:

“This does not mean that such adverse effects cannot occur”.

4.1.5 The Statement does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that:

¹ Noise Policy Statement for England, Defra, March 2010

“Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available”

- 4.1.6 It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

4.2 National Planning Policy Framework

- 4.2.1 The National Planning Policy Framework (NPPF²) initially published in March 2012, was updated in July 2021. One of the documents that the NPPF replaces is Planning Policy Guidance Note 24 (PPG 24) “Planning and Noise”³.

- 4.2.2 The revised NPPF advises that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives). One of these is an environmental objective which is described in par. 8 (c):

“to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.”

- 4.2.3 At par. 174 we are advised that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.”

² National Planning Policy Framework, Ministry of Housing, Communities and Local Government, July 2021

³ Planning Policy Guidance 24: Planning and Noise, DCLG, September 1994

4.2.4 Par. 185 goes on to state:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”*

4.2.5 Par. 187 seeks to ensure that any development does not prejudice the legally permitted operations and activities of other, existing non-residential uses, stating:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

4.3 Planning Practice Guidance – Noise

4.3.1 As of March 2014, a Planning Practice Guidance⁴ for noise was issued which provides additional guidance and elaboration on the NPPF, the guidance was updated in July 2019. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and

⁴ Planning Practice Guidance – Noise, <https://www.gov.uk/guidance/noise--2> 22nd July 2019.

- Whether or not a good standard of amenity can be achieved.

4.3.2 In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

“...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation”.

4.3.3 Examples of these factors include:

- The source and absolute noise level of the source along with the time of day that it occurs;
- Where the noise is non-continuous, the number of noise events and pattern of occurrence;
- The frequency content and acoustic characteristics of the noise;
- The effect of noise on wildlife;
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design;
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

4.3.4 The PPG also provides general advice on the typical options available for mitigating noise. It goes on to suggest that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

“Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed”.

4.3.5 The PPG was amended in December 2014 to clarify guidance on the potential effect of noise from existing businesses on proposed new residential accommodation. Even if existing noise levels are intermittent (for example, from a live music venue), noise will need to be carefully considered and appropriate mitigation measures employed to control noise at the proposed accommodation.

5 Local Authority Consultation

- 5.1 Bury Council Development Control confirmed via email on 4th April 2023 that setting noise limits at the site such that the existing representative noise levels are not exceeded is appropriate for the control of mechanical services plant noise.

6 Acoustic Standards and Guidance

6.1 **BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'**

- 6.1.1 BS 4142:2014+A1:2019⁵ provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. It replaced the 1997 edition of the Standard in October 2014 and was amended in June 2019. The amended version corrected a number of printing errors and further clarified that the standard is used to assess external noise levels, and not internal noise levels (although this can form part of the discussion regarding context). The key aspects of the Standard are summarised below.
- 6.1.2 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).
- 6.1.3 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.
- 6.1.4 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,*

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

- *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.*

6.1.5 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.”

6.1.6 The 2014 edition of BS 4142 also introduced a requirement to consider and report the uncertainty in the data and associated calculations and to take reasonably practicable steps to reduce the level of uncertainty.

7 Noise Survey

7.1 Measurements of Existing Noise Sources

7.1.1 Noise measurements were undertaken at the north side of the Fairfield General Hospital: Education Centre in accordance with BS 7445-1: 2003⁶ by Jo Lacy of Miller Goodall Ltd. The calibration of the sound level meter was checked before and after measurements with negligible deviation (<0.1 dB). Details of the equipment used are shown in Table 1 below.

⁶ BS 7445-1: 2003 Description and measurement of environmental noise – Part 1: Guide to quantities and procedures

Table 1: Noise monitoring equipment

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Class 1 Calibrator ⁷	NOR 1251	Norsonic	34123	02/09/2021	05409/1
Class 1 ^{8,9} Integrating Real Time 1/3 Octave Sound Analyser	NTi XL2-TA	NTi Audio	A2A-15860-E0	28/02/2023	06143/1
Microphone	NTi MC230A	NTi Audio	A16445	28/02/2023	06143/1

7.1.2 Noise monitoring was undertaken at the times specified in Table 2, below. Weather conditions were determined both at the start and on completion of the survey. It is considered that there were extended periods when meteorological conditions were appropriate for environmental noise measurements – when meteorological conditions were not appropriate, this data is ignored. Measurement locations are shown in Appendix 1.

