Proposed Large Scale Residential Development at Rathgowan, Mullingar, Co. Westmeath

Applicant: Marina Quarter Ltd.

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Volume II

Main Statement

CHAPTER 9

Noise & Vibration

August 2023

McCutcheon Halley
CHARTERED PLANNING CONSULTANTS

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9.1 Introduction

This EIAR Chapter has been prepared by AWN Consulting Ltd (AWN) to assess the potential noise and vibration effects of the proposed development in the context of current relevant standards and guidance as detailed in relevant sections below.

This chapter includes a description of the receiving noise climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development, during both the short-term construction phase and the long term operational phase, on its surrounding environment. The assessment of direct, indirect and cumulative noise and vibration effects on the surrounding environment have been considered in this chapter.

Mitigation and monitoring measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

9.2 Expertise & Qualifications

This assessment has been prepared by Mike Simms BE MEngSc MIOA MIET, Principal Acoustic Consultant at AWN, who has worked in the field of acoustics for 20 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, energy, industrial, commercial and residential. Recent relevant project experience where noise is an important element of the environmental assessment include:

- Player Wills and Bailey Gibson Strategic Housing Developments, Dublin 8;
- St Marnock's Bay Phase 1C, Portmarnock, Co Dublin;
- Havelock House mixed-use development, Ormeau Road, Belfast, and;
- Newtownmoyaghy housing development, Kilcock, County Kildare.

9.3 Proposed Development

The full description of the proposed development is outlined in Chapter 2 'Development Description' of this EIAR.

9.3.1 Aspects Relevant to this Assessment

When considering a development of this nature, the potential noise and vibration impact on the surroundings is considered for each of two distinct stages:

- Construction Phase, and;
- Operational Phase.

The construction phase will involve site clearing and excavations, piling of foundations, services installations, construction of building frame and envelope landscaping and construction of internal

roads. This phase will generate the highest potential noise impact due to the works involved, however, the phase is short-term and expected to be completed within 24 months .

The primary sources of outward noise in the operational context are long-term and will comprise traffic movements to site using the existing road network and building services plant noise. These issues are discussed in the relevant sections of this Chapter.

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9.4 Methodology

9.4.1 Relevant Legislation & Guidance

The assessment of effects has been undertaken with reference to the guidance documents listed below relating to environmental noise and vibration:

- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (2022);
- British Standard Institute (BSI) BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (BSI, 2014);
- British Standard Institute (BSI) BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (BSI, 2014);
- British Standard Institute (BSI) BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI, 1993);
- UK Department of Transport (UK DOT) Calculation of Road Traffic Noise (UK DOT, 1988);
- British Standard Institute (BSI) BS 4142: 2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound;
- United Kingdom Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2 (UKHA, 2020);
- International Organization for Standardization (ISO) ISO 1996: 2017: Acoustics – Description, measurement, and assessment of environmental noise (ISO, 2017).
- World Health Organisation Environmental Noise Guidelines for the European Region, 2018
- Professional Practice Guidance on Planning & Noise (ProPG) Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH) (2017)
- Westmeath County Council Noise Action Plan 2018-2023
- Transport Infrastructure Ireland Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2014)

The study has been undertaken using the following methodology:

- An environmental noise survey has been undertaken in the vicinity of the subject site in order to characterise the existing baseline noise environment;
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development;

- Predictive calculations have been performed during the construction phase of the project at the nearest sensitive locations to the development site;
- Predictive calculations have been performed to assess the potential effects associated with the operation of the development at the most sensitive locations surrounding the development site,
- The inward noise impact has been assessed according to ProPG and appropriate acoustic performances of the building envelope are presented;
- A schedule of mitigation measures has been proposed to reduce, where necessary, the identified potential outward effects relating to noise and vibration from the proposed development.

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9.4.1.1 Westmeath County Council Noise Action Plan

Westmeath County Council Noise Action Plan 2018-2023 states the following regarding its role in the planning process, on page 30:

> *Westmeath County Council will consider using the Planning Process, where necessary:*
>
> > *To integrate Noise Action Plans into the County Development Plan*
> >
> > *To integrate noise planning guidelines into planning processes to ensure that new developments take cognisance of noise pollution and noise mitigation*
> >
> > *To ensure that future developments are designed and constructed in such a way as to minimise noise disturbances.*
> >
> > *To incorporate any suitable National guidance on the treatment of noise into local policy.*

On page 27, possible mitigation measures in respect of noise are discussed:

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Some examples of acoustical measures to tackle noise are given below:

Screening noise

a) Noise barriers are less effective at reducing disturbance than reducing the volume of traffic.

b) Roadside barriers can be erected at the boundaries of properties.

c) Local sources of noise pollution must be taken into account when planning and designing new residences.

d) Orientation of building

Soundproof Glazing

Soundproofing with dual or triple glazing or equivalent product is a possibility for further protection against noise.

Changing road surfaces

To a low noise surface and replacing rough paving with smooth asphalt.

These mitigation measures will be taken into account in the environmental noise assessment presented in this Chapter.

9.4.2 Construction Phase Assessment Criteria

9.4.2.1 Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local Authorities typically control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In order to set appropriate construction noise limits for the development site, reference has been made to *BS 5228 2009+A1 2014 Code of practice for noise and vibration control on construction and open sites*. Part 1 of this document Noise provides guidance on selecting appropriate noise criteria relating construction works.

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on exiting ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities.

BS 5228-1:2009+A1:2014 sets out guidance on permissible noise levels relative to the existing noise environment. Table 9.1 sets out the values which, when exceeded, signify a significant effect at the facades of residential receptors.

Table 9.1 Example Threshold of Potential Significant Effect at Dwellings

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Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Daytime (08:00 – 19:00) and Saturdays (08:00 – 14:00)	65	70	75
Evenings and weekends [D]	55	60	65
Night-time (23:00 to 07:00hrs)	45	50	55

A. Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
B. Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.
C. Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.
D. 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties.

For the appropriate periods (i.e. daytime, evening and night time) the ambient noise level is determined and rounded to the nearest 5 dB. Baseline monitoring carried out at the nearest noise sensitive locations and considered in this assessment indicate that Category A, as detailed in Table 9.1, is appropriate in this instance.

9.4.2.2 Vibration

There are two aspects to the issue of vibration that are addressed in the standards and guidelines: the risk of cosmetic or structural damage to buildings; and human perception of vibration. In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

There is no published statutory Irish guidance relating to the maximum permissible vibration level. The following standards are the most widely accepted in this context and are referenced here in relation to cosmetic or structural damage to buildings:

- British Standard BS 5228-2 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (BSI 2014); and
- British Standard BS 7385-2 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI 1993).

BS 5228-2 and BS 7385-2 define the following thresholds for cosmetic damage to residential or light commercial buildings: PPV should be below 15 mm/s at 4 Hz to avoid cosmetic damage. This increases to 20 mm/s at 15 Hz and to 50 mm/s at 40 Hz and above. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded. This is summarised in Table 9.2 below.

Table 9.2 Allowable Vibration during Construction Phase

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Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

9.4.3 Operational Phase Assessment Criteria

9.4.3.1 Additional Vehicular Traffic on Surrounding Roads

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated increase in traffic noise levels that will arise because of vehicular movements associated with the development. In order to assist with the interpretation of the noise associated with additional vehicular traffic on public roads, Table 9.3, is taken from *Design Manual for Roads and Bridges LA 111 Sustainability & Environmental Appraisal. Noise and Vibration Rev 2* (2020),with the appropriate EPA Significance of Effect also noted.

Table 9.3 Significance in Change of Noise Level – Operational Phase Traffic

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact	EPA Significance of Effect
0	Inaudible	No impact	Imperceptible
0.1 – 2.9	Barely Perceptible	Negligible	Not significant
3 – 4.9	Perceptible	Minor	Slight, Moderate
5 – 9.9	Up to a doubling of loudness	Moderate	Significant
10+	Doubling of loudness and above	Major	Very significant

The guidance outlined in Table 9.3 will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely long-term effects during the operational phase.

