Redkite
Environmental

Ciaran Reilly

Proposed Residential Development

Main Street
Rathcoole
Co.Dublin

Response to Request for Further Information

Acoustic Design Statement

July 2023

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Contents

1.0 Introduction

Redkite Environmental Ltd. was commissioned by Ciaran Reilly to complete an Acoustic Design Statement in in response to a request for further information (RFI) relating to a planning application (file ref. No. SD22A/0323) for a proposed residential development comprising 12 dwellings, on a 0.48 hectare (ha) site off Main Street, Rathcoole. Refer to Attachment 1 for the proposed layout.

The local authority has requested the following under Item 15:

> *The site is located within the Significant Noise Boundary of Casement Aerodrome. The principles of residential development are not contested at the site; however, appropriate noise assessment should be undertaken and mitigation measures to protect residential amenity should be proposed by way of additional information.*

1.1 Assessment & Report Objectives

To address the local authority requirements, the principal aims of this study and report are to:

- ✓ Conduct a baseline sound survey to characterise the existing ambient sound environment and specifically quantify aircraft noise.
- ✓ Complete a desk-based study on aircraft movements in the area. In this regard liaise with the Defence Force where possible.
- ✓ Use the Guidance set out in the UK ProPG: Planning & Noise, New Residential Development, May 2017 to assess the noise exposure risk on the site for future residential. This Guidance incorporates the requirements of *BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.* Pro-Pg is listed as appropriate Guidance in the Noise Action Plan 2018 – 2023 for South Dublin.

2.0 Methodology

2.1 Competency

This assessment has been prepared by Ms. Siobhan Maher whose qualifications include a B.Sc. in Analytical Science, M.Tech. in Environmental Management and a post graduate Diploma in Acoustics and Noise Control Engineering. Siobhan is a full Member of the Institute of Acoustics (MIOA) since 2003 and also a Member of the Association of Acoustic Consultants Ireland (AACI). Siobhan was recently involved in the preparation of the AACI Environmental Noise Guidelines for Local Authority Enforcement and Planning Sections published in June 2019. http://aaci.ie/industry-publications/

Siobhan is the Managing Director of Redkite Environmental with over 20 years of experience providing environmental consultancy and environmental assessment services to business, industry and public sectors. In the area of acoustics, she has experience in environmental noise and vibration impact assessment, building acoustics (design and standard assessment),

environmental noise monitoring and prediction modelling and occupational noise assessment.

The methodology used in completing this report is presented below.

2.2 Characterisation of the Receiving Environment

The receiving environment, in terms of noise has been characterised by desk-based study, four site visits and two noise monitoring surveys completed on dates between 23rd – 24th and 27th – 28th February 2023.

2.2.1 Desk-Based Study

Transportation noise mapping available on https://gis.epa.ie/EPAMaps/ for the area was reviewed as part of the characterisation of the local soundscape.

The Air Corps Press Office also provided a broad overview of aircraft types that were operational during the survey dates.

2.2.2 Field Survey

In total, approximately 48 hours of monitoring using an unattended meter was completed over the course of 2 site visits. The meter was left on the site to record day, evening and night-time noise levels. During each visit the existing soundscape and site context in terms of all noise sources was observed.

The noise measurement methodology followed was in accordance with the recommendations of the following:

- ISO 1996 Acoustics – Description, Measurement and Assessment of Environmental Noise, Part 1, Basic Quantities and Assessment Procedures (2016) and Part 2 Determination of Environmental Noise Levels (2017), and,
- The EPA Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities, (NG4), revised January 2016.

The unattended ambient sound monitoring was undertaken at one Noise Monitoring Points (NMP) as described in Table 1 below and illustrated on Figure 1 and Plate 1 overleaf.