Table 2: Dates, times and weather conditions during short-term noise measurements

Measurement Location	Date	Time	Weather conditions
MPI	06/04/2023	16:00	Overcast, dry, 10°C, wind below 5 m/s
MP2	06/04/2023	16:10	Overcast, dry, 10°C, wind below 5 m/s
LPI	06/04/2023	16:30	Variable (see paragraph below)

7.1.3 The forecast suggested rain was likely at the site on Monday (10/04/2023), and that windspeeds would be above 5 m/s on Thursday (06/04/2023) and from Sunday (09/04/2023) onwards. Windspeeds were below 5 m/s on Thursday 6 April when attending the site, but it as it was forecast to be higher than appropriate for survey works, the data during those times have been disregarded.

⁷ IEC 60942 (2003) Electroacoustics – Sound calibrators

⁸ IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

⁹ IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

7.1.4 Measurements at LPI were taken over a multi-day / night period to capture noise levels at times considered to be representative at the site.

7.1.5 The measurement locations are detailed below:

- MP1 – approximately 20 m from proposed development location, and 3 m from the Facilities Building. Free-field and 1.5 m above local ground level
- MP2 – approximately 10m from the Estates building, and 25 m from the A&E department canopy at 1.5 m above local ground level and in a free-field position
- LPI – Measurements were made under facade conditions at a height of approximately 6 m above the ground, out of the window of the Fairfield General Hospital: Education Centre

7.1.6 The noise climate across the site was dominated by distant road noise from Rochdale Old Road to the north of the site with intermittent noise from vehicle passing by the measurement positions. While it was noted that there is some rooftop work being undertaken on the Facilities Building and on a building to the north-east of the A&E department, there was no work ongoing at the time of the measurements. There was also no audible plant noise at the site at any of the measurement positions.

7.2 Monitoring Results

7.2.1 A summary of the broadband measurement data is provided in Table 3 below with full data in Appendix 2. All data are sound pressure levels in dB re 20 µPa.

Table 3: Summary of noise measurements

Measurement Location	Start Time	Elapsed Time (hr:mn)	$L_{Aeq,T}$ (dB)	Overall L_{AFmax} (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
MP1	16:01	00:10	58	74	60	52
MP2	16:12	00:10	54	65	55	51
LPI ¹	07:00	16:00	65	108 ²	66	46
	23:00	08:00	58	91 ²	62	35

¹ Data reported was recorded over a 24-hour period commencing at 07:00 on 7 April 2023. Other data was excluded due to forecast bad weather.

² Based on the spectral data recorded, these max levels are due to emergency sirens

8 Impact of Noise from the Proposed Development

8.1 Noise Modelling

8.1.1 Prediction of noise levels at sensitive receptors was carried out using CadnaA software package.

8.1.2 The general horizontal plan information of the area surrounding and including the proposed development site was imported from Google Earth. 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. Topography was included in the design of the model as the proposed site is not flat.

8.1.3 The following parameters were assigned to the model:

- Propagation model: ISO 9613¹⁰
- Default ground absorption: 0.2 (Mixed ground, generally hard, reflecting surfaces)
- Two orders of reflection
- Buildings are reflecting (smooth, non-structured facade)
- Topography data from DEFRA LIDAR data

8.1.4 The octave band noise source data shown in Table 4 was imported directly into the model. This data was obtained from Day Architectural Ltd for mechanical services plant noise levels.

¹⁰ ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

Table 4: Noise source data used within CadnaA

Measurement Descriptor	SPL or SWL	Sound Level, dB								dB(A)
		in Octave Band Centre Frequency, Hz								
		63	125	250	500	1k	2k	4k	8k	
AHU Intake	SWL	72	74	69	61	59	53	46	37	65
AHU Exhaust	SWL	75	75	71	72	76	71	66	60	79
AHU Supply Breakout	SPL	56	56	38	36	37	37	28	17	44
AHU Exhaust Breakout	SPL	54	54	36	34	35	35	26	15	42
PUZ-ZM200YKA2	SPL	60.5	59.5	58	59	53.5	50.5	46.5	41	60
PUZ-ZM250YKA2R1	SPL	71.5	62.5	61	60.5	56.5	53	49	43	62
PUZ-HWM140YHA	SPL	56.5	57	53.5	50.5	48	43.5	39.5	35	53

8.1.5 Screen shots from the noise model indicating the noise contours and the highest predicted broadband L_{Aeq} noise levels at the nearest noise sensitive receivers are shown in Appendix 3.

