DRAGONFLY

CONSULTING

Crowther Bruce & Co Ltd

New Mills, Marsden

Noise Impact Assessment

DC4936-NR1

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Report Version Issue Log

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This report has been prepared by Dragonfly Consulting with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client.

Dragonfly Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Limitations to this Report

This report entails a physical investigation of the site with a sufficient number of sample measurements to provide quantitative information concerning the type and degree of noise affecting the site. The objectives of the investigation have been limited to establishing sources of noise material to carrying out an appropriate assessment.

The number and duration of noise measurements have been chosen to give reasonably representative information on the environment within the agreed time, and the locations of measurements have been restricted to the areas unoccupied by building(s) that are easily accessible without undue risk to our staff.

As with any sampling, the number of sampling points and the methods of sampling and testing cannot preclude the existence of “hotspots” where noise levels may be significantly higher than those actually measured due to previously unknown or unrecognised noise emitters. Furthermore, noise sources may be intermittent or fluctuate in intensity and consequently may not be present or may not be present in full intensity for some or all of the survey duration.

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1.0 INTRODUCTION

KPP Architects, on behalf of Crowther Bruce & Co Ltd, has appointed Dragonfly Consulting to carry out a Noise Impact Assessment for a proposed mixed-use development, including both residential and commercial use at New Mills, Marsden.

The noise assessment has been conducted with reference to the National Planning Policy Framework, the (NPPF) and *Noise Policy Statement for England* (NPSE) and to appropriate British Standards, recognised guidance and reference documents relevant to this site.

A glossary of technical terminology is included in Appendix A to support this document.

1.1 Site Conditions

1.1.1 Existing Site Conditions

The proposed development site is a former mill which comprised of multiple buildings, situated between Warehouse Hill Road and Brougham Road in Marsden. The site is surrounded by residential dwellings located in all directions.

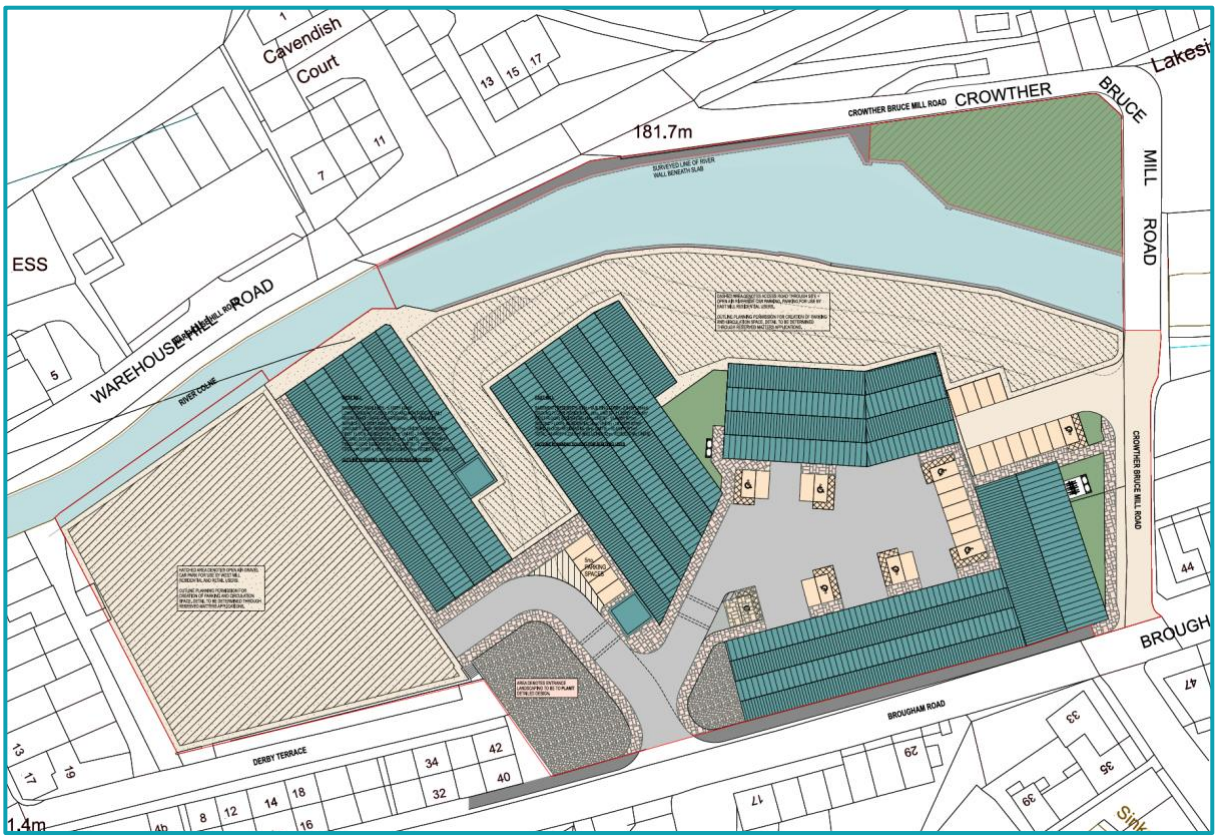
1.1.2 Proposed Site Conditions

It is proposed to demolish large portions of the existing structures on site and construct a mixed-use development at the site location. The proposals include large commercial units to the east (building ref: A, B & C), and mixed-use retail and residential use to the west (East and West Mill). Vehicle parking will be available for all commercial, retail and residential use on site, including a large open air gravel car park designated for the West Mill retail and residential use.

At this stage, and for the purposes of this assessment, it is understood that the newly proposed onsite commercial use and site servicing operations (i.e deliveries in and out) will operate 24 hours a day.

The proposed site layout of the development site, prepared by KPP Architects (ref: 2029-02) is shown in Figure 1.1 overleaf.

Figure 1.1
Proposed Site Layout



1.1.3 Noise Sensitive Receptor (NSR) Locations

Noise contributions have been considered at the following existing noise sensitive receptors (NSRs) based on their proximity to the site:

Table 1.1
Noise Sensitive Receptor (NSR) Locations

Reference	Address	Cardinal/Ordinal Direction	Description
NSR1	Residential dwellings along Peel Street, Marsden, Huddersfield HD7 6BR.	West.	2-storey residential dwellings.
NSR2	Residential dwellings along Brougham Road, Marsden, Huddersfield HD7 6BN.	South.	2-storey residential dwellings.
NSR3	Residential dwellings along Warehouse Hill Road, Marsden, Huddersfield HD7 6AB.	North.	2-storey residential dwellings.
NSR4	Residential dwellings along Brougham Road, Marsden, Huddersfield HD7 6BJ.	East.	2-storey residential dwellings.

Where applicable, the assessment has been undertaken based on predicted noise contributions at both ground floor (1.5 m), and first floor (4.0 m) windows.

NSR locations are shown in Appendix C.

2.0 GUIDANCE

2.1 National Guidance

2.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development. It requires Local Plans to be consistent with the principles and policies set out in the NPPF with the objective of contributing to the achievement of sustainable development.

The NPPF states that the planning system has three overarching objectives in achieving sustainable development including a requirement to 'contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'

Paragraph 187 of the NPPF states:

"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."

Additionally, Paragraph 198 of the NPPF states:

"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…"

2.1.2 Noise Policy Statement for England

The 'Noise Policy Statement for England' sets out the following vision for ongoing noise policy:

"Promote good health and a quality of life through the effective management of noise within the context of Government policy on sustainable development."

This vision should be achieved through the following Noise Policy Aims:

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

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

To achieve this vision, the Noise Policy Statement sets 3 noise levels to be defined by the assessor:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms: below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The Noise Policy Statement considers that noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed noise levels fall between the LOAEL and the SOAEL noise levels, the Policy Statement requires that:

"…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… This does not mean that such adverse effects cannot occur."

Where noise levels are below the LOAEL, it is considered there will be no adverse effect. Once noise levels are below the NOEL, there will be no observable change.

2.2 Local Policy

2.2.1 Kirklees Local Plan Strategy and Policy

Kirklees Local Plan Strategy and Policy (Adopted 27 February 2019) sets out policy and expectations for newly proposed developments; the following polices detail good design guidance and noise pollution expectations:

"Policy LP24 Design

Good design should be at the core of all proposals in the district and should be considered at the outset of the development process, ensuring that design forms part of pre-application consultation of a proposal. Development briefs, design codes and masterplans should be used to secure high quality, green, accessible, inclusive and safe design, where applicable. Where appropriate and in agreement with the developer schemes will be submitted for design review."