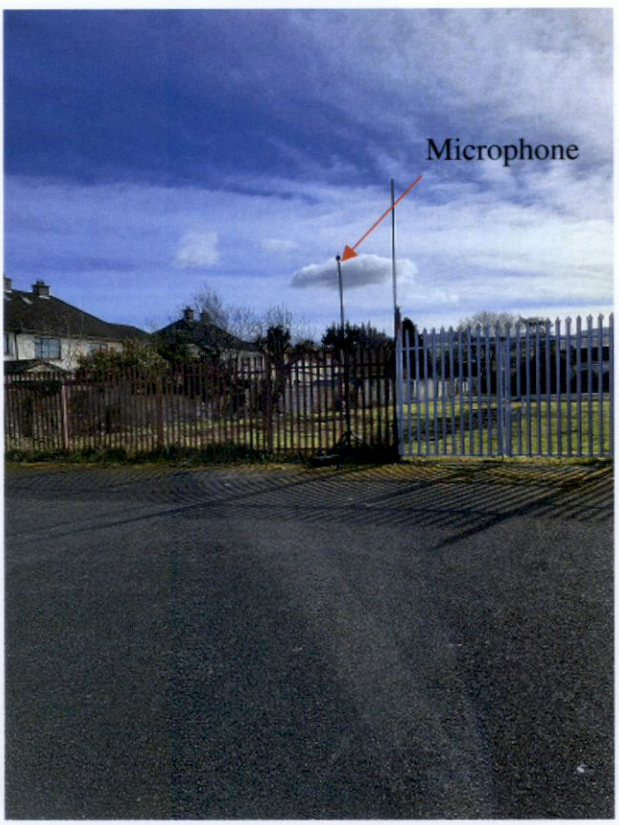
Table 1 Noise Monitoring Point

Location	Grid Ref.	Description
NMP1 (unattended)	302122E; 226655N	Approx 85m setback from the centre-line of Main Street

Figure 1 Noise Monitoring Location

Source: Google Maps. Red line boundary indicative only.

Plate 1 NMP1



Unattended monitoring at NMP1 was completed from Thursday, 23/2/23 @ approx. 12.50 hrs to Friday, 24/2/23 @13.30 hrs.

The second event was completed on Monday 27/2/23 @ approx. 10.20hrs to Tuesday 28/2/23 @ 10.45 hrs.

All primary noise sources contributing to the ambient sound environment were noted during the site visits. Audio was recorded during the unattended events to aid with later analysis.

Overall weather conditions prevailing during the survey were suitable for noise monitoring. The following weather synopsis is taken from Casement Aerodrome:

23- 24th Feb 2023:

A gentle breeze up to 5m/sec occurred from a northwesterly direction initially but was below 4m/sec. Wind direction changed from northwesterly to west/southwesterly through the course of the day (23rd), overnight and during the daytime of the 24th February 2023. Temperatures were between 6 -8°C. No rainfall occurred during the monitoring period.

27th – 28th Feb 2023:

A gentle breeze up to 5m/sec occurred from an easterly direction initially but reduced overnight to very calm conditions from a mainly northwest direction. Wind direction changed to north/northeast from 07.00 hrs on the 28th February 2023. Temperatures were around 5 - 6°C. Some rainfall occurred during the monitoring period between 05.00 - 06.00 hrs on the 28th February 2023. Rainfall was noted in the audio data at a similar time and have been accounted for in the characterisation of the baseline sound environment.

Sound measurements were carried out using a Type 1 Sound Level Meter (SLM) and associated hardware (calibrator and weather-proof outdoor kit). Software used includes Nti Extended Acoustic Pack and Noise Explorer Version 2.0 for post-processing and analysis. The microphone was placed at a height of approx. 4m above ground level (Refer to Plate 1).

The monitoring equipment was calibrated before and after use. The observed drift was <0.2 dB. Sound levels were measured using the A-weighted network, and a fast-sampling interval. Further details of the monitoring equipment used are set out in Table 2 below.

Table 2 Monitoring Equipment

Instrument Type	Manufacturer	Model Number	Serial Number
Sound Level Meter	NTi	XL2	A2A-08898-E0
Microphone	NTi	MA220	5062
Acoustical Calibrator	NTi/Larson Davis	CAL 200	11728

The SLM including the microphone and the calibrator have been externally calibrated in accordance with standard procedures. All tests are traceable in accordance with ISO/IEC 17025. Attachment 2 contains the calibration certs for the equipment used.

A Testo 410-1 (Serial No. 38463402/711 with manuf. calibration cert) Digital Wind Speed Scale Gauge Meter Anemometer with a range from 0.4 – 20m/s and a temperature range from -10 – 50°C was used also used on-site to measure wind speeds and temperature.

2.3 Impact Assessment

The UK ProPG: Planning & Noise, New Residential Development, May 2017[1] was used as guidance in completing the inward noise impact assessment or noise exposure risk to future residents arising from transportation noise. This document outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. Stage 1 comprises an initial noise risk assessment of sites proposed for residential development considering either measured and/or predicted noise levels. A site is then characterised as negligible to high risk in terms of exposure of future residents to transportation noise. A full stage 2 assessment including implementing a good acoustic design process is triggered depending on the existing ambient noise environment and findings of the Stage 1 Noise Risk Assessment.