9.4.3.2 Building Services Plant Noise

The most appropriate standard used to assess the impact of a new continuous source (i.e. plant items) to a residential environment is BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*. This standard describes a method for assessing the impact of a specific noise source at a specific location with respect to the increase in "background" noise level that the specific noise source generates. The standard provides the following definitions that are pertinent to this application:

- "*Specific sound level, $L_{Aeq,\ Tr}$*" is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, *T*. This level has been determined with reference to manufacturers information for specific plant items.
- *"Rating level"* $L_{Ar,Tr}$ is the specific noise level plus adjustments for the character features of the sound (if any), and;
- *"Background noise level"* is the sound A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the L_{A90} parameter. These levels were measured as part of the baseline survey.

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The assessment procedure in BS4142 is outlined as follows:

- determine the specific noise level;
- determine the rating level as appropriate;
- determine the background noise level, and;
- subtract the background noise level from the specific noise level in order to calculate the assessment level.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. A difference of +10dB or more is a likely to be an indication of a significant adverse impact. A difference of around +5dB is likely to be an indication of an adverse impact, dependent on the context. Where the rated plant noise level is equivalent to the background noise level, noise effects are typically considered to be neutral.

9.4.3.3 Vibration

The development is a residential in nature, therefore it is not anticipated that there will be any outward impact associated with vibration for the operational phase.

9.4.4 Inward Noise Impact Criteria

The Professional Guidance on Planning & Noise (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a UK or Irish government document, since it's publication it has been generally considered as a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The ProPG outlines a systematic risk based 2-stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

- Stage 1 - Comprises a high level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,
- Stage 2 – Involves a full detailed appraisal of the proposed development covering four "key elements" that include:
    - Element 1 - Good Acoustic Design Process;

- Element 2 - Noise Level Guidelines;
- Element 3 - External Amenity Area Noise Assessment, and;
- Element 4 - Other Relevant Issues.

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A summary of the ProPG approach is illustrated in **Figure 9.1**.

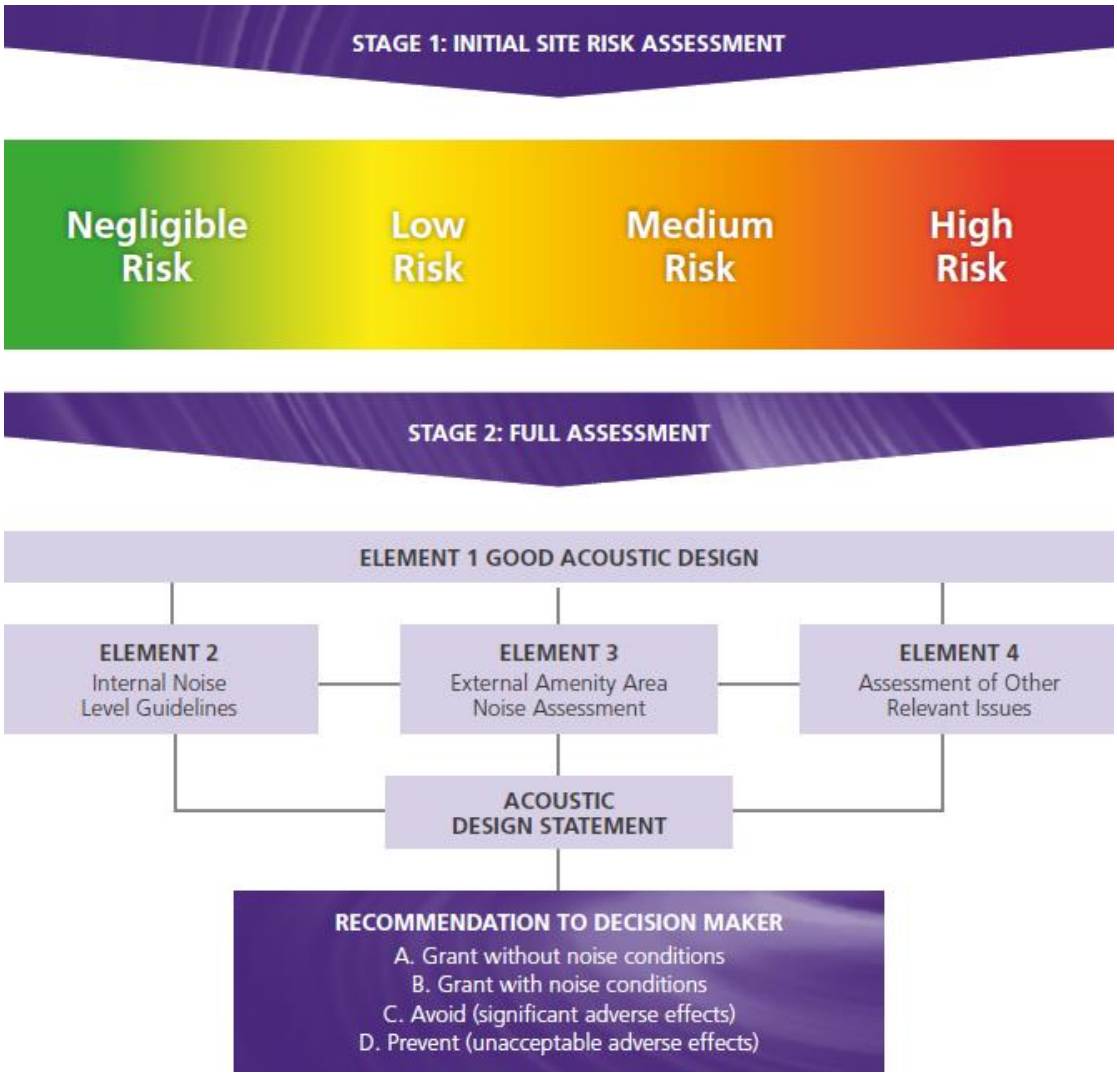

Figure 9.1 ProPG Approach (Source: ProPG)

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 9.2 presents the basis of the initial noise risk assessment; it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

It should be noted that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night.

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Paragraph 2.9 of ProPG states that,

> *"The noise risk assessment may be based on measurements or prediction (or a combination of both) as appropriate and should aim to describe noise levels over a "typical worst case" 24 hour day either now or in the foreseeable future."*

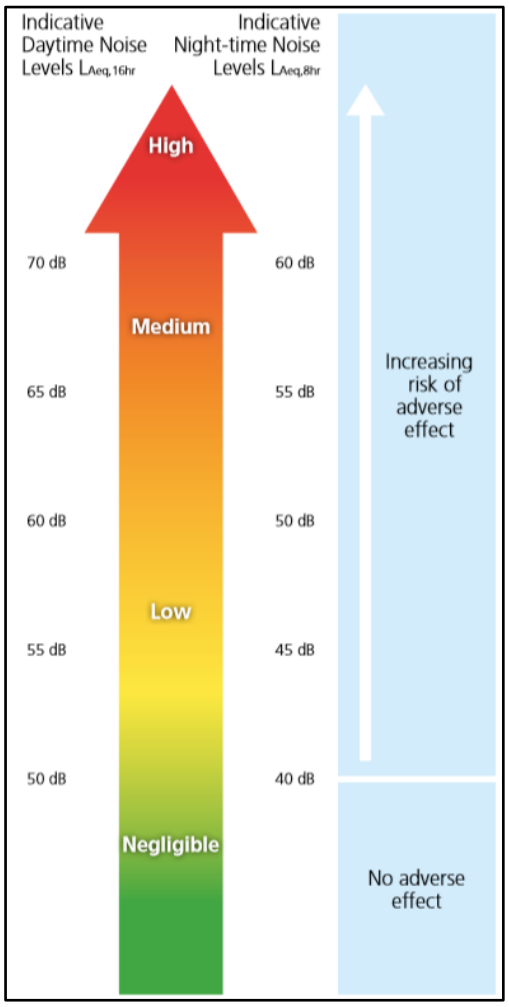

Figure 9.2 Initial Noise Risk Assessment

9.5 Difficulties Encountered

No difficulty was encountered in the preparation of this chapter.

9.6 Baseline Environment

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9.6.1 Environmental Noise Survey

9.6.1.1 Site Location

The site is located to the northwest of the town centre. It is located to the northwest of the junction of the of the R394 and R393 roads. For the site layout and boundary please refer to Figure 1.1 in Chapter 1 of the EIAR.

9.6.1.2 Baseline Noise Survey Locations

An environmental noise survey was conducted at the site in order to quantify the existing noise environment. The survey was conducted in general accordance with ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*.