8.2 Noise Levels at On-site receptors

8.2.1 Breakthrough noise to waiting room below new roof

8.2.2 The waiting room directly below the rooftop plant area has a guidance internal ambient noise limit of 50 dB (HTM-08). To ensure that this limit is achieved, we recommend that the roof construction achieves a minimum weighted sound reduction of R_w 40 dB. A typical construction capable of achieving this would be, e.g. a single ply roof with a mineral tile ceiling.

8.2.3 Mechanical services plant items on the roof should incorporate suitable vibration isolation fixings from the manufacturer. General guidance for vibration isolation would comprise items such as:

- Flexible/resilient connections between plant items/ductwork and the building
- Vibration isolating mounts or other vibration isolating system
- No rigid connections / fixings between the plant items and the structure of the building

8.2.4 Noise at Facilities offices to north

8.2.5 The predicted plant noise level at the Facilities office 20 m to the north of the new roof is 45 dBA. Assuming 15 attenuation through an open window, this would result in an internal level in the office spaces of approximately 30 dBA, which is significantly below typical guidance limits for office, which are 45–50 dBA for open plan offices and 35–40 dBA for executive offices (BS 8233). The predicted external level of 45 dBA is also 7 dB below the existing background sound level measured at MPI during the daytime. On this basis, the impact from the new rooftop plant noise at the Facilities office to the north is predicted to be low.

8.3 BS 4142:2014+A1:2019 Assessment of Night Time Noise at Dwellings on Rochdale Old Road

8.3.1 A BS 4142 noise impact assessment has been undertaken in order to assess the potential noise impact at the most affected residential location and is detailed in this section of the report.

8.3.2 The following BS 4142 assessment has considered the night- time impact (23:00 – 07:00) as a worst-case. The 8-hour background sound level measured during the night time period at LT1 has been used as the basis for the assessment.

8.3.3 This is considered to be a worst-case approach as the influence from weather was negligible during this period of the survey, so background noise levels were at the lowest. Furthermore, this period was over the Easter weekend, when traffic levels are likely to be lower due to the bank holidays, again resulting in lower noise levels.

8.3.4 Based on the above assumptions, the BS 4142 assessment of noise impact at the most affected location from the proposed development site is shown in Table 5 below:

Table 5: BS 4142:2014 Noise Impact Assessment: Night -Time

Results		Relevant Clauses of BS 4142:2014	Commentary
Measured Ambient Noise Level	$L_{Aeq,8hours} = 58 \text{ dB}$	7.3.1	Measured over 16-hour period at the site
Background Sound Level	$L_{A90,8hours} = 35 \text{ dB}$	8.1.2 8.3	Determined from measurements made during the 8-hour daytime period

Results		Relevant Clauses of BS 4142:2014	Commentary
Assessment made during the day-time, so the reference interval is 60 min		7.2	
Predicted Sound Level	$L_{Aeq,15mins} = 11 \text{ dB}$		Using CadnaA modelling
Acoustic feature correction	+0 dB	9.2	No acoustic character expected
Rating Level	$(11 + 0) \text{ dB} = 11 \text{ dB}$		
Excess of Rating Level over Background Sound Level	$(11 - 35) \text{ dB} = -24 \text{ dB}$		i.e. Cumulative plant noise lower than background noise
Assessment indicates likelihood of significant adverse impact		11	Initial estimate only
Context		11 8.5	-
Uncertainty of the assessment		10	There is some uncertainty in noise levels at the receptor position, however the predicted level is significantly below the background level and the risk remains 'low'.

8.3.5 It can be seen from the above table that the initial estimate of noise impact of the proposed extension to Fairfield General Hospital's A&E department, based on the BS 4142 methodology, indicates plant noise levels below the existing representative background sound levels.