3.0 Definitions

The following definitions apply in this report:

L_{Aeq} is the A – weighted equivalent continuous sound level – the sound level of a steady sound having the same energy as a fluctuating sound over a specified measurement period.

L_{A10} is the A-weighted noise level which is exceeded for 10% of the specified measurement period. This gives an indication of the upper limit of fluctuating noise such as that from intermittent road traffic over the measurement period.

L_{A90} is the A-weighted noise level exceeded for 90% of the measurement period and is useful in providing an indication of the background noise level experienced over the measurement period.

L_{AFmax} is the maximum A-weighted noise level measured during a cycle with a fast time weighting.

[1] This document was prepared by a working group comprising members of the UK Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption, it has been generally considered as a best practice guidance for assessing inward noise risk for new residential development.

L_{AFmin} is the minimum A-weighted noise level measured during a cycle with a fast time weighting.

$L_{Aeq,16hr}$ A-weighted, Leq. Sound Level, measured over the 16-hour period 07.00 - 23.00 hours

L_{day} Day equivalent level: A-weighted, Leq. Sound Level, measured over the 12-hour period 07.00 - 19.00 hours

L_{den} Day-evening-night level. It is a descriptor of noise level based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night-time noise (23.00-7.00) and an additional penalty of 5 dB(A) for evening noise (i.e. 19.00-23.00).

$L_{evening}$ Evening time equivalent level: Leq. A-weighted, Sound Level, measured from 19.00 – 23.00 hours.

L_{night} Night equivalent level: Leq. A-weighted, Sound Level, measured overnight 23.00 – 07.00 hours.

Rw – weighted sound reduction index - a single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies. (Laboratory measurement). The apparent Rw is the value as measured in the field.

SEL – Single Event Level - the dB(A) level which if it lasted for one second would produce the same A-weighted sound energy as the actual event. Also known as L_{Ae}.

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

4.0 Description of Existing Conditions

The proposed development site has an area of 0.48 ha and generally comprises of two sections. The northern section is in hardstand and comprises an existing 2-storey protected building used for office space, car-parking and a number of sheds. The remaining southern part of the site is grassed.

The site is bounded to the north by Rathcoole Main Street and to the east and west by existing residential development. There are also 2 public houses, Rathcoole Inn and Baurnafea House, to either side of the protected structure. The grassed area is bounded by a 1-5 - 2m high block work wall.

Casement Aerodrome lies to the northeast with two runways oriented southwest/northeast and northwest/east. During the site visits, training planes were observed descending slightly northwest of the site over Rathcoole to approach the southwest runway from a south-westerly direction.

5.0 Results of Monitoring

Attachment 3 contains the logged printout results from NTi Explorer Software V. 1.92 for NMP1.

The ambient sound environment of the site is not dominated by any one individual source. It is characterised by a number of noise sources including distant traffic on the N7, local traffic on the Main Street and intermittent overhead aircraft. Other sources audible at times included low level music and talking (late evening) from the adjacent public houses. Dogs barking and birdsong were considered to be significantly contributory to the sound levels recorded. These sources also contributed to some L_{Amax} values > 60 dB at night.

The site is screened from Rathcoole Main Street by the existing 2-storey buildings. Therefore, local traffic is present with some individual noisy vehicles audible but the set-back and screening reduces the noise exposure risk from this source to the proposed residential buildings.

Due to wind direction, the N7 traffic noise was more clearly audible and predominant on the 27th and 28th February compared to the 23rd/24th when the predominant wind direction was south-westerly.

A dog barking in a nearby house contributed the highest values recorded. Extremely high values were removed from the data.

Aircraft noise recorded was noted in a number of categories:

- Up to 28 "jets" descending from the southwest. These are Air Corp training planes and were the loudest noted.
- Other aircraft noise "planes" which were more distant/higher in altitude in nature and not particularly loud.
- Smaller aircraft, possibly helicopters but these may also be included under "planes".

Tables 3 and 4 overleaf summarise the findings of the monitoring undertaken at NMP1.