"Policy LP52 Protection and improvement of environmental quality

Proposals which have the potential to increase pollution from noise, vibration, light, dust, odour, shadow flicker, chemicals and other forms of pollution or to increase pollution to soil or where environmentally sensitive development would be subject to significant levels of pollution, must be accompanied by evidence to show that the impacts have been evaluated and measures have been incorporated to prevent or reduce the pollution, so as to ensure it does not reduce the quality of life and well-being of people to an unacceptable level or have unacceptable impacts on the environment. Such developments which cannot incorporate suitable and sustainable mitigation measures which reduce pollution levels to an acceptable level to protect the quality of life and well-being of people or protect the environment will not be permitted. Where possible, all new development should improve the existing environment."

2.3 Best Practice and Other Relevant Guidance

2.3.1 British Standard (BS) 7445-1:2003 – Description and Measurement of Environmental Noise – Part 1: Guide to Quantities and Procedures

This document defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

The methods and procedures described in this British Standard are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise at a site. This British Standard does not specify limits for environmental noise.

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

BS 4142:2014+A1:2019 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

2.3.3 BS 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

BS 8233:2014 provides a methodology to calculate the noise levels entering a building through facades and façade elements and provides details of appropriate measures for sound insulation between dwellings. It includes recommended internal noise levels which are provided for a variety of situations.

2.3.4 ISO 9613 Attenuation of Sound during Propagation Outdoors

IS0 9613 presents a calculation methodology for the determination of the attenuation of sound outdoors. The methodology enables the prediction the levels of environmental noise at a distance from a variety of sources.

2.3.5 Bayerisches landesamt für Umwelt (BayLfU) 2007 Parking Area Noise. Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar Centers and Bus Stations as well as of Multi-Story Car Parks and Underground Car Parks (Bayerisches Landesamt für Umwelt) ISBN: 3-936385-26-2

BayLfU presents the recommended calculation method for determining noise emissions from parking areas serving a variety of uses. It provides details of the input quantities and the relevant calculation methodologies. Application of this standard is considered appropriate in lieu of there being a recognised and reliable British standard.

3.0 ASSESSMENT METHODOLOGY

3.1 Assessed Sources of Environmental Noise

With reference to the guidance detailed within Section 2.0, Table 3.1 presents the specific methodology adopted for the assessment of noise arising from the development proposals.

Table 3.1
Assessed Sources of Environmental Noise

Potential Noise Source	Relevant Assessment Methodology
Commercial / Industrial Noise Sources including Fixed Plant and Delivery Events	BS 4142:2014+A1:2019
Car Parking	BS 8233:2014
Proposed Residential Dwellings	BS 8233:2014

3.2 Selection of Assessment Criteria

The following criteria have been selected to determine the threshold of effect levels in the context of the National Planning Policy Framework and Noise Policy Statement for England.

Table 3.2
Assessment Criteria: BS 4142:2014+A1:2019

Effect Level	Criteria	Justification
Lowest Observed Adverse Effect Level (LOAEL)	Free-field external noise levels at adjacent sensitive receptor locations within +5 dB of representative background noise level.	Noise levels + 5 dB above background are considered an indication of where adverse noise impacts may occur in the context of BS 4142. Noise levels below this level are an indication that it is less likely that the specific sound source will have an adverse impact.
Significant Observed Adverse Effect Level (SOAEL)	Free-field external noise levels at receptor above +10 dB of representative background noise level.	None – Planning guidance requires that impacts must be reduced below the SOAEL through mitigation, with adverse impacts above the Lowest Observable Adverse Impact Level (LOAEL) but below the SOAEL being mitigated as far as is reasonable.

Table 3.3
Assessment Criteria: BS 8233:2014

Effect Level	Criteria	Justification
Lowest Observed Adverse Effect Level (LOAEL)	Internal Noise Levels at adjacent sensitive receptor locations below 35 dB $L_{Aeq,\ 16hr}$ / 30 dB $L_{Aeq,\ 8hr}$ / 45 dB L_{AfMax}.	Noise Levels within BS 8233:2014 target criteria.
Significant Observed Adverse Effect Level (SOAEL)	Internal Noise Levels at adjacent sensitive receptor locations exceed 40 dB $L_{Aeq,\ 16hr}$ / 35 dB $L_{Aeq,\ 8hr}$ / 50 dB L_{AfMax}.	None – Planning guidance requires that impacts must be reduced below the SOAEL through mitigation, with adverse impacts above the Lowest Observable Adverse Impact Level (LOAEL) but below the SOAEL being mitigated as far as is reasonable.

4.0 ENVIRONMENTAL NOISE SURVEY

4.1 Survey Methodology

Daytime and night-time measurements were undertaken at four (4no.) measurement locations from 9th to 14th April 2025. The noise measurements established typical external ambient and background noise levels at the site. The measurement locations are hereby referred to in this report as follows:

- 'Location 1' – sound level meter positioned approximately 1.0m from a second storey window ground at the west of the site;
- 'Location 2' – sound level meter positioned approximately 3.0m from the ground to the south of the site adjacent to Brougham Road;
- 'Location 3' – sound level meter positioned approximately 2.5m from the ground to the north of the site adjacent to Warehouse Hill Road; and
- 'Location 4' – sound level meter position approximately 1.5m from the ground to the east of the site adjacent to Mill Road.

The equipment used during the survey is detailed in Appendix B. The sound level meters were calibrated before and after the measurements and no significant calibration drifts were found to have occurred (>0.2dB). The noise monitoring equipment had been calibrated to a traceable standard within the twenty-four months preceding the survey. Calibration certificates are available on request.

The measurement locations are shown in Appendix C.

4.2 Survey Results

All monitored noise data has been screened to remove samples influenced by adverse weather conditions, including periods of rainfall and high wind speeds (>5m/s), which has been obtained from a nearby weather monitoring station on the Met Office Weather Observations Website (WOW) database.

Table 4.1 summarises the periods excluded from the analysis due to adverse weather and construction activities. All other periods were considered suitable for noise monitoring.

Table 4.1
Excluded Monitoring Periods

Date	Time Periods Removed
10/04/2025	2100h-2130h
11/04/2025	0000h-0300h
	0545h-0645h
12/04/2025	0115h-0200h
	1000h-1030h
	1300h-1345h
13/04/2025	0630h-0930h
	1045h-1145h
	1330h-1400h
14/04/2025	0530h-1400h

Summaries of the measured noise levels are given in Table 4.2. Location 1 has been corrected from façade conditions to free field. Full noise measurement survey data available upon request.

Table 4.2
Summary of Measured Noise Levels – 09/04/25 to 14/09/25 – Free Field, dB