The noise measurement locations were selected to represent the noise environment at Noise sensitive locations surrounding the proposed development. The selected locations are shown in Figure 9.3 and described as below:

- N1 – Attended noise measurements undertaken to the east of the proposed development site, at the western end of the Ashfield housing estate.
- N2 – Attended noise measurements undertaken near the south-eastern corner of the proposed development site, near the roundabout at the intersection of the R393 and R394 roads.
- N3 – Attended noise measurements undertaken near the norther boundary of the site, within the Brookfield housing estate.
- UN1 – Unattended noise measurements undertaken near the eastern boundary of the site.

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Figure 9.3 Noise Monitoring Locations

9.6.1.3 Survey Periods

Attended surveys were conducted from 13:30 to 16:45 on Tuesday 20 September 2022. Over the course of the survey the weather was generally dry, calm and mild. Temperatures were approximately 10°C, wind speeds were approximately 4 to 5 m/s.

An unattended survey was carried out form 13:30 on 20 September to 14:15 on 22 September 2022.

9.6.1.4 Personnel and Instrumentation

AWN installed and collected the noise monitoring equipment. The following instrumentation was used in conducting the noise and surveys:

Table 9.4 Instrumentation Details

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Equipment	Type	Serial Number	Calibration Date	Calibration Due
Sound Level Meter (Attended)	Rion NL-42	1076330	20/10/2020	20/10/2022
Sound Level Meter (Unattended)	Rion NL-42	998413	16/03/2022	16/03/2024

9.6.1.5 Measurement Parameters

The noise survey results are presented in terms of the following parameters.

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

9.6.1.6 Attended Noise Survey Results

Noise level measurements of 15 minutes duration were taken at location N1 to N3. The results are presented in Table 9.5 to Table 9.7.

Table 9.5 Summary of Measurement Results for Location N1

Time	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
13:38	Traffic Noise from R394	59	71	63	53
14:47	Occasional vehicle movements within housing estate	60	68	63	53
15:49	Birdsong	60	67	63	55

Noise levels were in the range 59 to 60 dB $L_{Aeq,15min}$ and 53 to 55 dB $L_{A90,15min}$. The main contributors to noise build-up were local and distant road traffic.

Table 9.6 Summary of Measurement Results for Location N2

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Time	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. 2x10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
14:01	▪ Traffic Noise from R393 and R394 ▪ Pedestrian activity	64	74	68	56
15:01		67	79	71	57
16:01		65	79	68	58

Noise levels were in the range 64 to 67 dB $L_{Aeq,15min}$ and 56 to 58 dB $L_{A90,15min}$. The main contributor to noise build-up was road traffic on surrounding roads.

Table 9.7 Summary of Measurement Results for Location N3

Time	Subjective Impression of Noise Environment	Measured Noise Levels (dB re. 2x10^{-5} Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
14:24	Local traffic from housing estate Distant traffic on Regional Roads Pedestrian Activity Increase in road traffic during last measurement period	49	70	48	39
15:27		47	71	43	38
16:30		51	66	52	47

Noise levels were in the range 47 to 51 dB $L_{Aeq,15min}$ and 38 to 47 dB $L_{A90,15min}$. The main contributors to noise build-up were local and distant road traffic.

9.6.1.7 Unattended Noise Survey Results

Measurement equipment was configured to record noise levels over consecutive 15-minture intervals. The equipment was check-calibrated using a sound level meter calibrator at the time of installation and again at collection.

Table 9.8 Summary of Measurement Results for Location UN1 - Daytime

Date	Measured Noise Levels (dB re. 2x10^{-5} Pa)					
	$L_{Aeq,15min}$			$L_{A90,15min}$		
	Highest	Lowest	Average	Highest	Lowest	Average
Tuesday 20 Sept	69	60	67	63	36	55
Wednesday 21 Sept	70	61	68	64	41	56
Thursday 22 Sept	70	66	68	65	48	58

Table 9.9 Summary of Measurement Results for Location UN1 – Night-time

Date	Measured Noise Levels (dB re. 2x10^{-5} Pa)					
	$L_{Aeq,15min}$			$L_{A90,15min}$		
	Highest	Lowest	Average	Highest	Lowest	Average
Tuesday 20 to Weds 21 Sept	66	45	59	49	25	31
Weds 21 to Thurs Sept	67	52	60	52	32	40

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Figure 9.4 presents the time history of the unattended noise measurements:

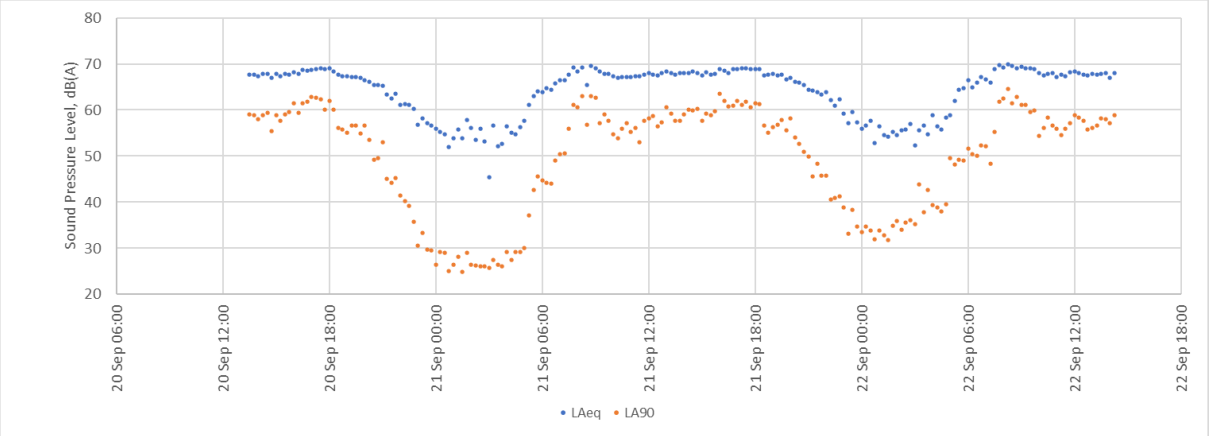

Figure 9.4 Noise Levels Measured by Unattended Sound Level Meter

The L_{AFmax} values were measured over 15-minute intervals over the duration of the unattended monitoring survey. Figure 9.5 presents the number of measured L_{AFmax} events for each decibel level during the night-time periods measured at location UN1. The data shows that a value of 76 dB $L_{AFmax, 15\ min}$ is not typically exceeded at this location.

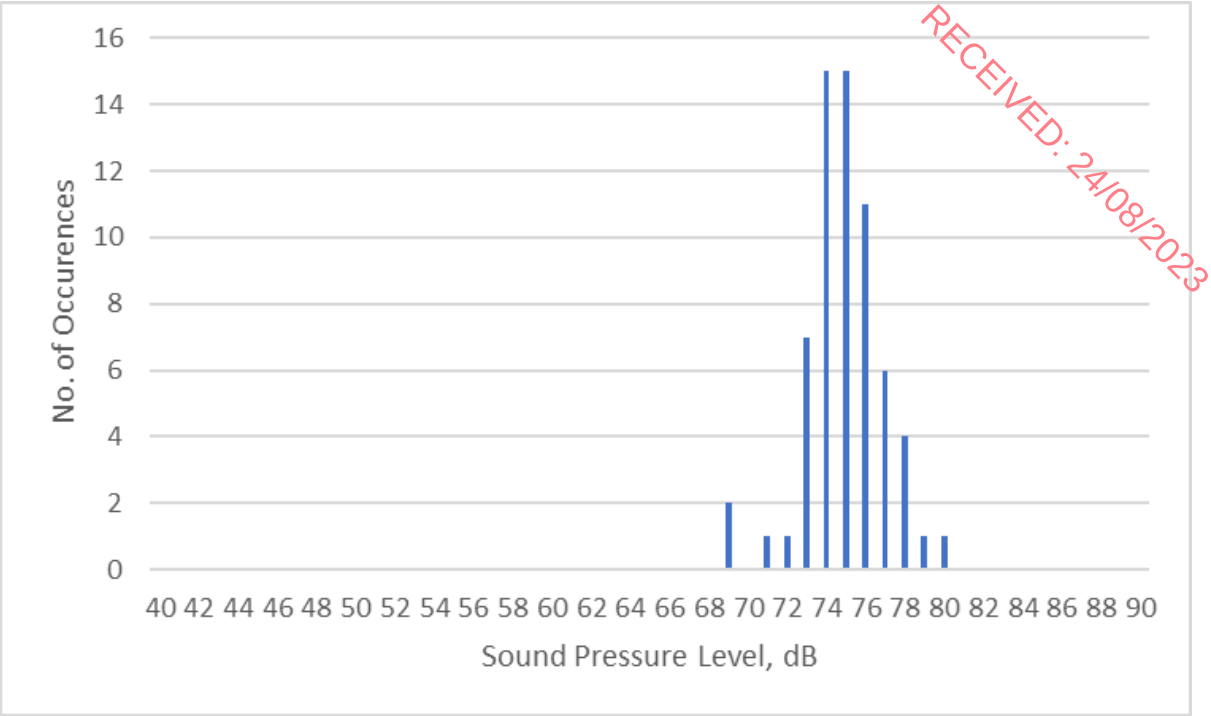

Figure 9.5 Number of $L_{Amax,\ 15\ min}$ events at each decibel level – Night-time period