8.3.6 This is compliant with the requirements of Bury Council, and therefore no acoustic mitigation is required.

9 Conclusions

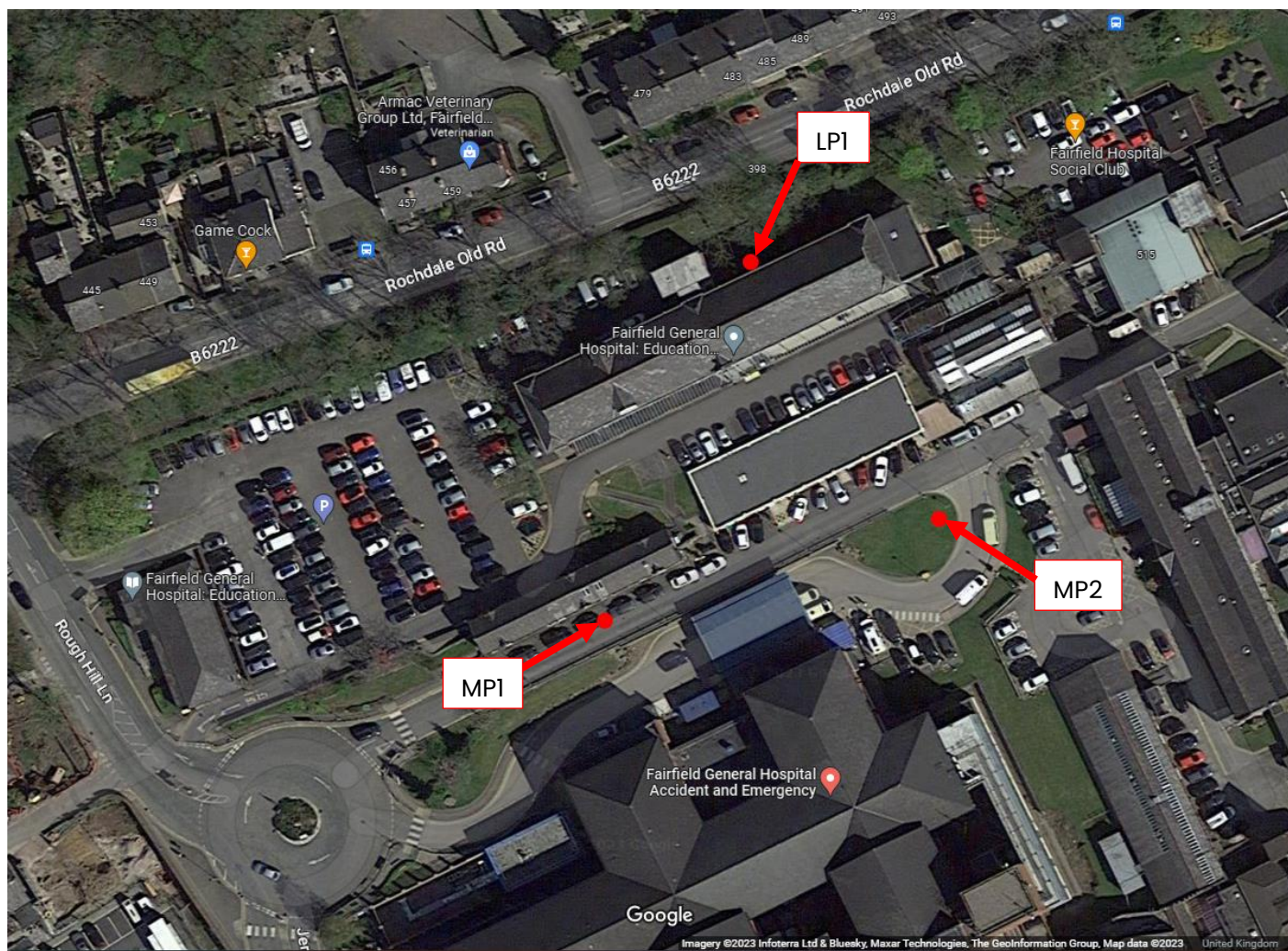
9.1 A noise assessment was undertaken to predict the impact of extending the existing A&E department at Fairfield General Hospital. A noise survey over a number of days determined the existing representative day- and night-time sound levels, against which plant noise was assessed.

9.2 It has been found that without mitigation, the noise emissions from the proposed new plant items would be expected to comply with the requirements of Bury Council i.e. below background sound levels at all noise sensitive receptors.