Measurement Position	Date	Period	Time (h)	$L_{Aeq, T}$	L_{A10}	L_{A90}	L_{AFMax}
1	09/04/25	Daytime	1300h-2300h	44.5	41.6	32.5	75.0
	09/04/25-10/04/25	Night-time	2300h-0700h	44.5	36.2	30.4	71.1
	10/04/25	Daytime	0700h-2300h	47.9	47.3	39.3	93.2
	10/04/25-11/04/25	Night-time	2300h-0700h	42.0	40.4	34.1	68.1
	11/04/25	Daytime	0700h-2300h	44.4	44.9	37.8	72.1
	11/04/25-12/04/25	Night-time	2300h-0700h	38.9	38.1	32.5	69.9
	12/04/25	Daytime	0700h-2300h	43.6	44.5	37.2	74.4
	12/04/25-13/04/25	Night-time	2300h-0700h	39.1	39.6	34.4	69.7
	13/04/25	Daytime	0700h-1130h	43.4	44.4	38.4	70.4
	13/04/25-14/04/25	Night-time	2300h-0700h	37.2	38.0	34.4	66.1
2	09/04/25	Daytime	1300h-2300h	52.5	50.7	39.3	90.9
	09/04/25-10/04/25	Night-time	2300h-0700h	40.5	37.4	31.9	68.6
	10/04/25	Daytime	0700h-2300h	52.7	51.7	38.9	91.9
	10/04/25-11/04/25	Night-time	2300h-0700h	40.6	37.0	31.0	70.9
	11/04/25	Daytime	0700h-2300h	51.0	51.3	38.1	85.6
	11/04/25-12/04/25	Night-time	2300h-0700h	44.1	38.5	30.6	76.7
	12/04/25	Daytime	0700h-2300h	50.9	51.3	38.3	86.9
	12/04/25-13/04/25	Night-time	2300h-0700h	41.8	37.7	30.4	72.7
	13/04/25	Daytime	0700h-1130h	49.8	48.9	36.6	88.9
	13/04/25-14/04/25	Night-time	2300h-0700h	38.0	34.4	28.6	78.4
3	09/04/25	Daytime	1300h-2300h	50.1	50.9	41.7	86.6
	09/04/25-10/04/25	Night-time	2300h-0700h	48.2	44.5	40.8	72.1
	10/04/25	Daytime	0700h-2300h	52.4	52.8	43.6	82.6
	10/04/25-11/04/25	Night-time	2300h-0700h	45.9	44.9	41.2	69.0
	11/04/25	Daytime	0700h-2300h	50.9	51.2	43.0	86.5
	11/04/25-12/04/25	Night-time	2300h-0700h	50.4	46.2	41.1	78.8
	12/04/25	Daytime	0700h-2300h	48.7	50.7	42.5	81.3
	12/04/25-13/04/25	Night-time	2300h-0700h	46.9	44.5	40.9	72.4
	13/04/25	Daytime	0700h-1130h	48.6	49.9	42.5	80.2
	13/04/25-14/04/25	Night-time	2300h-0700h	42.9	42.6	40.5	74.1
4	09/04/25	Daytime	1300h-2300h	53.0	52.0	44.1	92.9
	09/04/25-10/04/25	Night-time	2300h-0700h	44.8	43.6	39.9	75.4
	10/04/25	Daytime	0700h-2300h	51.9	51.3	41.4	88.2
	10/04/25-11/04/25	Night-time	2300h-0700h	42.8	42.2	38.5	68.0
	11/04/25	Daytime	0700h-2300h	51.4	50.5	40.9	86.2
	11/04/25-12/04/25	Night-time	2300h-0700h	45.9	43.9	38.5	75.9
	12/04/25	Daytime	0700h-2300h	50.8	50.4	40.7	86.2
	12/04/25-13/04/25	Night-time	2300h-0700h	44.5	42.3	37.5	74.2
	13/04/25	Daytime	0700h-1130h	51.8	49.0	40.1	87.8
	13/04/25-14/04/25	Night-time	2300h-0700h	41.4	40.2	37.4	71.5

4.3 Observations and Comments

The noise environment at the measurement locations were dominated by contributions from the surrounding road traffic noise from Warehouse Hill Road, Mill Lane and Brougham Road.

For the assessment, it is considered that the levels measured are representative of the typical acoustic environment at the survey location.

4.4 BS 4142:2014+A1:2019 Background (L_{A90}) Statistical Analysis

In accordance with the methodology detailed in Section 8 of BS 4142:2014+A1:2019, representative background noise levels have been determined through statistical analysis of all 15-minute samples and are expressed as integers (with 0.5 dB being rounded up).

The results of the statistical analysis of measured background noise levels during the daytime and night-time reference periods are presented in Table 4.3, below, and in a graphical format in Figures 4.1 to 4.8. The records highlighted in teal denotes the representative background levels used within this assessment.

Table 4.3 below summarises the background noise levels utilised for the assessment:

Table 4.3
Background Noise Level Utilised at NSRs

NSR	Daytime (0700h-2300h), $L_{A90,15min}$	Night-time (2300h-0700h) $L_{A90,15min}$
1	38	34
2	39	29
3	43	41
4	41	37

Figure 4.1
'Location 1' – Daytime Background ($L_{A90,15min}$) Analysis (0700h-2300h)

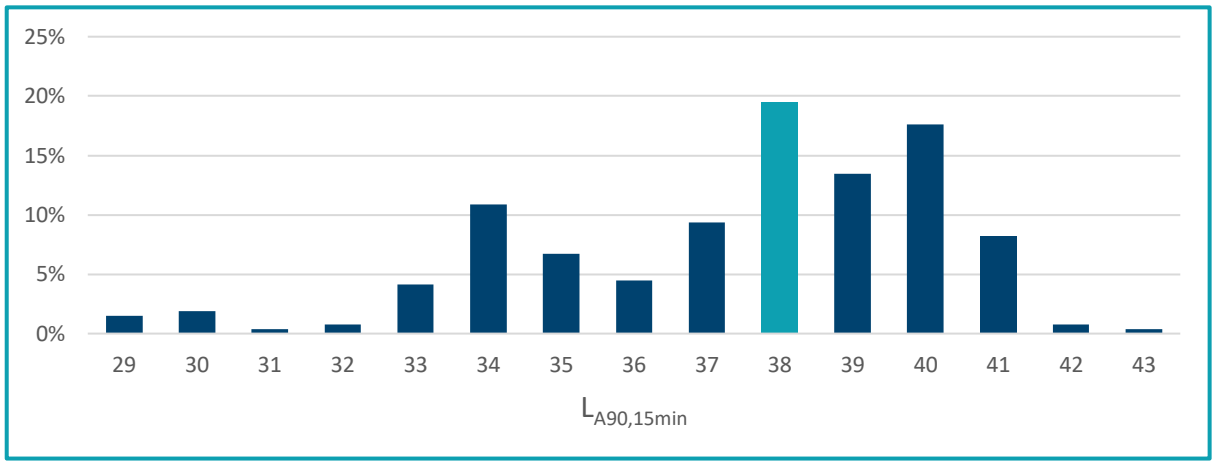


Figure 4.2
'Location 1' – Night-time Background ($L_{A90,15min}$) Analysis (2300h-0700h)

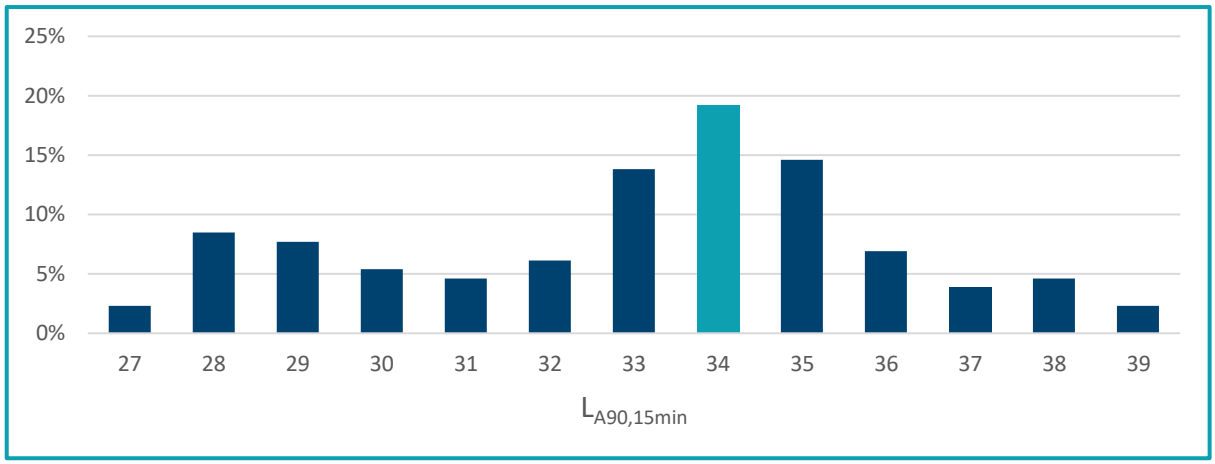


Figure 4.3
'Location 2' – Daytime Background ($L_{A90,15min}$) Analysis (0700h-2300h)

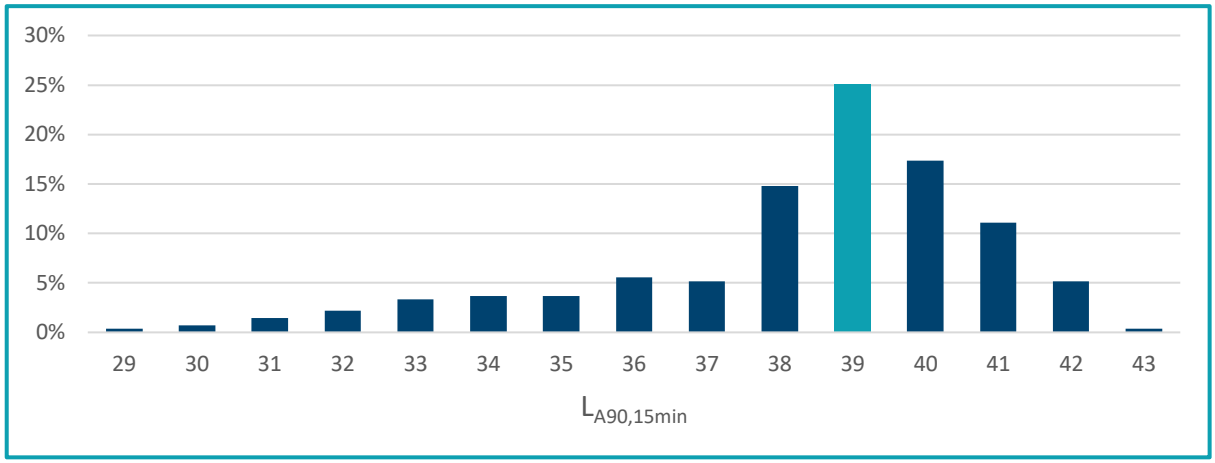


Figure 4.4
'Location 2' – Night-time Background ($L_{A90,15min}$) Analysis (2300h-0700h)