Table 3 Summary Results NMP1 (23rd – 24th February)

Interval	L_{Aeq}	L_{A10}	L_{A90}	L_{AFmax}	Description of Ambient Noise Environment
$L_{Aeq,16hr}$ (07.00 -23.00 hrs)	54	56	49	77	Mixture of sources as described above. Large individual barks, crows cawing, horns and motorbike (1) excluded where possible. A large amount of birdsong and lower dog barking could not be excluded due to the amount. The total noise levels are not representative of transportation noise alone.
L_{day} (07.00 – 19.00hrs)	54	56	50	76	
$L_{evening}$ (19.00 – 23.00hrs)	51	54	46	77	
L_{night} or $L_{Aeq,8hr}$ (23.00 – 07.00hrs)	48	52	39	67	
L_{den}	56				

Table 4 Summary Results NMP1 (27th – 28th February)

Interval	L_{Aeq}	L_{A10}	L_{A90}	L_{AFmax}	Description of Ambient Noise Environment
$L_{Aeq,16hr}$ (07.00 - 23.00 hrs)	56	60	46	80	Motorway noise was higher during this event due to the wind direction. Rain occurred between 06.00 - 07.00hrs and would have caused wet road conditions thus potentially increasing distant road traffic noise as well as affecting the microphone. Birds were tweeting at night-time and were especially loud during the dawn chorus. A delivery truck or possibly a waste lorry to one of the nearby premises was audible at 06.52 hrs (this was removed from the data). A large amount of birdsong and lower dog barking could not be excluded. The total noise levels are not representative of transportation noise alone.
L_{day} (07.00 – 19.00hrs)	58	61	50	80	
$L_{evening}$ (19.00 – 23.00hrs)	47	50	43	68	
L_{night} or $L_{Aeq,8hr}$ (23.00 – 07.00hrs)	52	58	36	68	
L_{den}	58				

As noted from the Tables above, noise levels were higher on 27th – 28th February however weather conditions were a contributory factor. Therefore, the values recorded on the 23rd – 24th February are considered to be more representative of neutral conditions.

The total noise associated with aircraft has been extracted from the data as follows:

Table 5 Aircraft Noise

Type	Total Duration (secs)	L_{Aeq}	L_{Amax}	Total SEL (all events)
23rd – 24th Feb				
Jet	940	62	76	92
Planes	2,551	55	70	90
Other aircraft	549	55	74	82
27th – 28th Feb				
Jet	732	69	80	97
Plane & other aircraft	1492	51	64	83

Three planes were noted during the night-time period of the 23rd – 24th Feb. These occurred between 06.22 – 06.30 hrs on the 24th February.

Ten planes were noted during the night-time period of the 27th – 28th Feb. 50% occurred between 23.00 hrs –00.15 hrs while the remainder occurred between approx. 03.00 – 04.15 hrs. Not all L_{Amax} values associated with the planes were above 60 dB.

The loudest aircraft are the training jets but these occurred during daytime hours only.

The $L_{Aeq16hr}$ values are calculated as 44 – 48 dB(A) for all identified aircraft noise only.

The L_{night} values are calculated as 32 – 34 dB(A) for all identified aircraft noise only.

It is clear from the data, that the aircraft noise averaged over the assessment periods is low. However, assessment will be based on L_{Amax} values in this instance in order to ensure an adequate level of sound insulation to future-proof the development.

Tables 6 and 7 overleaf presents the L_{Amax} and the SEL values for the loudest aircraft - jets.

Table 6 Training Plane (Jets) Passover Noise Data (23rd – 24th February 2023)

Jets	31.5	63	125	250	500	1000	2000	4000	8000	L_{Amax}	L_{Ae}
	Hz dB(A)										
1	17	37	57	64	68	67	66	57	39	73	79
2	24	41	54	66	68	72	69	60	42	76	81
3	22	41	57	67	70	72	69	63	47	76	82
4	20	34	53	60	62	61	56	39	18	67	73
5	22	40	56	62	66	67	65	58	41	72	79
6	27	41	56	66	69	72	68	61	42	75	82
7	20	38	49	61	69	68	67	57	40	73	80
8	20	37	54	67	74	71	69	62	46	77	83
9	25	40	61	64	68	69	68	59	43	74	80

Jets	31.5	63	125	250	500	1000	2000	4000	8000	L_{Amax}	L_{Ae}
	Hz dB(A)										
10	23	38	53	65	69	67	65	55	39	73	80
11	22	34	56	63	69	69	67	58	41	74	81

Table 7 Training Plane (Jets) Passover Noise Data (27th – 28th February 2023)

Jets	31.5	63	125	250	500	1000	2000	4000	8000	L_{Amax}	L_{Ae}
	Hz dB(A)										
1	43	56	63	63	71	72	70	61	52	76	81
2	37	44	48	58	65	71	67	55	52	73	81
3	40	60	61	69	74	72	69	61	41	78	83
4	32	56	58	66	64	62	59	43	22	70	75