9.6.1.8 Additional Noise Survey at Ashe Road

An additional daytime noise survey was carried out on 19 July 2023 by AWN for the purposes of quantifying the noise level along Ashe Road and also to ascertain whether the electrical substation could be an intrusive potential noise source for the proposed development. The measurements were taken with a Rion NL-52 what was calibrated on 2 September 2022.

Noise measurements were carried out at four locations as shown in Figure 9.6. The measured noise levels are presented in Table 9.10. Measurements were of 15 minutes' duration at L1 and of 10 minutes duration at L2, L3 and L4.

Table 9.10 Summary of Measurement Results for Additional Noise Survey

Location	Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
L1	14:50	69	84	45	49
	15:54	70	85	49	53
	16:10	70	83	47	51
L2	15:09	58	69	44	50
L3	15:21	57	70	51	54
L4	15:41	58	73	47	51

The dominant noise source was road traffic along Ashe Rd, with the construction activities at the Rathgowan Phase 3 site becoming audible during occasional lulls in road traffic noise.

Close inspection of the substation showed that there was no audible source of noise within the substation compound.

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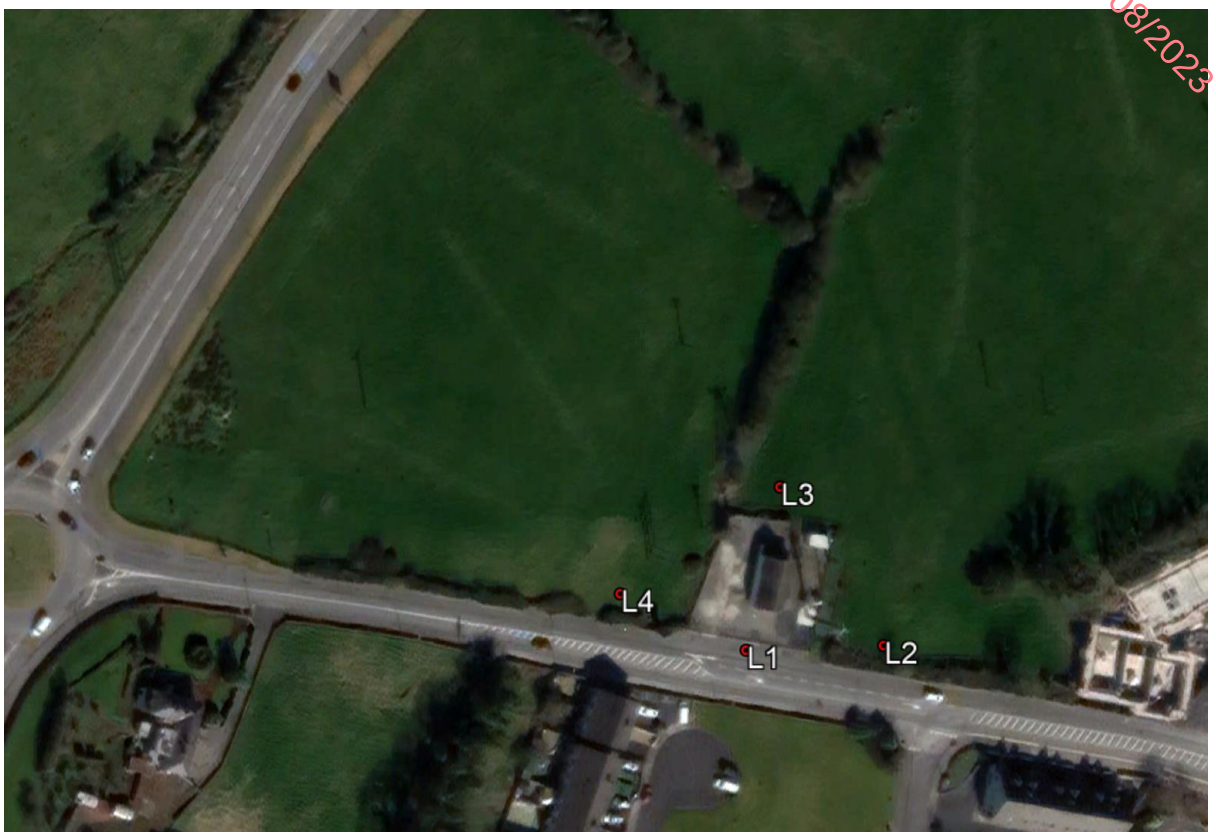

Figure 9.6 Additional Noise Measurement Locations at Mullingar Substation

9.6.2 Road Noise Model

In addition to the noise survey discussed in the previous section, proprietary noise calculation software has been used for the purposes of this impact assessment to calculate road traffic noise levels at various facades across the development site. The selected software, Envirosuite Predictor, calculates noise levels in accordance with the UK's Calculation of Road Traffic Noise (CRTN 1988) which is the recommended procedure for Irish National routes as per Transport Infrastructure Ireland's (TII) Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2004).

The resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- The magnitude of the noise source in traffic flow and average velocity;
- The distance between the source and receiver;
- The presence of obstacles such as screens or barriers in the propagation path;
- The presence of reflecting surfaces; and,
- The hardness of the ground between the source and receiver.

In order to determine the noise levels at the various façades of the proposed development, the following information was included in the model:

- Site layout drawings of proposed development, and;
- OS mapping of surrounding environment.

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The results of the noise survey were used to calibrate the noise model. In this instance the noise model results are within 1dB of the measured values indicating good agreement between the model and the measurements. Figure 9.7 shows a 3D view of the noise developed model.

Predicted noise levels for day and night periods over the site, in the absence of the proposed development, are presented in Figure 9.8 and **Figure 9.9**. These are used to evaluate the Noise Risk at the site.

Figure 9.7 3D Noise model of site

Figure 9.8 Daytime noise contours in dB(A) over existing site – in the absence of the development

Figure 9.9 Night-time noise contours in dB(A) over existing site – in the absence of the development

Figure 9.10 and Figure 9.11 show the predicted noise level contours over the site with the proposed development in place. Daytime noise levels range from 60 to 65 dB $L_{Aeq,16hrs}$ at the eastern edge of the site, to below 50 $L_{Aeq,16hrs}$ at the western part of the site.

Similarly, night noise levels range from 55 to 60 dB $L_{Aeq,8hrs}$ at the western edge of the site, to below 40 dB $L_{Aeq,8hrs}$ at the eastern part of the site.

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Figure 9.10 Daytime Predicted Noise Contours

Figure 9.11 Night-time Predicted Noise Contours

9.6.3 Future Noise Environment

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It is important to note that the noise model is based on the measured noise levels and is representative of current traffic volumes. It is acknowledged that an increase in road traffic volumes would give rise to a corresponding increase in noise levels. With road traffic noise, typically a 25% increase in volumes would be expected to give rise to a 1 dB increase in noise levels.

In order to present a worst-case scenario, all predicted façade noise levels and mitigation measures will include a 2 dB increase to account for future traffic growth.