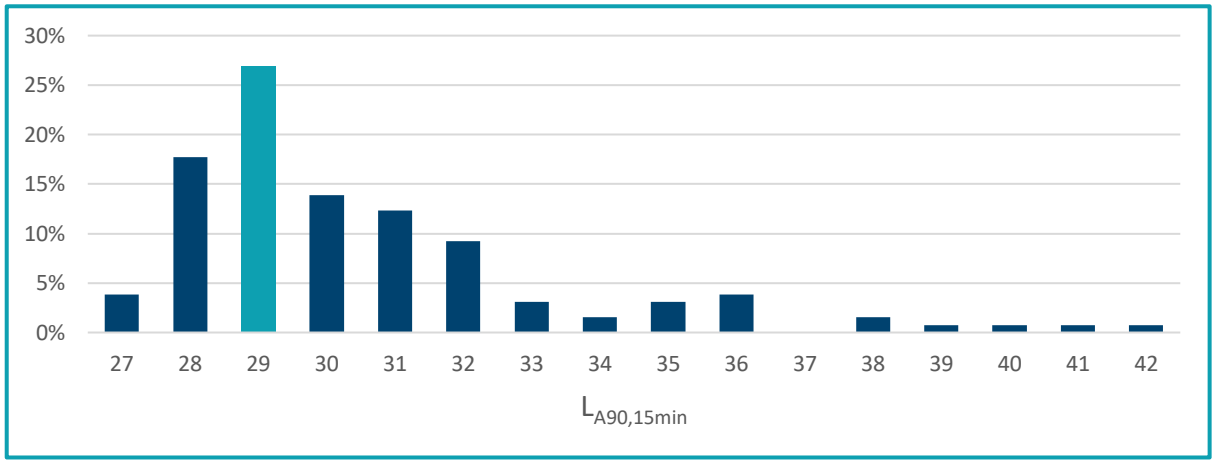


Figure 4.5
'Location 3' – Daytime Background ($L_{A90,15min}$) Analysis (0700h-2300h)

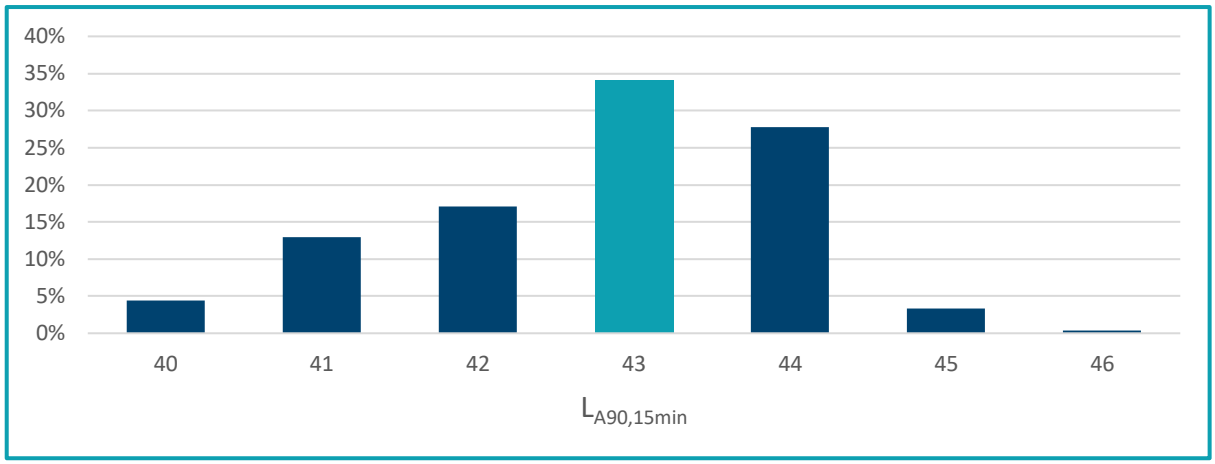


Figure 4.6
'Location 3' – Night-time Background ($L_{A90,15min}$) Analysis (2300h-0700h)

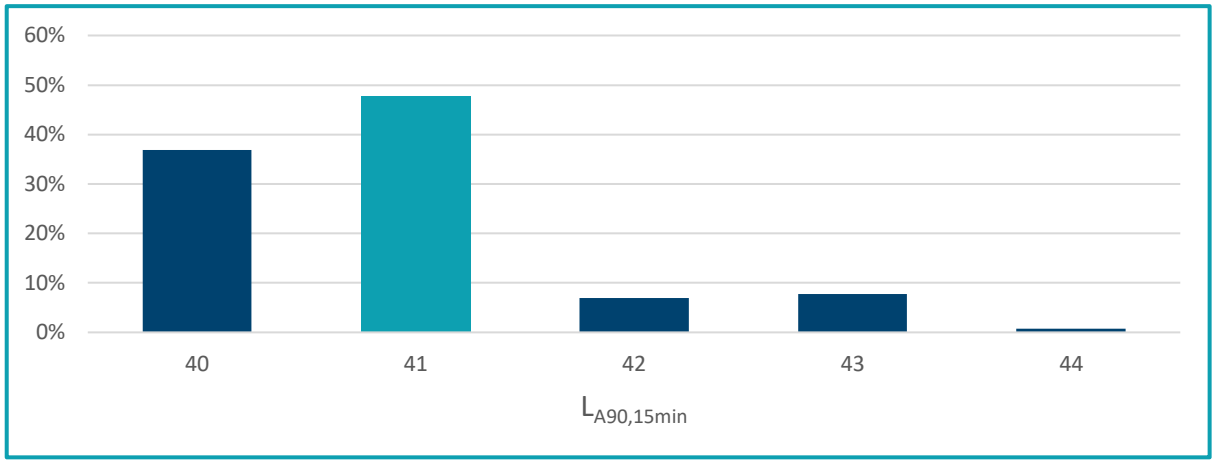


Figure 4.7
'Location 4' – Daytime Background ($L_{A90,15min}$) Analysis (0700h-2300h)