APPENDICES

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Appendix 1: Measurement Positions



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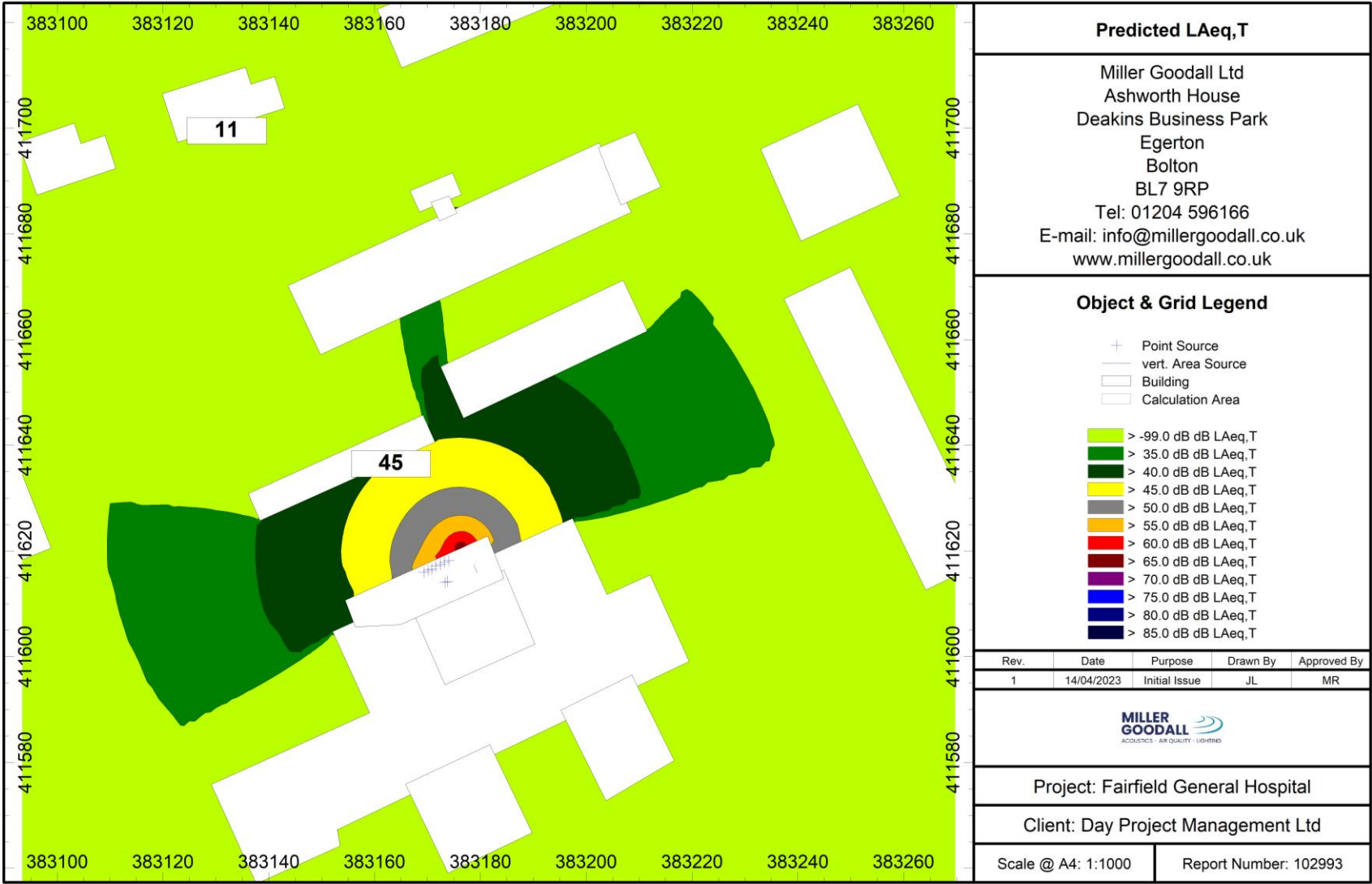
Appendix 2: Measurement Data – 15 min periods