9.6.4 Summary of Assumed Façade Noise Levels on Developed Site

Based on a review of the survey data, the following noise levels are assumed to be incident on the various façades of the development:

Table 9.11 Assumed Façade Noise Levels on Development Site

Period	Assumed Noise Level, dB(A)	
	Facades along R394	Facades along Ashe Road
Daytime $L_{Aeq,16hrs}$	65	67
Night-time $L_{Aeq,8hrs}$	55	60
Night-time L_{Amax}	78	78

9.6.5 Noise Risk Assessment Conclusion

Giving consideration to the noise levels presented in the previous sections, the initial site noise risk assessment has concluded that the level of risk across the site is Negligible to Low Risk across much of the site, to Medium Risk along the eastern edge. ProPG states the following with respect to various levels of risk:

> *Negligible RiskThese noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.*
>
> *Low Risk At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.*
>
> *Medium Risk As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.*

Given the above it can be concluded that part of the development site may be categorised as having 'Medium' risk, an Acoustic Design Strategy will be required to demonstrate that suitable care and

attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impact will be avoided in the final development.

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It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used:

> *"2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Therefore, following the guidance contained in ProPG does not preclude residential development on sites that are identified as having medium risk noise levels. It merely identifies the fact that a more considered approach will be required to ensure that developments on the higher risk sites are suitable designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

9.7 The 'Do nothing' Scenario

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and within the development site will remain largely unchanged resulting in a neutral and local impact in the long-term. However, there is a housing development on the west side of the R394 (Westmeath County Council File reference 22/515) which is not yet constructed, the impact of which is assessed in the EIAR submitted with that application.

9.8 Potential Significant Effects

9.8.1 Construction Phase

As the construction programme has been established in outline form, construction noise associated with activities on site during this phase are reviewed for the purposes of determining the likely significant effects. Indicative ranges of noise levels associated with construction may be calculated in accordance with the methodology set out in BS 5228-1. This standard sets out sound power and sound pressure levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels.

For site clearance, building construction works, road works and landscaping works (excavators, loaders, dozers, concreting works, mobile cranes, generator), noise source levels are quoted in the range of 70 to 80 dB L_{Aeq} at distances of 10 m within BS 5228-1. For the purposes of this assessment,

a combined sound power value of 113 dB L_{WA} has been used for construction noise calculations. This would include, for example, 2 no. items of construction plant with a sound pressure level of 80 dB L_{Aeq} at 10 m and 3 no. items of plant with a sound pressure level of 75 dB L_{Aeq} at 10 m, resulting in a total noise level of 85 dB L_{Aeq} at 10m along the closest works boundary. This is a highly conservative value as it assumes all items of plant are operating simultaneously along the closest boundary.

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Given the nature of the proposed works which will include standard house and apartment building techniques across the site, a cumulative construction noise level of 85 dB L_{Aeq} at 10m represents a conservative noise level used to assess construction activities associated with the earlier stages of construction when, excavation, foundation and piling works will be employed. This worst-case scenario is a robust assumption made for developments of this size, on the basis that it is unlikely that more than 5 no. items of such plant/equipment would be operating simultaneously in such close proximity to each other at all times. In reality items of construction plant and machinery will be operating at varying distances from any one noise-sensitive location (NSL) .

Once the ground preparation and foundation works have been completed, a large portion of the work will involve manual labour and cranes with lower overall noise levels. For the purpose of this assessment a combined sound power value of 106 dB L_{WA} has been used for construction noise calculations during ongoing site works and compounds once site clearance and excavation works are completed. This would include, for example, one item of plant at 75 dB L_{Aeq} and three items of plant at 70 dB L_{Aeq} operating simultaneously within a work area resulting in a total noise level of 78 dB L_{Aeq} along the closest works boundary.

For the purposes of the calculation, the closest noise sensitive location to construction works are the houses to the east of the site, the nearest of which is at a distance of approximately 10 m from a development building. The next nearest noise-sensitive locations are the houses to the south and north at a distance of approximately 20 m from the nearest development building.

Table 9.12 Potential construction noise levels at varying distances

Description of noise source	Sound Pressure Level at 10 m	Calculated noise levels at varying distances (dB $L_{Aeq,T}$)				
		20 m	50 m	75 m	100 m	150 m
Site clearance, excavation, foundations, internal roads and landscaping	85	77	69	65	63	59
General Construction	78	70	62	58	56	52

The calculated noise levels in Table 9.12 show that at the closest residential NSLs to the works, which are at distances of the order of 10 to 20 m from the nearest building, the predicted noise levels are in excess of the adopted criteria of 65 dB $L_{Aeq,1hr}$, leading to a significant impact while construction activity is close to the noise-sensitive location. Mitigation measures in respect of these locations, including a solid site hoarding offering a reduction in noise levels of 10dBm, are discussed in Section 9.10.1.

However, once the construction activity moves to other areas of the site, the noise levels will reduce. For the majority of the construction period at the majority of noise-sensitive locations, the construction noise levels are within the adopted criteria of 65 dB $L_{Aeq,1hr}$.

The construction noise effects are before mitigation is applied therefore at the closest locations, negative, significant and short-term.

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Table 9.13 Description of impacts for Construction Noise

Quality	Negative
Significance	Significant at distances less 75m or less, otherwise Moderate
Extent	Local
Probability	Likely
Duration	Short-term

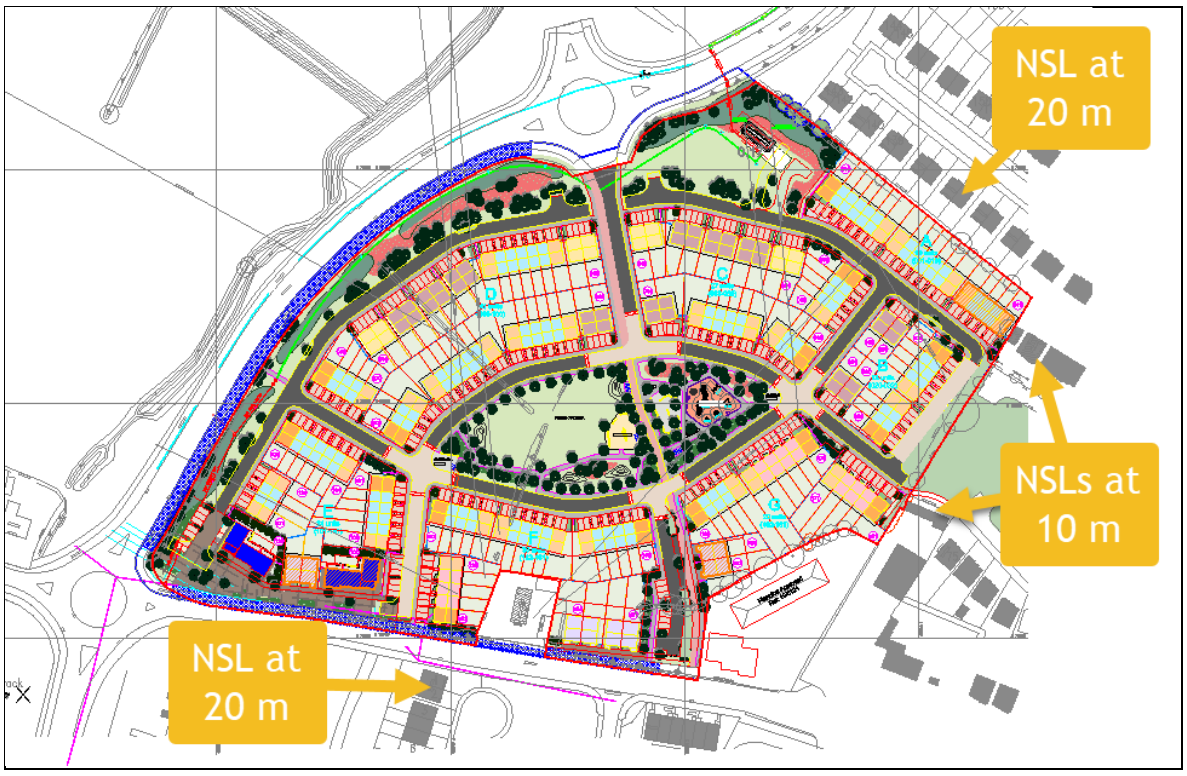

Figure 9.12 Map showing Noise Sensitive Locations

9.8.1.1 Construction Vibration

In terms of construction vibration, it is anticipated that excavations will be made using standard excavation machinery, which typically do not generate appreciable levels of vibration close to the source. Taking this into account and considering the distance that these properties are from the works and the attenuation of vibration levels over distance, the resultant vibration levels are expected to be

well below a level that would cause disturbance to building occupants or even be perceptible. The associated impact is considered neutral, imperceptible and short-term.