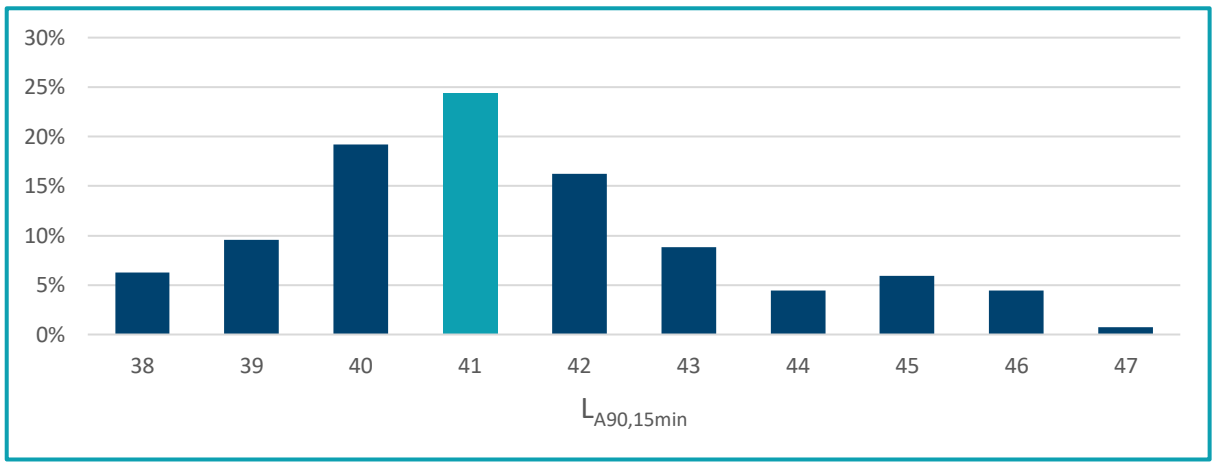
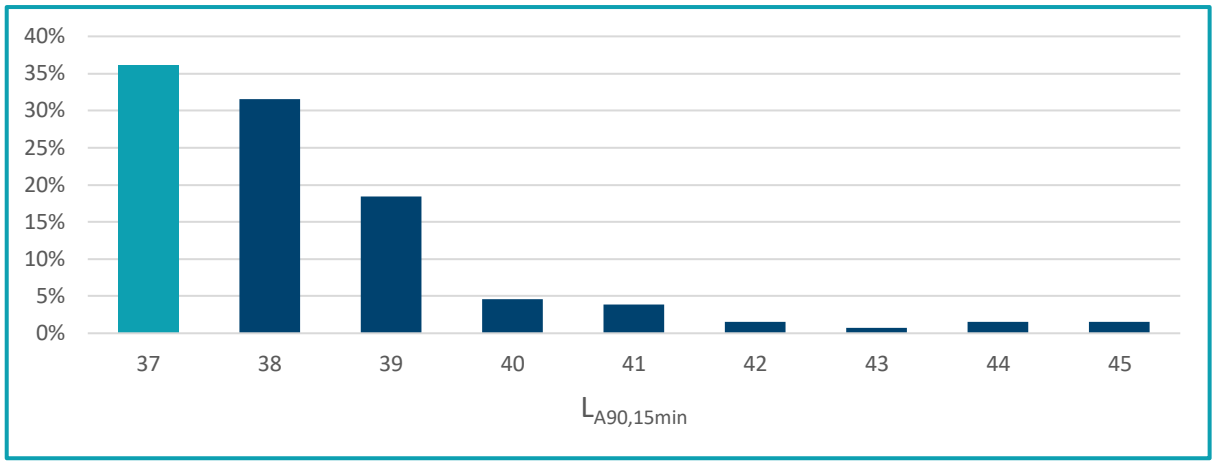


Figure 4.8
'Location 4' – Night-time Background ($L_{A90,15min}$) Analysis (2300h-0700h)



5.0 NOISE MODELLING METHODOLOGY

5.1 Data Sources

Modelling calculations have been undertaken based on the spatial settings and data sources identified in Table 5.1.

Table 5.1
Noise Model Input Data

Parameter	Scenario	Data Source	Assumptions
Site Plans	Existing	*OS Mastermap Data*	Existing building heights modelled as 8.5m AGL (typical 2-storey building height) unless otherwise stated through global mapping software.
	Proposed (Site Layout)	Proposed Regeneration New Mills, Marsden 2029-02	None.
Ground Heights	All	Environment Agency Open Data LiDAR Digital Terrain Model (2.0m resolution)	None.
Ground Absorption	All	*n/a*	Mixed ground conditions off site (G=0.5) / Hard reflective ground conditions on site (G=0.0).
Reflections	All	*n/a*	3rd order reflections have been accounted for within the noise model.

5.2 Source Noise Assumptions

5.2.1 Fixed Plant

At the current design stage, there is no fixed M&E strategy. However, for the purposes of presenting a robust assessment and to give an indication of the development's potential operational noise output, indicative plant limits have been determined for the development operating. Once details of the confirmed M&E strategy become available, further assessment should be undertaken to ensure plant noise contributions are adequately controlled.

As location plans for the fixed plant items associated with the development have not yet been finalised, the assessment considers the maximum allowable limit for one item of roof plant per proposed unit.

Assessed plant locations are presented in Figure 5.1 with indicative plant limits for the proposed commercial development presented in Table 5.2.

Figure 5.1
Indicative Fixed Plant Location

Table 5.2
Fixed Plant Noise Limits

Time Period	Operational Noise Output L_{WA}, dB
Daytime	72.3
Night-time	63.8

N.b. In accordance with ISO 9613-1, where spectral content of assessed noise sources is not available, such as indicative fixed plant limits, the attenuation terms for 500Hz are applied to determine noise contributions at adjacent sensitive receptor locations.

5.2.2 Servicing Arrangements (i.e. Deliveries in and out)

Given the inherent variability in noise output from site servicing operations, modelling has been undertaken based on knowledge of typical delivery operations from similar sites.

It has been assumed that all delivery operations will be undertaken externally to the amenity building with unloading undertaken via the use of a roll cage and tail lift, as is typical of developments of this nature.

Where available, current industry research has been utilised as the preferred source of data for the assessment. Although in some instances there is a lack of research available, and reliance has been placed on noise survey data from similar operations.

A Technical Note prepared by Via Solutions Ltd states that *"There are not expected to be HGV movements generated by the New Mills development due to the nature of the proposed land uses and unit sizes, but deliveries to the site will also be restricted in size and number by a site management plan".* As such, noise source data for LGV deliveries will be utilised.

A summary of all assessed noise sources associated with site servicing is presented in Table 5.3, overleaf. The Table also provides details of the associated data sources utilised to inform the assessment.

Table 5.3
Site Servicing Data Summary

Noise Source	Assessed Metric	Parameter	Data Source(s)
LGV Manoeuvre (Pass-by)	L_{Aeq}	Broadband Noise Output	Bayerisches landesamt für Umwelt – Parking Area Noise (BayLfU, 2007).
		Spectral Data	Dragonfly Report DC3417-R1v2 (Land South of High Street, Wootton PA/2021/610).
Vehicle Idling (Stand Noise)		Broadband Noise Output	Bayerisches landesamt für Umwelt – Parking Area Noise (BayLfU, 2007).
		Spectral Data	Dragonfly Delivery Noise Survey (Planning Application: Harrogate – 17/0045/FULM).
Vehicle Starting (Ignition Noise)		Broadband Noise Output	Bayerisches landesamt für Umwelt – Parking Area Noise (BayLfU, 2007).
		Spectral Data	Dragonfly Delivery Noise Survey (Planning Application: Harrogate – 17/0045/FULM).
Reverse Alarm	L_{Amax}	Broadband Noise Output	Manufacturer Data for Tonal Reverse Alarm (Lightbar Uk Limited Product ref – SKU AC.RA102S).
		Spectral Data	None – assumed tonal noise output at 1kHz as is typical with alarms of this nature.
(Un)loading Using Roll Cages	L_{Aeq}	Broadband Noise Output	Dragonfly Report DC3417-R1v2 (Land South of High Street, Wootton PA/2021/610).
		Spectral Data	
	L_{Amax}	Broadband Noise Output	Dragonfly Delivery Noise Survey (Planning Application: Harrogate – 17/0045/FULM).
		Spectral Data	

Source noise level data utilised in the assessment of ambient (L_{Aeq}) and maximum (L_{Amax}) noise contributions are presented in the Tables below. All data is presented as sound power levels with no 'on-time', speed or other corrections.

Table 5.4
Servicing Arrangements: Assessed Noise Source Sound Power Levels
(Ambient Noise Level L_{Aeq} Assessment)

Noise Source	Octave Band Sound Power Level (L_w), Hz (dB(Z))								Sum
	63	125	250	500	1000	2000	4000	8000	dB(A)
LGV Manoeuvre (Pass-by)	99.0	82.0	81.0	76.0	78.0	74.0	71.0	66.0	***82.4***
Vehicle Idling (Stand Noise)	97.7	92.8	95.0	92.7	91.9	85.9	78.5	68.9	***95.6***
(Un)loading Using Roll Cages	78.2	78.1	77.6	81.2	79.0	74.8	69.0	60.1	***83.1***

Table 5.5
Servicing Arrangements: Assessed Noise Source Sound Power Levels
(Maximum Noise Level L_{AfMax} Assessment)

Noise Source	Octave Band Sound Power Level (L_w), Hz (dB(Z))								Sum
	63	125	250	500	1000	2000	4000	8000	dB(A)
Starting (Ignition Noise)	105.6	100.7	102.9	100.6	99.8	93.8	86.4	76.8	***103.5***
Reverse Alarm	-	-	-	-	102.0	-	-	-	***102.0***
(Un)loading	108.4	110.0	116.7	115.7	110.0	107.5	102.9	98.7	***116.5***

Operational Assumptions – Site Servicing Arrangements

To provide an indication of the developments potential noise output, reasonable assumptions have been made around delivery events occurring during both daytime and night-time periods. This assumption also ensures that a reasonable worst-case approach has been followed when considering the sites potential for noise impacts.