Start Time	Elapsed Time (hh:mm:ss)	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{AFmin} (dB)	L_{A1} (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{A99} (dB)
07/04/2023 07:00	00:15:00	62.8	75.4	41.6	70.7	67.3	46.1	43.0
07/04/2023 07:15	00:15:00	63.0	77.3	42.7	70.4	67.0	47.1	44.0
07/04/2023 07:30	00:15:00	61.8	77.6	40.7	69.6	66.4	45.4	42.8
07/04/2023 07:45	00:15:00	62.5	75.0	42.8	70.8	66.3	47.4	43.8
07/04/2023 08:00	00:15:00	62.3	74.9	40.4	69.7	66.5	45.5	42.4
07/04/2023 08:15	00:15:00	61.6	79.0	38.2	70.0	66.4	44.8	41.3
07/04/2023 08:30	00:15:00	62.3	74.2	38.6	69.8	66.5	44.3	40.3
07/04/2023 08:45	00:15:00	68.5	94.5	39.7	78.7	67.4	44.3	41.1
07/04/2023 09:00	00:15:00	63.0	76.0	40.7	71.2	66.9	45.2	42.2
07/04/2023 09:15	00:15:00	66.4	90.6	40.9	76.0	67.0	47.2	42.1
07/04/2023 09:30	00:15:00	63.5	73.7	37.8	69.8	67.1	46.1	40.9
07/04/2023 09:45	00:15:00	64.8	85.3	38.1	73.9	67.4	45.6	39.9
07/04/2023 10:00	00:15:00	62.7	73.3	39.4	69.3	66.3	48.8	42.3
07/04/2023 10:15	00:15:00	63.2	80.6	40.6	69.5	66.5	48.8	42.9
07/04/2023 10:30	00:15:00	64.4	82.6	40.5	72.7	67.1	50.8	44.1
07/04/2023 10:45	00:15:00	64.4	78.0	37.8	73.9	67.5	46.6	39.8
07/04/2023 11:00	00:15:00	64.4	82.1	42.8	72.1	67.2	50.9	44.2
07/04/2023 11:15	00:15:00	63.1	73.4	39.8	69.3	66.4	50.7	44.2
07/04/2023 11:30	00:15:00	64.0	75.8	40.8	71.9	67.2	49.2	43.2
07/04/2023 11:45	00:15:00	63.8	79.2	39.0	69.6	67.2	48.3	41.0
07/04/2023 12:00	00:15:00	63.8	78.8	41.4	71.4	66.9	48.5	43.3
07/04/2023 12:15	00:15:00	65.3	86.8	39.1	70.4	66.9	51.4	42.3
07/04/2023 12:30	00:15:00	62.9	76.9	38.9	69.7	66.4	48.4	41.1
07/04/2023 12:45	00:15:00	64.3	83.8	39.1	72.0	66.6	49.8	43.3
07/04/2023 13:00	00:15:00	63.0	70.2	38.1	68.6	66.4	49.1	41.3
07/04/2023 13:15	00:15:00	63.6	77.1	40.7	70.4	66.8	50.0	43.7
07/04/2023 13:30	00:15:00	65.1	91.3	41.1	73.4	66.3	50.4	43.5
07/04/2023 13:45	00:15:00	63.0	70.6	40.0	68.4	66.5	48.3	41.8
07/04/2023 14:00	00:15:00	63.4	76.9	41.0	71.7	66.4	49.5	42.4
07/04/2023 14:15	00:15:00	63.1	71.6	39.7	68.9	66.3	50.5	42.1
07/04/2023 14:30	00:15:00	62.5	72.6	38.6	69.1	65.9	47.4	41.1