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Table 9.14 Description of impacts for Construction Vibration

Quality	Negative
Significance	Not Significant
Extent	Local
Probability	Likely
Duration	Short-term

9.8.1.2 Construction Traffic

In terms of the additional traffic on local roads that will be generated as a result of construction of this development the following comment is presented: Considering that in order to increase traffic noise levels by 1dB traffic volumes would need to increase by the order of 25% it is considered that additional traffic introduced onto the local road network due to the construction of this development will not result in a significant noise impact. With reference to Table 9.3, the resultant noise impact is negative, not significant and short-term.

Table 9.15 Description of impacts for Construction Traffic

Quality	Negative
Significance	Not Significant
Extent	Local
Probability	Likely
Duration	Short-term

9.8.2 Operational Phase

9.8.2.1 Additional Vehicular Traffic on Surrounding Roads

During the operational phase of the proposed development, there will be a small increase in vehicular traffic on surrounding roads associated with the site and other planned developments. Details of the traffic assessment are included in Chapter 12 of this EIAR.

For the purposes of assessing potential noise impact, it is appropriate to consider the relative increase in noise level associated with traffic movements on existing roads surrounding the subject site with and without development. Using the information on daily traffic flows in terms of AADT (annual average daily traffic) presented in Chapter 12, the impact from the increase in traffic from the proposed development has been assessed for the year of 2025 and the year of 2040 relative to the Do nothing scenario along the sections of road detailed in Table 9.16.

Table 9.17 repeats the analysis though it assumes that the development planning ref 22/515 is not constructed, therefore the change in traffic flow and traffic noise is greater.

Table 9.16 Predicted Change In Noise Level associated with Vehicular Traffic – Assuming 22/515 is constructed

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Road Link	2025		2040	
	Increase in traffic flow	Increase in noise level, dB	Increase in traffic flow	Increase in noise level, dB
Jct 1: A – R394 (North)	2%	0.1	1%	0.1
Jct 1: B – Midland Hospital	1%	0.1	1%	0.0
Jct 1: C – R394 (South)	4%	0.2	3%	0.1
Jct 1: D – Unknown Local Road	1%	0.0	1%	0.0
Jct 2: A – R394 (North)	3%	0.1	3%	0.1
Jct 2: B – Phase 1&2	--	--	--	--
Jct 2: C – R394 (South)	3%	0.1	3%	0.1
Jct 2: D – Phase 3	--	0.0	--	0.0

Table 9.17 Predicted Change In Noise Level associated with Vehicular Traffic – Without 22/515

Road Link	2025		2040	
	Increase in traffic flow	Increase in noise level, dB	Increase in traffic flow	Increase in noise level, dB
Jct 1: A – R394 (North)	4%	0.2	3%	0.1
Jct 1: B – Midland Hospital	3%	0.1	3%	0.1
Jct 1: C – R394 (South)	10%	0.4	8%	0.3
Jct 1: D – Unknown Local Road	2%	0.1	2%	0.1
Jct 2: A – R394 (North)	9%	0.4	7%	0.3
Jct 2: B – Phase 1&2	--	--	--	--
Jct 2: C – R394 (South)	9%	0.4	7%	0.3
Jct 2: D – Phase 3	--	--	--	--

The changes in noise levels are all less that 1dB, therefore in accordance with Table 9.3, the associated effect is neutral to negative, imperceptible to not significant and long-term.

Table 9.18 Description of impacts for Additional Vehicular Traffic on Surrounding Roads

Quality	Neutral
Significance	Imperceptible
Extent	Local
Probability	Likely
Duration	Short-term

9.8.2.2 Building Services Plant

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It is expected that the principal items of building and mechanical services plant will be for heating and ventilation of the buildings. These items and their location will be selected at the detailed design stage to ensure that noise emissions to sensitive receivers both external and within the development itself will be within the relevant criteria set out in Section 9.4.3.2. The effects are considered negative, not significant and long-term.

Table 9.19 Description of impacts for Building Services Plant

Quality	Negative
Significance	Not Significant
Extent	Local
Probability	Likely
Duration	Long-term

9.8.3 Cumulative Effects

There are three planning applications of scale: one located on the western side of the R394 road, by the same applicant, reference number 22/515, corresponds to phase 3 of the Rathgowan housing development. This development is currently being constructed.

Application references 21/97 and 21/139 represent earlier applications on the subject site. If the Proposed Development is permitted, then these developments will not be constructed.

9.8.3.1 Construction Phase

There is potential for cumulative construction impacts should the construction phases of the proposed development coincide with that of other developments.

However, as shown in

Figure **9.12**, considering the distances between the proposed and permitted developments, construction works for the permitted developments will be considerably further from these noise-sensitive locations than the that of the subject site, and hence the noise level due to construction at those sites will be commensurately lower.

For the closest noise-sensitive locations, i.e. those at distances of the order of 10 to 20 m from the works, the effects remain negative, significant, local and short-term.

For locations at greater distances greater, the effects remain negative, moderate, local and short-term.

9.8.3.2 Operational Phase

The key potential noise source associated with the proposed development relates to additional traffic on the surrounding road network. The cumulative noise impacts associated with existing, permitted and development-related traffic has been considered within this assessment and the effects are considered neutral to negative, imperceptible to not significant and long-term at all locations.

9.8.4 Summary

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The Table below summarises the identified likely effects during the construction phase of the proposed development in the absence of mitigation.

Table 9.20 Summary of Construction Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Construction of dwellings	Negative	Significant at 20 to 20m distance, otherwise Moderate	Local	Likely	Short-term	Direct
Construction Traffic	Negative	Not Significant	Local	Likely	Short-term	Direct

The Table below summarises the identified likely effects during the operational phase of the proposed development in the absence of mitigation.

Table 9.21 Summary of Operational Phase Likely Significant Effects in the absence of mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Traffic	Neutral to negative	Imperceptible to Not Significant	Local	Likely	Long-term	Direct
Building Services Plant	Negative	Not Significant	Local	Likely	Long-term	Direct

9.9 Inward Impact

This section presents the findings of the ProPG Stage 2 Full Acoustic Assessment.

9.9.1 Element 1 – Good Acoustic Design Process

9.9.1.1 ProPG Guidance

In practice, good acoustic design should deliver the optimum acoustic design for a particular site without adversely affecting residential amenity or the quality of life of occupants or compromising other sustainable design objectives. It is important to note that ProPG specifically states that good acoustic design is not equivalent to overdesign or "gold plating" of all new development but that it seeks to deliver the optimum acoustic environment for a given site.

Section 2.23 of the ProPG outlines the following checklist for Good Acoustic Design:

- Check the feasibility of relocating, or reducing noise levels from relevant sources;

- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc;
- Assess the viability of alternative solutions; and,
- Assess external amenity area noise.

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In the context of the proposed development, each of the considerations listed above have been addressed in the following subsections.

9.9.1.2 Application of GAD Process to Proposed Application

9.9.1.2.1 Relocation or Reduction of Noise from Source

The main noise sources are located outside the redline boundary of the site and therefore it is beyond the scope of this development to introduce any noise mitigation at source.

9.9.1.2.2 Planning, Layout and Orientation

The layout of the site leaves a buffer of approximately 15 m in width between the development facades which are closest to the R394 road and a small buffer of the order of 10m onto the Ashe Road. Also, the open amenity areas within the site are located further back from the road and the noise level in these areas benefits from the acoustic screening offered by the buildings themselves.

9.9.1.2.3 Select Construction Types for meeting Building Regulations

Masonry constructions will be used in constructing the external walls of the development. This construction type offers high levels of sound insulation performance. However, as is typically the case the glazed elements and any required ventilation paths to achieve compliance with Part F of the Building Regulations will be the weakest elements in the façade in terms of sound insulation performance.