Table 5.5 presents a summary of the operational assumptions accounted for within the noise model to determine ambient noise contributions at adjacent sensitive receptor locations. Assumptions are based around a typical delivery / collection taking 15 minutes to complete unless stated otherwise.

Table 5.6
Operational Assumptions (Per Assessed Delivery Event)

Noise Source	Source Type	Height Above Ground Level (AGL)	Operational Assumptions
LGV Manoeuvre (Pass-by)	Moving Point Source	1.0m	LGV travelling at 15km/h along access route. 2 complete manoeuvres per event (i.e.,1 in and 1 out daytime, 1 in or 1 out night-time).
Vehicle Idling (Stand Noise)	Point Source	1.0m	30sec total idling (30sec on arrival or 30sec pre-departure).
(Un)loading Using Roll Cage and Tail Lift		1.0m	(Un)loading operations take approximately 15mins to complete.

5.2.3 Car Parking

Operational Assumptions – Car Parking

Noise emissions from car parking events have been modelled in accordance with *'BayLfU Parking Area Noise'*. Table 5.7 provides a summary of parameter included within the BayLfU parking area sources.

For the commercial units, car parking turnover rates have been modelled at 2 per space per hour, reflecting typical shift change parking rates and representing a reasonable worst-case scenario. At this stage, details for the proposed car park to the west are not yet finalised, as such, indicative car parking assumptions have been utilised from BayLfU car parking inputs for retail and residential use and summarised below. Once details are finalised following reserved matters, further assessment should be undertaken.

Table 5.7
BayLfU Modelling Input Data: Car Parking Events

Parameter	Input
Commercial Units (Building ref: A, B & C)	
No. Parking Spaces	29
Events per space (1hr – Day)	2.0 (per space)
Events per space (1hr – Night)	2.0 (per space)
West Car Park (Indicative)	
Emissions Calculation	LfU-Study-2007
No. Parking Spaces	100
Events per space (1hr – Day)	0.64 (per space)
Events per space (1hr – Night)	0.2 (per space)

The noise model input data for the assessment of car parking maximum noise events is presented in Table 5.8 below.

Table 5.8
Car Parking: Assessed Noise Source Sound Power Levels
(Maximum Noise Level L_{Amax} Assessment)

Noise Source	Octave Band Sound Power Level (L_{WA}), Hz (dB(A))								Sum
	63	125	250	500	1000	2000	4000	8000	dB(A)
Car Parking L_{Amax} Event	101.2	95.1	95.6	93.5	96.1	92.3	88.4	85.8	***99.6***

5.3 Road Source Noise Validation

The existing ambient noise was calculated by utilising the measured noise data summarised in Section 4 as a validation point in the noise model. The noise output of the main noise-producing elements of the wider site, namely Warehouse Hill Road to the north, Mill Road to the east, Brougham Road to the south and Peel Street to the west, was subsequently calibrated to provide values representative of the measured levels at measurement Locations 1, 2, 3 & 4.

Table 5.9
Comparison of Measured and Modelled Data

Location	Assessment Metric	Period	Measured Level, dB $L_{Aeq,T}$	Modelled Level, dB $L_{Aeq,T}$	Difference, dB
Location 1	$L_{Aeq,16h}$	0700h-2300h	47.9	47.9	0.0
	$L_{Aeq,8h}$	2300h-0700h	44.5	44.5	0.0
	L_{Amax}		63.0	63.0	0.0
Location 2	$L_{Aeq,16h}$	0700h-2300h	52.7	52.7	0.0
	$L_{Aeq,8h}$	2300h-0700h	43.9	43.9	0.0
	L_{Amax}		64.3	64.3	0.0
Location 3	$L_{Aeq,16h}$	0700h-2300h	52.3	52.3	0.0
	$L_{Aeq,8h}$	2300h-0700h	50.2	50.2	0.0
	L_{Amax}		65.4	65.4	0.0
Location 4	$L_{Aeq,16h}$	0700h-2300h	51.9	51.9	0.0
	$L_{Aeq,8h}$	2300h-0700h	45.8	45.8	0.0
	L_{Amax}		63.6	63.6	0.0

There is no difference between the measured and modelled levels, dB, and therefore, the models are considered to be suitably verified.

5.4 Uncertainty

5.4.1 Survey

Given the duration of the survey and the use of the highest measured daytime and night-time noise levels to ascertain noise propagation across the site, it is considered that the limits of Class 1 sound level meters are the only limiting factor when considering survey uncertainty.

Standard equipment uncertainties have been considered by applying allowable tolerances minus the maximum allowable test laboratory uncertainties given in IEC 61672-1, as defined by Narang and Bell (*Narang, P. and Bell, T., 2008. New IEC standards and periodic testing of sound level meters. Proceedings of the Internoise, Shanghai, China, pp.26-29*).

The following table provides an overview of standard equipment uncertainties relevant to the SLM class utilised within the survey.

Table 5.10
Standard uncertainties using allowable tolerances minus test laboratory tolerances given in IEC 61672-1 (source: Narang and Bell, Table 14)

SLM Class	Frequency Weighting	Directional Response	Level Linearity	Toneburst Response	Calibrator (IEC 61672)	Supply Voltage	Combined Standard Uncertainty +/- dB
Class 1	0.5	0.5	0.4	0.25	0.125	0.05	0.9

5.4.2 Modelling

CadnaA noise modelling software has been utilised to ascertain how noise propagates throughout the proposed development. The software directly incorporates the ISO 9613 calculation procedure which has an uncertainty rating of +/- 3dB.

5.4.3 Design Calculations

Where design calculations have been utilised to determine the required performance of the glazing and ventilation strategy for the scheme, the method outlined within Annex G of BS 8233 (which is based on the BS EN 12354-3 calculation methodology) has been followed. The expected precision of this calculation methodology is quoted as +/- 2dB.

5.4.4 Combined Uncertainty

Based on the information provided above, the combined Root Sum Squared (RSS) uncertainty for the assessment has been calculated as +/- 3.9dB.

6.0 ASSESSMENT

6.1 Commercial Development

6.1.1 Fixed Plant Limits – Fixed Plant

As the operational noise characteristics of the plant are not yet known, to account for any potentially adverse acoustic characteristics, a correction of +4dB has been applied to determine the rating level ($L_{Ar'Tr}$) in accordance with BS 4142:2014+A1:2019. This is based on fixed plant potentially having clearly perceptible tonality which is often attributed to such noise sources.

The results of the assessment are shown in Table 6.1. In accordance with BS 4142:2014+A1:2019 Paragraph 8.6, the background levels are expressed as integers (with 0.5 dB being rounded up):

Table 6.1
BS 4142 Assessment of Fixed Plant Noise Impact Daytime / Night-time, $L_{Ar'Tr}$ dB

NSR	Existing Measured Background (L_{A90})		Predicted Rating Level ($L_{Ar'Tr}$)		Difference, dB	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
1	38	34	25.8	17.3	-12.2	-16.7
2	39	29	37.5	29.0	-1.5	0.0
3	43	41	34.1	25.6	-8.9	-15.4
4	41	37	41.0	32.5	0.0	-4.5

As shown in Table 6.1, providing the cumulative noise output of all external fixed plant is kept within the previously determined limits (presented in Table 5.2), noise contributions will be at most, parity with background noise levels during both the daytime and night-time reference periods, inclusive of a +4dB character correction for uncertainty.

Noise impacts arising from the cumulative operation of fixed plant items is therefore predicted to be below the **LOAEL**, as defined in Section 3.0.

6.1.2 Site Servicing Operations (i.e. Deliveries in and out)

The assessment of ambient noise contributions (L_{Aeq}) from site servicing operations has been undertaken following the guidance within BS 4142:2014+A1:2019, and operational assumptions detailed in in Section 5.2.2.

In accordance with BS 4142:2014+A1:2019, a +3dB acoustic character correction, to account for the intermittent nature of the operations as a whole, and +4 dB for clearly perceptible tonality associated with reverse alarms, has been applied to the predicted ambient noise contributions (L_{Aeq}) to determine the rating level ($L_{Ar'Tr}$).

The results of the assessment are shown in Table 6.2 overleaf, in accordance with BS 4142 Para 8.6, background levels are expressed as integers (with 0.5 dB being rounded up).