07/04/2023 14:45	00:15:00	73.7	102.2	40.8	81.9	67.2	51.0	42.6
07/04/2023 15:00	00:15:00	63.3	72.5	39.3	69.9	66.5	52.7	45.1
07/04/2023 15:15	00:15:00	63.1	77.7	40.2	69.4	66.3	48.2	41.6
07/04/2023 15:30	00:15:00	63.5	77.6	40.9	70.0	66.8	48.7	42.1
07/04/2023 15:45	00:15:00	62.7	80.3	40.1	68.4	66.3	48.4	41.8
07/04/2023 16:00	00:15:00	63.8	77.2	37.9	70.0	66.7	52.1	41.3
07/04/2023 16:15	00:15:00	62.6	79.7	37.3	69.0	66.4	48.4	39.7
07/04/2023 16:30	00:15:00	63.5	74.6	36.6	69.9	66.9	49.0	39.0
07/04/2023 16:45	00:15:00	63.0	82.0	39.3	68.9	66.1	47.4	41.9
07/04/2023 17:00	00:15:00	62.7	72.5	39.6	69.3	66.3	47.5	40.8
07/04/2023 17:15	00:15:00	62.2	69.4	37.7	68.2	66.0	48.3	40.2
07/04/2023 17:30	00:15:00	62.8	76.4	35.6	71.0	66.4	42.7	37.0
07/04/2023 17:45	00:15:00	62.9	77.4	37.7	69.7	66.3	48.7	40.1
07/04/2023 18:00	00:15:00	61.8	73.5	37.6	68.5	65.6	44.7	39.5
07/04/2023 18:15	00:15:00	63.3	83.5	43.3	69.8	66.3	49.9	44.6
07/04/2023 18:30	00:15:00	62.9	75.7	41.7	70.4	66.7	47.7	43.0
07/04/2023 18:45	00:15:00	78.1	108.2	42.1	77.6	66.3	47.1	43.7
07/04/2023 19:00	00:15:00	62.2	70.4	42.1	68.7	66.3	47.4	43.3
07/04/2023 19:15	00:15:00	62.9	83.9	42.7	69.7	65.8	50.4	45.2
07/04/2023 19:30	00:15:00	62.3	71.2	41.8	69.2	66.7	46.9	43.6
07/04/2023 19:45	00:15:00	62.9	81.7	40.3	69.6	66.6	47.9	42.8
07/04/2023 20:00	00:15:00	59.1	69.2	39.9	67.0	63.9	43.8	41.1
07/04/2023 20:15	00:15:00	60.8	74.1	40.9	67.9	65.1	46.5	42.7
07/04/2023 20:30	00:15:00	60.3	71.1	40.7	67.6	64.5	45.0	42.0
07/04/2023 20:45	00:15:00	60.5	73.8	41.1	68.5	64.6	45.7	42.4
07/04/2023 21:00	00:15:00	60.5	74.3	39.0	69.1	65.1	42.9	40.2
07/04/2023 21:15	00:15:00	60.8	72.9	35.4	68.5	65.4	42.4	37.6
07/04/2023 21:30	00:15:00	59.5	70.5	34.2	68.2	64.5	40.0	36.8
07/04/2023 21:45	00:15:00	60.4	70.5	37.4	68.1	64.9	42.7	39.3
07/04/2023 22:00	00:15:00	60.2	70.6	38.2	68.7	64.9	41.8	39.6
07/04/2023 22:15	00:15:00	61.4	81.1	34.1	69.8	65.3	42.4	36.7
07/04/2023 22:30	00:15:00	59.6	71.6	35.7	68.4	64.8	40.3	37.6
07/04/2023 22:45	00:15:00	60.0	72.5	36.0	68.6	64.8	40.8	37.4
07/04/2023 23:00	00:15:00	59.7	75.1	35.3	68.5	65.2	39.5	36.3
07/04/2023 23:15	00:15:00	59.6	70.8	35.9	68.4	64.5	40.4	37.3
07/04/2023 23:30	00:15:00	59.3	74.8	36.1	68.7	64.4	38.8	37.3
07/04/2023 23:45	00:15:00	59.2	73.5	35.9	69.1	64.1	40.0	36.9

08/04/2023 00:00	00:15:00	58.4	72.3	35.7	68.5	63.6	38.9	36.9
08/04/2023 00:15	00:15:00	57.4	73.4	36.7	67.4	63.0	40.3	37.9
08/04/2023 00:30	00:15:00	56.2	76.2	39.9	67.0	59.7	41.0	40.3
08/04/2023 00:45	00:15:00	65.6	91.1	39.5	76.8	63.5	41.2	40.2
08/04/2023 01:00	00:15:00	56.6	71.1	34.4	67.5	62.1	40.2	36.9
08/04/2023 01:15	00:15:00	55.2	72.2	32.6	67.8	59.2	34.3	33.2
08/04/2023 01:30	00:15:00	56.2	71.6	31.7	68.2	61.1	33.8	32.5
08/04/2023 01:45	00:15:00	54.0	70.1	30.5	66.9	57.3	32.8	31.4
08/04/2023 02:00	00:15:00	55.1	71.5	31.4	67.6	59.4	33.1	32.0
08/04/2023 02:15	00:15:00	56.9	76.1	31.8	70.1	58.6	33.4	32.3
08/04/2023 02:30	00:15:00	59.0	87.8	30.6	66.5	57.4	32.5	31.3
08/04/2023 02:45	00:15:00	54.4	70.7	31.1	67.1	57.6	33.2	32.0
08/04/2023 03:00	00:15:00	55.3	70.8	31.5	67.6	60.0	33.9	32.2
08/04/2023 03:15	00:15:00	55.0	70.9	31.9	66.9	59.6	33.5	32.5
08/04/2023 03:30	00:15:00	52.6	74.5	31.2	65.4	53.1	32.9	32.0
08/04/2023 03:45	00:15:00	54.2	70.3	31.5	66.4	58.8	34.3	32.5
08/04/2023 04:00	00:15:00	54.8	72.5	32.6	67.4	59.2	34.9	33.9
08/04/2023 04:15	00:15:00	53.0	73.8	31.7	66.2	46.8	33.1	32.4
08/04/2023 04:30	00:15:00	53.3	71.3	32.2	67.0	53.5	34.4	33.0
08/04/2023 04:45	00:15:00	55.4	72.0	32.8	68.3	57.7	36.0	34.0
08/04/2023 05:00	00:15:00	51.2	67.5	32.9	63.8	52.5	35.5	33.8
08/04/2023 05:15	00:15:00	56.4	71.3	34.0	68.4	60.6	37.8	35.1
08/04/2023 05:30	00:15:00	57.4	70.6	37.4	67.8	61.9	44.9	40.7
08/04/2023 05:45	00:15:00	56.4	69.5	35.9	66.9	61.2	41.1	37.5
08/04/2023 06:00	00:15:00	57.1	74.7	36.2	68.1	60.9	41.3	38.3
08/04/2023 06:15	00:15:00	58.7	75.7	37.8	69.5	63.4	42.1	39.4
08/04/2023 06:30	00:15:00	59.8	72.6	39.0	69.0	65.0	43.0	40.2
08/04/2023 06:45	00:15:00	60.2	72.2	38.6	69.5	65.5	43.2	40.5