Consideration will therefore be given to the provision of upgraded glazing and acoustic vents where required. For units where it will not be possible to achieve the desirable internal acoustic environments with windows open, the proposal here will be to provide dwelling units with glazed elements and ventilators that have good acoustic insulation properties so that when the windows are closed the noise levels internally are good. Inhabitants will be able to open the windows if they wish, however, doing so will increase the internal noise level. This approach to mitigation is supported in ProPG where it states the following (note emphasis has been added in bold),

> *"2.22 Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided;* ***occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open****. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building*

envelope insulation with closed windows should be justified in supporting documents "

Note 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded

2.34 *Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling ventilation" in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal LAeq target noise levels should not generally be exceeded."*

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It is very important to note that it is impractical to achieve the good internal noise levels with windows open across the vast majority of development sites in close proximity to major infrastructure such as roads or airports. Such sites would need to be classified as having a negligible risk in accordance with the ProPG noise risk assessment approach. For this reason, there are no guidance documents either at a local level or an international level that AWN is aware of which would support the approach of achieving the ideal internal noise levels only in the open window scenario. It is therefore considered entirely correct and justifiable to provide building facades with a moderate degree of sound insulation such that with windows closed but vents opened a good internal acoustic environment is achieved.

9.9.1.2.4 Impact of noise control measures on fire, health and safety etc

The good acoustic design measures that have been implemented on site, e.g. upgrading the glazing along certain façades are not considered to have effects on fire risk issues or health and safety.

9.9.1.2.5 Assess Viability of Alternative Solutions

The option of introducing additional noise screening along the boundary of the site was considered. In this instance, it was concluded that the benefits of measures of this type would be limited given the proposed buffer between the houses and the surrounding road network.

9.9.1.2.6 Assess External Amenity Area Noise

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr."

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The values are largely based on WHO guideline values. In Figure 9.10, it is shown that across the majority of the site, the individual gardens and open amenity space are predicted to have noise levels generally within this range.

Good acoustic design principles employed have ensured that there is open space available in the quietest part of the site, which will be available to all occupants of the proposed development.

9.9.1.2.7 Summary

Considering the constraints of the site, in so far as possible and without limiting the extent of the development area, the principles of Good Acoustic Design have been applied to the development.

In terms of viable alternatives to acoustic treatment of façade elements, currently it is not considered likely that there will be further options for mitigation outside of proprietary acoustic glazing and ventilation.

9.9.2 Element 2 – Internal Noise Guidelines

9.9.2.1 Internal Noise Criteria

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 9.22 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur, such as New Year's Eve.

Table 9.22 ProPG Internal Noise Levels

Activity	Location	(07:00 to 23:00hrs)	(23:00 to 07:00hrs)
Resting	Living room	35 dB $L_{Aeq,16hrs}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hrs}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hrs}$	30 dB $L_{Aeq,8hrs}$ 45 dB $L_{Amax,T}$*

*Note The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.

In addition to these absolute internal noise levels ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal L_{Aeq} values by up to 5 dB can still provide reasonable internal conditions.

9.9.2.2 Discussion on Open/Closed Windows

In the first instance, it is important to note the typical level of sound reduction offered by a partially open window falls in the region of 10 to 15 dB.

Considering the design goals outlined in Table 9.22, and a sound reduction across an open window of 15 dB, the free-field noise levels that would be required to ensure that internal noise levels do not exceed good (i.e. at or below the internal noise levels) or reasonable internal noise levels (i.e. 5 dB above the internal noise levels) have been summarised in Table 9.23.

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Table 9.23 External Noise Levels Required to Achieve Internal Noise Levels

Level Desired	Day 07:00 to 23:00hrs	Night 23:00 to 07:00hrs
Good (i.e. at or below the internal noise levels)	50 – 55 dB $L_{Aeq,16hrs}$	45 dB $L_{Aeq,8hrs}$
Reasonable (i.e. 5 dB above the internal noise levels)	55 – 60dB $L_{Aeq,16hrs}$	50 dB $L_{Aeq,8hrs}$

For the buildings closest to the eastern boundary of the site the external noise levels are such that there are façades where it will not be possible to achieve the desired good internal noise levels with windows open, therefore appropriate acoustic specifications to windows and passive vents will be provided to ensure the rooms are adequately ventilated and achieve the good internal noise levels detailed here.

However, for the buildings in the central and western parts of the site, the noise levels are such the good acoustic conditions are possible with windows open.

9.9.2.3 Proposed Façade Treatment

The British Standard BS EN 12354-3: 2000: Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principles outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades.

9.9.2.4 Glazing

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As is the case in most buildings, the glazed elements of the building envelope are typically the weakest element from a sound insulation perspective. In this instance the facades along the first line of buildings as shown in Figure 9.13 will be provided with glazing that, when closed, achieve the indicative minimum sound insulation performance as set out in Table 9.24. See Figure 9.13 for the extent of glazing requirements in red and green zones.

Table 9.24 Sound Insulation Performance Requirements for Glazing, SRI (dB)

Façades	Octave Band Centre Frequency (Hz)						R_w
	125	250	500	1k	2k	4k	
Along Ashe Road (**Red**)	24	25	31	41	43	44	37
Along R394 (Green)	24	25	32	34	36	38	34

Acoustic specifications such as that presented in Table 9.24 can be achieved using double-glazed units with slightly thicker than standard glass. This performance could also be achieved using a suitably specified triple glazing window.

In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

The overall R_w outlined above are provided for information purposes only. The over-riding requirement is that the internal noise criteria is achieved, other combinations of upgraded glazing and ventilation (see below) may provide the same or better performance than those outlined here.

Figure 9.13 Site Plan with Areas for Acoustic Treatment in Red and Green

9.9.2.5 Wall Construction

In general, all wall constructions (i.e. block work or concrete) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal. The calculated internal noise levels across the building façade have assumed a minimum sound reduction index of 50 dB R_w for this construction.

9.9.2.6 Ventilation

The ventilation strategy for the development will be in accordance with Part F of the Building Regulations and will be finalised at the detail design stage. Options which will be considered to achieve compliance with background ventilation requirements will be adjustable hit and miss acoustic ventilators or trickle vents built into the façade or window frames respectively. It is recommended that the wall vents in the facades marked in red in Figure 9.13 are specified to achieve a sound insulation performance as set out in Table 9.25. This specification can be achieved by a range of proprietary vents in either through frame trickle vent or through wall vents.

Table 9.25 Sound Insulation Performance Requirements for Vents, SRI (dB)

Octave Band Centre Frequency (Hz)						$D_{ne,w}$
125	250	500	1k	2k	4k	
41	36	44	45	59	65	44

Similarly, the overall $D_{ne,w}$ outlined above are provided for information purposes only. The over-riding requirement is that the internal noise criteria is achieved, other combinations of upgraded glazing and ventilation may provide the same or better performance than those outlined here.

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9.9.2.7 Roofs

There is the potential for the roof structure to allow the passage of sound into the rooms. In order to control potential sound transmission via this route the ceiling / roof construction will need to provide a sound reduction in excess of that required for the windows.

For the proposed houses with pitched tiled roofs, a suitable sound reduction performance would be provided by a standard tiled or slated roof with a single 12.5mm layer plasterboard ceiling and heat insulation layer above the ceiling.

Any penetrations through the ceiling constructions must be as small as possible and made good by fully filling with plaster or with an acoustic sealant.

9.9.2.8 Internal Noise Levels

Taking into account the external façade levels and the specified building envelope the internal noise levels have been calculated. In all instances the good internal noise criteria are achieved for daytime and night-time periods.

9.9.2.9 Element 3 – External Amenity Area Noise Assessment

As previously discussed, Figure 9.10 illustrates that the inhabitants will have access to an outdoor amenity area at the especially in the north-eastern area of the site, which achieves a noise level ≤55dB $L_{Aeq,16hr}$ which is recommended in ProPG.

9.9.2.10 Element 4 – Assessment of Other Relevant Issues

Element 4 gives consideration to other factors that may prove pertinent to the assessment, these are defined in the document as:

- 4(i) compliance with relevant national and local policy
- 4(ii) magnitude and extent of compliance with ProPG
- 4(iii) likely occupants of the development
- 4(iv) acoustic design v unintended adverse consequences
- 4(v) acoustic design v wider planning objectives

Each is discussed in turn below.

9.9.2.10.1 Compliance with Relevant National and Local Policy

There are no National policy documents relating to the acoustic design of residential dwellings. Locally the Westmeath Noise Action Plan specifies that "*Local sources of noise pollution must be taken into account when planning and designing new residences*". This Acoustic Design Statement has been prepared in compliance with the requirements of ProPG and therefore complies with the requirements of local policy.