Table 6.2
BS 4142 Assessment of Servicing Noise Impact (Deliveries), $L_{Ar'Tr}$ dB

NSR	Existing Measured Background (L_{A90})		Predicted Rating Level ($L_{Ar'Tr}$)		Difference, dB	
	Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
1	38	34	32.8	37.4	-5.2	+3.4
2	39	29	46.6	50.8	+7.6	+21.8
3	43	41	39.0	44.2	-4.0	+3.2
4	41	37	29.7	34.2	-11.3	-2.8

The results of the assessment presented in Table 6.2 show that noise contributions from site servicing operations are predicted to exceed the existing measured background by up to 7.6dB during the daytime and 21.8dB during the night-time at NSR2.

Noise impacts arising from the site servicing operations is therefore predicted to be above the **LOAEL** and **SOAEL**, as defined in Section 3.0.

Therefore, it is considered that further consideration will be required to achieve the criteria requirements at NSR2, which is detailed further in this report.

Night-time Maximum Noise Level Assessment – BS 8233:2014

An assessment of maximum noise level (L_{Amax}) contributions is presented in Table 6.3. Internal noise levels have been calculated based on a nominal reduction of 15dB for noise attenuation through a partially open window.

Table 6.3
Assessment of Servicing Noise Impact (Deliveries) Night-time, L_{Amax} dB

NSR	External Noise Levels, L_{Amax}	Internal Noise Levels, L_{Amax}	Internal Criteria, L_{Aeq} (Night-time)	Within Criteria
1	59.9	44.9	45	✓
2	74.5	59.5		✗
3	48.4	33.4		✓
4	53.6	38.6		✓

The results of the assessment show that night-time maximum (L_{Amax}) noise level contributions associated with site servicing operations (deliveries) are predicted to be above the BS 8233:2014 internal noise criteria at NSR2, and exceed the **SOAEL**, as defined in Section 3.0.

Therefore, it is considered that further consideration will be required to achieve the criteria requirements during the night-time period, which is detailed further in this report.

6.1.3 Car Parking Assessment

Ambient noise contributions from car parking events have been assessed with windows open at the nearest sensitive receptors (NSRs), using the specified parameters set out in Section 5.2.3. To present a worst-case, a nominal reduction of 15dB has been applied to account for attenuation through a partially open window.

The results of the assessment are presented in Table 6.4 overleaf.

Table 6.4
BS 8233:2014 Assessment of Car Parking Noise Impact, (Daytime/Night-time) $L_{Aeq,T}$

NSR	External Noise Levels ($L_{Aeq,T}$)		Internal Noise Levels ($L_{Aeq,T}$)		BS 8233:2014 Internal Target Criteria Daytime/Night-time $L_{Aeq,T}$	Within Criteria
	Daytime	Night-time	Daytime	Night-time		
1	42.8	37.7	27.8	22.7	35 / 30	✓
2	48.1	43.1	33.1	28.1		✓
3	43.4	38.3	28.4	23.3		✓
4	37.9	37.9	22.9	22.9		✓

The results of the assessment presented in Table 6.4 show that daytime and night-time ambient ($L_{Aeq,T}$) noise level contributions associated with car parking are predicted are predicted to fall below BS 8233:2014 internal noise criteria, and therefore fall below the **LOAEL**, as defined in Section 3.0.

Night-time Maximum Noise Level Assessment – BS 8233:2014

An assessment of maximum noise level events associated with car parking during the night-time period is presented in Table 6.5. To account for the attenuation afforded by a partially open window, a nominal reduction of 15 dB has been applied to determine the predicted internal noise levels.

Table 6.5
Assessment of Car Parking Noise Impact Night-time, L_{Amax} dB

NSR	External Noise Levels, L_{Amax}	Internal Noise Levels, L_{Amax}	Internal Criteria, L_{Aeq} (Night-time)	Within Criteria
1	66.1	51.1	45	✗
2	67.2	52.2		✗
3	62.1	47.1		✗
4	65.1	50.1		✗

The results of the assessment presented in the Table above show that night-time maximum (L_{Amax}) noise level contributions associated with car parking are predicted to exceed the internal noise criteria, and exceed the **LOAEL**, as defined in Section 3.0.

Night-time Maximum Noise Level Assessment – BS 8233:2014 – Comparison

Existing maximum noise events measured at each measurement location have been compared against the maximum noise level events from car parking events predicted a the NSRs. The absolute maximum event during the night-time period ($L_{Amax,1min}$) and typical maximum values, chosen by taking the 10th highest maximum level over the course of the night, have been used for comparison.

Table 6.6, overleaf, shows the results of the comparison.

Table 6.6
Maximum Noise Events Comparison – Car Parking

NSR	Maximum Predicted External Noise Level Event	Maximum Measured External Noise Level Event	Typical Measured External Noise Level Event	Difference, dB	
				Maximum	Typical
1	66.1	71.1	68.4	-5.0	-2.3
2	67.2	78.4	70.8	-11.2	-3.6
3	62.1	78.8	72.1	-16.7	-10.0
4	65.1	75.9	71.5	-10.8	-6.4

As shown in Table 6.6, the existing measured maximum noise levels and typical maximum noise levels (10th highest) already experienced in the area exceed the predicted maximum noise levels from car parking events at each NSR, as outlined in this assessment. Therefore, any predicted exceedance is unlikely to be significant, especially as these events are isolated. Within the context of the existing noise environment, they would not be discernible from other sporadic maximum noise level events, given that similar exceedances already occur. On this basis, the predicted noise levels are considered acceptable within the existing environment at the NSRs.

Noise impacts arising from maximum car parking events are therefore predicted to be below the **LOAEL** for the assessment, as defined in Section 3.0.

6.2 Noise Mitigation (Commercial Development)

As noted in the assessment above, site servicing operations (Deliveries / Collection) without specific noise mitigation measures are expected to exceed the **LOAEL** and **SOAEL** threshold during the daytime night-time and therefore would not comply with the aims and objectives of the NPPF. The following section considers specific mitigation measures to offset any potentially adverse effects arising from such activities on-site, demonstrating a suitable approach to bringing the site forward in compliance with National Planning Objectives.

Investigative noise modelling has been conducted to determine the most appropriate approach to ensure predicted noise effects fall in line with BS 4142 guidance and therefore below the LOAEL. The findings indicate that a restriction of use is the most appropriate way to reduce noise emissions at the NSRs. By restricting the use to daytime only (0700h-2300h) for site servicing (deliveries), all assessed noise impacts will remain below the LOEAL, as detailed in Section 3.0.

It must be noted that due to the significant exceedance of noise levels from these operations during the night-time reference period, that strategic use of a noise barrier would not be sufficient in the context of this site.

In addition to the restriction of use, the use of tonal reverse alarms should be restricted. Where feasible, less intrusive broadband alarms should be used instead. This measure would decrease the need for acoustic feature corrections by 4dB, subsequently reducing the magnitude of predicted exceedances, and therefore the predicted noise rating level at NSR2 would fall below the LOAEL.

6.3 Residential Development

6.3.1 Predicted Internal Levels – Partially Open Window

Calculations of internal noise levels have been completed for the proposed development to demonstrate that suitable internal noise levels can be achieved within the most noise exposed rooms.

Nosie impacting on the proposed East and West Mill residential development has been modelled with the aid of CadnaA® noise modelling software. Noise effects from existing road traffic noise sources have been considered, as well as noise source assumptions from the proposed commercial use of the development, which is summarised in Section 5.0. It should also be noted that any mitigation included as part of the commercial development to ensure noise impacts are within the assessment criteria have been considered as part of the noise impacts upon the proposed residential development. This includes restricting site servicing operations (deliveries) to daytime hours only.

The assessment of noise impacting on the East and West Mill residential development has been undertaken on a façade-by-façade basis. The highest predicted noise contribution along each façade has been returned as the assessment value.