Appendix 3: Predicted plant noise levels



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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 controlled 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_{Amax} The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

$L_{A10(18\text{ hour})}$ Often referred to as the UK road traffic noise index, this is the arithmetic average of the values of L_{A10} hourly for each of the 18 one hour periods between 06:00 and 00:00.

L_{day} The A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the daytime periods (07:00 – 19:00) of a year. Referenced in the Environmental Noise Directive 2002/49/EC.

- L_{evening}** The A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the evening periods (19:00 – 23:00) of a year. Referenced in the Environmental Noise Directive 2002/49/EC.
- L_{night}** The A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night-time periods (23:00 – 07:00) of a year. Referenced in the Environmental Noise Directive 2002/49/EC.
- L_{den}** The equivalent continuous sound pressure level of a notionally steady sound having the same energy as a fluctuating sound over a 24 hour period equivalent to 00:00 to 24:00 but with weightings of 5 dB and 10 dB applied to evening and night-time periods respectively to reflect the greater noise sensitivity of the population at those times. L_{den} is derived using the L_{day} , L_{evening} and L_{night} noise indices and is referenced in the Environmental Noise Directive 2002/49/EC.
- NOEL** No observed effect level: the level of noise exposure below which no effect at all on health or quality of life can be detected.
- LOAEL** Lowest observed adverse effect level: the level of noise exposure above which adverse effects on health or quality of life can be detected.
- SOAEL** Significant observed adverse effect level: the level of noise exposure above which significant adverse effects on health or quality of life can be detected.
- R_w** Single number rating used to describe the sound insulation of building elements and is defined in BS EN ISO 10140-2: 2010 (formerly BSEN ISO 140-3:1995). It is derived by measurement under laboratory conditions and does not take into account the effects of flanking transmissions.
- $D_{\text{nt,w}}$** The weighted standardized level difference is a single figure rating used to describe the sound insulation of a construction separating two rooms, for example a wall or floor, and is defined in BS EN ISO 16283-1:2014 (formerly BSEN ISO 140-4:1998). It is derived by measurement of an in-situ construction and therefore takes into account the effects of flanking transmissions, workmanship etc.
- $D_{\text{ne,w}}$** The weighted element-normalized level difference is a single figure rating used to describe the sound insulation of small elements within a larger construction and is

defined in BS EN ISO 10140-2:2010 (BSEN ISO 140-10:1991). It is most often used to rate the sound insulation performance of ventilator units e.g. trickle vents.

C_{tr} A single-number spectrum adaptation term used to characterise the sound insulation rating with respect to urban traffic. It is defined in ISO 717-1:2013.

NR curves Noise Rating – or NR – curves were developed by the International Organization for Standardization (ISO) to determine the acceptable indoor acoustic environment for hearing preservation, speech communication and annoyance. They are most often used to quantify noise within a building from mechanical and electrical (M&E) systems.

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