9.9.2.10.2 Magnitude and Extent of Compliance with ProPG

As discussed within this report the following conclusions have been drawn with regards to the extent of compliance with ProPG:

- All dwellings as part of the development have been designed to achieve the good level of internal noise levels specified within ProPG with windows closed but with the mechanical ventilation systems providing suitable levels of ventilation, and;
- All external amenity areas have been shown to have an external noise level that complies with the recommended criterion set out in ProPG.

Based on the preceding it is concluded that the proposed development is in full compliance with the requirements of ProPG.

9.9.2.10.3 Likely Occupants of the Development

The criteria adopted as part of this assessment are based on those recommended for permanent dwellings and are therefore considered robust and appropriate for the likely occupants.

9.9.2.10.4 Acoustic Design v Unintended Adverse Consequences

Unintended adverse consequences did not occur on this project.

9.9.2.10.5 Acoustic Design v Wider Planning Objectives

With reference to the Westmeath Noise Action Plan (NAP) 2018-2023, this assessment has demonstrated the noise insulation measures required to ensure that the proposed dwelling units achieve a good internal noise environment.

9.10 Mitigation

9.10.1 Construction Phase Mitigation

In this instance the assessment within this document has found that construction noise is expected to be below the level where a significant impact is likely to occur. Notwithstanding this, the contractor will be required to ensure that all best practice noise and vibration control methods will be used to minimise noise and vibration levels.

With regard to construction activities, best practice operational and control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2.*

BS5228 includes guidance on several aspects of construction site practices, including, but not limited to:

- selection of quiet plant;
- control of noise sources;
- screening (boundary, and or localised plant screening);
- hours of work;
- liaison with the public, and;
- monitoring.

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Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise monitoring.

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9.10.1.1 Selection of Quiet Plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. To facilitate this, each item of plant equipment will be required to comply with the EC Directive on Outdoor Noise Emissions 2000/14/EC. The least noisy item will be selected wherever possible.

9.10.1.2 Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that "as far as reasonably practicable sources of significant noise should be enclosed". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators.

BS5228 makes a number of recommendations in relation to "use and siting of equipment". These are all directly relevant and hence are reproduced below. These recommendations will be adopted on site.

> *"Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas.*
>
> *Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.*
>
> *Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.*
>
> *Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.*
>
> *Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material."*

Other forms of noise control at source relevant to the development works are set out below:

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- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling.
- For percussive tools such as pneumatic concrete breakers and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- Demountable enclosures can also be used to screen operatives using hand tools/ breakers and will be moved around site as necessary.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

9.10.1.3 Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver. Screening may be a useful form of noise control when works are taking place at basement and ground level to screen noise levels at ground floor adjacent buildings.

In addition, careful planning of the site layout will also be considered. The use of localised mobile (mobile hoarding screens and / or acoustic quilts) to items of plant with the potential to generate high levels of noise are an effective noise control measure. These options will be considered when percussive works are taking place in close proximity to the nearest sensitive perimeter buildings.

In particular, screening offering a reduction in noise levels of 10 dB will be required along the boundaries with the Ashfield housing area.

9.10.1.4 Liaison with the Public

A designated noise liaison will be appointed to site during construction works. All noise complaints will be logged and followed up in a prompt fashion by the liaison officer. In addition, prior to particularly noisy construction activity, the liaison officer will inform residents at the nearest noise sensitive locations of the time and expected duration of the noisy works.

9.10.1.5 Hours of Work

Construction works will be undertaken within the times below, taken from the Construction Environmental Management Plan:

- Monday to Friday 07:00 to 18:00hrs
- Saturday 08:00 to 14:00hrs
- Sunday and Public Holidays No work on site.

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However, it may be necessary for some construction operations to be undertaken outside these times, for example; connections to public service systems or utilities. Such works will be agreed in advance with Westmeath County Council.

In order to ensure that acceptable operational noise levels at the nearest noise sensitive locations are achieved, the following mitigation measures will be considered during the detailed design stage.

9.10.2 Operational Phase Mitigation

9.10.2.1 Additional Vehicular Traffic on Surrounding Roads

During the operational phase of the development, noise mitigation measures with respect to the impact of traffic from the development are not deemed necessary.

9.10.2.2 Building Services Plant

With consideration at the detailed design stage the selection and location of plant items will ensure that noise emissions to sensitive receivers both external and within the development itself will be within the relevant criteria, therefore no further mitigation is required.

Considering that sensitive receivers within the development are much closer than off-site sensitive receivers, once the relevant noise criteria is achieved within the development it is expected that there will be no negative impact at sensitive receivers off site.

9.10.2.3 Inward Impact

At detailed design stage, glazing and vent specifications such as the indicative values presented in sections 9.9.2.4 and 9.9.2.6 respectively will ensure suitable internal noise levels.

9.10.3 Cumulative Mitigation

9.10.3.1 Construction Phase

No noise mitigation measures are required.

Nonetheless it is recommended that liaison between construction sites is on-going throughout the duration of the construction phase. Contractors should schedule work in a co-operative effort to limit the duration and magnitude of potential cumulative impacts on nearby sensitive receptors.

9.10.3.2 Operational Phase

Not required.

9.11 Residual Impact Assessment

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This section describes the degree of environmental change that will occur after the proposed mitigation measures have taken effect.

9.11.1 Construction Phase

During the construction phase of the project there is the potential for short-term noise effects on nearby noise sensitive properties due to noise emissions from site activities. The application of binding noise limits and hours of operation, along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum as far as practicable.

Likely noise and vibration effects during the construction phase will be local, negative, short-term and moderate.

9.11.2 Operational Phase

9.11.2.1 Additional Vehicular Traffic on Surrounding Roads

The predicted change noise levels associated with additional traffic is predicted to be of imperceptible impact along the existing road network. In the context of the existing noise environment, the overall effects from noise contribution of increased traffic is considered to be of neutral, imperceptible and long-term effect to nearby noise sensitive locations

9.11.2.2 Building Services Plant

Noise levels associated with operational plant are expected to be well within the adopted day and night-time noise limits at the nearest noise sensitive properties taking into account the site layout, the nature and type of units proposed and distances to nearest residences. Assuming the operational noise levels do not exceed the adopted design goals, the resultant residual noise effects from this source will be of negative, not significant, long-term impact.

9.11.3 Cumulative Impact

The cumulative noise impacts associated with existing and development related traffic, along with the developments mentioned in Section 9.8.3 has been considered within this assessment and the effects are considered neutral, imperceptible and long-term at all locations.

9.11.4 Summary

Table 9.26 summarises the identified likely significant effects during the construction phase of the proposed development following the application of mitigation measures.

Table 9.26 Summary of Construction Phase Effects Post Mitigation

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Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Construction	Negative	Significant up to 20m distance, otherwise Moderate	Local	Likely	Short-term	Direct
Construction Vibration	Negative	Not Significant	Local	Likely	Short-term	Direct
Construction Traffic	Negative	Not Significant	Local	Likely	Short-term	Direct

The Table below summarises the identified likely significant effects during the operational phase of the proposed development post mitigation.

Table 9.27 Summary of Operational Phase Effects Post Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Building Services	Negative	Not Significant	Local	Likely	Long-Term	Direct
Traffic	Neutral to Negative	Imperceptible to Not Significant	Local	Likely	Long-term	Direct

9.12 Risk of Major Accidents or Disasters

Not applicable.

9.13 Significant Interactions

The noise assessment interacts with the traffic assessment - the additional traffic on roads surrounding the development has been taken into account in the assessment. The associated effect is neutral to negative, imperceptible to not significant and long-term.

9.14 References & Sources

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- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (2022);
- British Standard Institute (BSI) BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (BSI, 2014);
- British Standard Institute (BSI) BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (BSI, 2014);
- British Standard Institute (BSI) BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI, 1993);
- UK Department of Transport (UK DOT) Calculation of Road Traffic Noise (UK DOT, 1988);
- United Kingdom Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2 (UKHA, 2020);
- British Standard Institute (BSI) BS 4142: 2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound;
- International Organization for Standardization (ISO) ISO 1996: 2017: Acoustics – Description, measurement, and assessment of environmental noise (ISO, 2017).
- World Health Organisation Environmental Noise Guidelines for the European Region, 2018
- Professional Practice Guidance on Planning & Noise (ProPG) Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH) (2017)
- Westmeath County Council Noise Action Plan 2018-2023
- Transport Infrastructure Ireland Guidelines for the Treatment of Noise and Vibration in National Road Schemes (2014)