Internal ambient noise levels within all habitable rooms have been assessed with open windows providing natural ventilation. To account for the attenuation afforded by a partially open window, a nominal correction of 15dB R_w has been applied. The results of the assessment are presented in Table 6.7 below:

Table 6.7
Assessment of Noise Intrusion Levels – Open Windows (Natural Ventilation)

Facade	External Noise Level			Internal Noise Level			Within Criteria (Y/N)
	$L_{Aeq,16h}$	$L_{Aeq,8h}$	L_{AFMax}	$L_{Aeq,16h}$	$L_{Aeq,8h}$	L_{AFMax}	
East Mill							
A (West)	47.2	42.4	77.1	32.2	27.4	62.1	N
B (South)	55.0	49.1	72.6	40.0	34.1	57.6	N
C (North)	50.3	48.1	55.1	35.3	33.1	40.1	N
D (East)	54.1	45.2	77.1	39.1	30.2	62.1	N
West Mill							
A (East)	50.0	47.9	71.3	35.0	32.9	56.3	N
B (North)	53.7	51.6	60.7	38.7	36.6	45.7	N
C (West)	53.2	49.3	68.4	38.2	34.3	53.4	N
D (South)	48.0	43.0	69.1	33.0	28.0	54.1	N

As shown in the Table above, the results of the assessment indicate that use of open windows to provide natural ventilation will not be sufficient to meet the requirements of BS 8233:2014.

6.3.2 In-Façade Mitigation

Based on the results of the assessment outlined above, an alternative glazing and ventilation strategy will be required to ensure noise levels fall within the criteria set within BS 8233:2014.

Detailed calculations have been undertaken in accordance with Annex G of BS 8233:2014 to determine appropriate solutions for the site.

As details of the floor plan and dimensions of the external façade are not yet finalised, the area of external façade that is glazed and unglazed for the sensitive use rooms has been calculated using the following assumptions:

- Living Room dimensions of 5m (length) x 4m (width) x 2.3m (height);
- Bedroom dimensions of 3m (length) x 4m (width) x 2.3m (height); and
- Double glazed window dimensions of 1m (width) x 1.8m (height).

At the current design stage there is no fixed ventilation strategy for the development. The following ventilation strategy have been considered to demonstrate site suitability; this should be viewed as indicative only.

Table 6.8
Building Regulations Approved Document F Requirements

Specification	Approved Document F – Indicative Ventilation Strategy	Passive Ventilation Requirement within Habitable Spaces
Specification A	Continuous mechanical extract and (MEV).	4000mm^2 EA in each habitable room for dwellings spanning multiple floors or 5000mm2 EA for single storey dwellings or flats.
Specification B	Natural ventilation with background ventilators and intermittent extract fans.	8000mm^2 EA in each habitable room for dwellings spanning multiple floors or 10000mm2 EA for single storey dwellings or flats.

Please note, consideration for the requirements of Part F of the Building Regulations has been given to support the assessment of acoustic suitability only. Part F compliance should be determined through consultation with a qualified ventilation specialist.

Table 6.9 presents a summary of the proposed specifications. Please note, the below does not provide an exhaustive list of suitable options for glazing and ventilation, but care should be taken to ensure the selected product meets the octave band performance requirements set out below.

Table 6.9
Example Glazing & Ventilation Strategy

Specification	Building Element	Unit	Minimum Recommended Sound Reduction Performance					R_w	$D_{ne,w}$
			125	*250*	*500*	*1000*	*2000*		
Specification A	Example Glazing	Pilkington 6mm / 16mm argon / 8.8mm Optiphon	25.0	27.0	38.0	48.0	47.0	41	-
	Example Ventilation	Zehnder Greenwood 2500EAW.AC2	41.7	39.6	37.2	45.3	52.6	-	45
Specification B	Example Glazing	Pilkington 10mm / (6 - 16mm) / 4mm	24.0	21.0	32.0	37.0	42.0	35	-
	Example Ventilation	Zehnder Greenwood 5000EAW.AC2	39.9	37.9	31.8	46.7	53.3	-	42

Façade performance calculations are not limited to the impact of glazing and ventilation systems. To account for the attenuation afforded by the external wall, the calculations include the performance afforded by a typical brick/block cavity wall. Table 6.10 shows the sound reduction performance of the external wall.

Table 6.10
SRI of Façade, dB (R_W)

Frequency in Hz	125	250	500	1000	2000	4000	R_w (dB)
SRI of Façade	46.0	44.0	46.0	54.0	62.0	67.0	52

6.3.3 Predicted Internal Levels – Closed Window

Table 6.11 presents the results of the predicted internal noise levels following incorporation of the specification outlined in the Section above.

Table 6.11
Assessment of Noise Intrusion Levels – Closed Windows (Alternative Ventilation)

Facade	Specification	Internal Noise Level			Within Criteria (Y/N)
		$L_{Aeq,16h}$	$L_{Aeq,8h}$	L_{AFMax}	
East Mill					
A (West)	Specification A	14.9	8.2	42.9	Y
B (South)	Specification A	22.7	15.1	38.4	Y
C (North)	Specification B	22.5	18.5	25.2	Y
D (East)	Specification A	21.8	11.2	42.9	Y
West Mill					
A (East)	Specification B	22.2	18.3	41.4	Y
B (North)	Specification B	25.9	23.0	30.8	Y
C (West)	Specification B	25.4	19.7	38.5	Y
D (South)	Specification B	20.2	13.4	39.2	Y

As shown in the Table above, following incorporation of the alternative glazing and ventilation strategy, internal noise levels are predicted to be compliant with the requirements of BS 8233:2014.

It is therefore considered that the calculated internal noise levels are below the LOAEL set for this project. The LOAEL is defined as:

LOAEL – Lowest Observed Adverse Effect Level – Internal noise levels achieve the requirements of the BS 8233:2014 standard assuming windows are closed, and an alternative source of ventilation is provided.

6.4 Assertion of Competence

This assessment has been completed by Adam Shaw, Senior Acoustic Consultant with responsibilities for completing acoustic reports on behalf of Dragonfly Consulting. I am a Corporate Member of the Institute of Acoustics and an Associate Member of the British Occupational Hygiene Society.

I hold a Bachelor of Science in Sound Engineering, with Honours, from Birmingham City University.

7.0 CONCLUSIONS

KPP Architects, on behalf of Crowther Bruce & Co Ltd, has appointed Dragonfly Consulting to carry out a Noise Impact Assessment for a proposed mixed-use development, including both residential and commercial use at New Mills, Marsden.

The noise assessment has been conducted with reference to the National Planning Policy Framework and the appropriate British Standards, recognised guidance & reference documents relevant to this site.

This report describes a noise survey of the site and the subsequent analysis to determine the noise environment of the proposed development. It then compares the results with the adopted criteria and, where applicable, recommendations are made with respect to the design of the development.

The assessment indicates that noise from all proposed commercial operations, inclusive of the proposed mitigation, is predicted to fall below the LOAEL.

The assessment also identifies that the site is suitable for residential development. Recommendations are provided for appropriate glazing and ventilation throughout the development to minimise external noise ingress and maintain high internal acoustic standards in all sensitive rooms.

The NPPF defines the LOAEL as:

LOAEL – Lowest Observed Adverse Effect Level

The level above which adverse effects on health and quality of life can be detected.

7.1 Recommendation to Decision Makers

Based on the assessment detailed within this report, it is not considered that noise should be a barrier to the development. It is recommended that the site be granted planning consent with the addition of suitable conditions to address the following items:

- Fixed Plant – at the current design stage no fixed M&E details are available. It is therefore recommended that a pre-occupation condition be included to facilitate the assessment of site fixed plant requirements as and when these become available; and
- Site Servicing Operations (Deliveries / Collections) – it is considered that a restriction of use on all site servicing operations on-site be included during the night-time period, limiting access to daytime hours only.

Appendix A – Glossary of Terminology

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A-1
Sound Levels Commonly Found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} This is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{10} & L_{90} If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. L_{10} is the level exceeded for 10% of the time and is often used as a descriptor for road traffic noise. Similarly, L_{90} is the level exceeded for 90% of the time and is often used to describe the background level. It is common practice to use the L_{10} index to describe traffic noise.

L_{AMax} This is the maximum A-weighted sound pressure level recorded over the period stated. L_{AMax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment.

Appendix B – Monitoring Equipment

Table B-1
Noise Monitoring Equipment

Equipment	Serial Number
01dB Cube Sound Level Meter	10892
G.R.A.S 40CD Microphone	233511
01dB PRE22N Preamplifier	11071
01dB Cube Sound Level Meter	10889
G.R.A.S 40CD Microphone	231555
01dB PRE22N Preamplifier	1610358
01dB Fusion Sound Level Meter	11860
G.R.A.S 40CD Microphone	331802
01dB PRE22N Preamplifier	1707207
01dB Fusion Sound Level Meter	12298
G.R.A.S 40CD Microphone	332011
01dB PRE22N Preamplifier	1936193
Cirrus CR:515 Acoustic Calibrator	103792

Appendix C – Measurement Locations

Figure C-1
Measurement Locations