Jets	31.5	63	125	250	500	1000	2000	4000	8000	L_{Amax}	L_{Ae}
	Hz dB(A)										
5	35	52	57	65	64	64	59	48	33	70	75
6	22	32	57	59	59	60	56	43	23	66	72
7	31	36	52	55	58	61	55	37	23	64	71
8	28	34	52	56	59	54	46	35	22	62	70
9	19	34	44	65	58	54	46	20	16	66	72
10	26	42	57	66	68	78	70	43	36	79	86
11	28	41	56	67	69	78	69	41	34	79	85
12	28	40	60	64	69	76	68	40	32	78	85
13	32	41	54	65	69	78	70	41	34	79	86

Jets	31.5	63	125	250	500	1000	2000	4000	8000	L_{Amax}	L_{Ae}
	Hz dB(A)										
14	33	43	57	68	72	80	71	43	41	81	87
15	28	41	54	66	69	78	71	42	37	80	87
16	37	50	55	67	70	79	71	42	38	80	87
17	24	39	59	65	70	77	69	41	34	78	86
18	25	41	57	66	70	78	70	42	37	80	86
19	34	44	57	66	71	79	71	43	35	80	87

6.0 Desk-Based Study

6.1 South Dublin County Development Plan 2022 – 2028

Section 11. 8.6. of the South Dublin County Development Plan 2022 – 2028, sets out policy on airport and aerodrome noise as follows:

> *The areas within which aircraft noise may be significant in the vicinity of the airports and aerodromes is indicated on the Development Plan Maps and these noise significant areas may be subject to updating. For residential development and other noise vulnerable land uses, an appropriate noise assessment with accompanying mitigation measures to protect residential amenity should be submitted.*

Policy IE13 Noise notes:

> *Discourage noise sensitive developments in the immediate vicinity of airports and aerodromes.*

IE13 Objective 1 notes:

> *To limit residential development and other land uses impacted by noise, such as nursing homes, schools, hospitals and conference centres within the Noise Significant Area Boundary delineated for Casement and Weston… and ensure that any noise sensitive uses are subject to an appropriate noise assessment and mitigation measures to protect residential amenity.*

Land-use zoning map 8 indicates the site within the significant noise boundary.

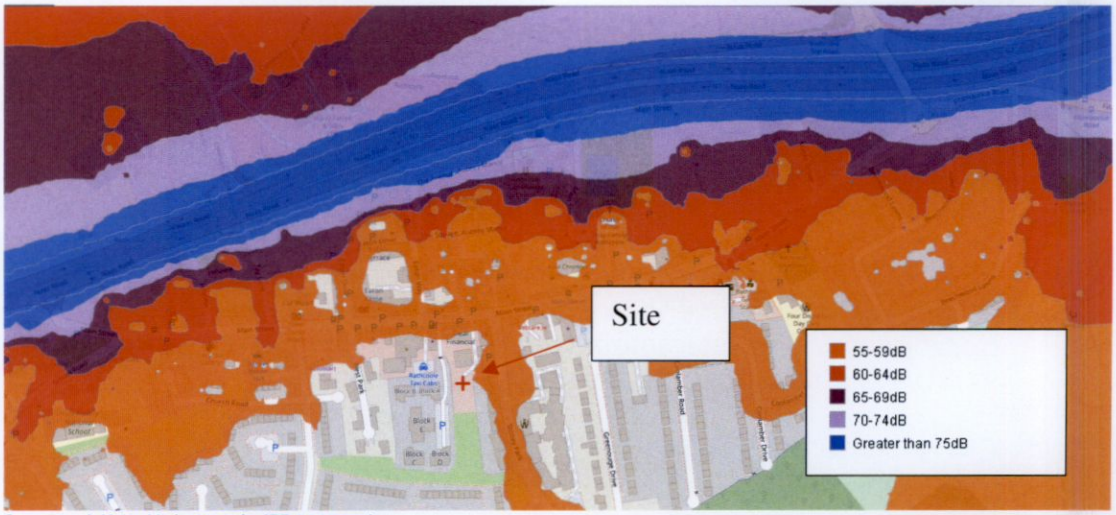
6.2 Casement Aerodrome Consultation

The Press Office of the Air Corps confirmed that a mix of planes and helicopters were operational during the survey. For security reasons no other information could be provided.

6.3 Environmental Noise Action Plan

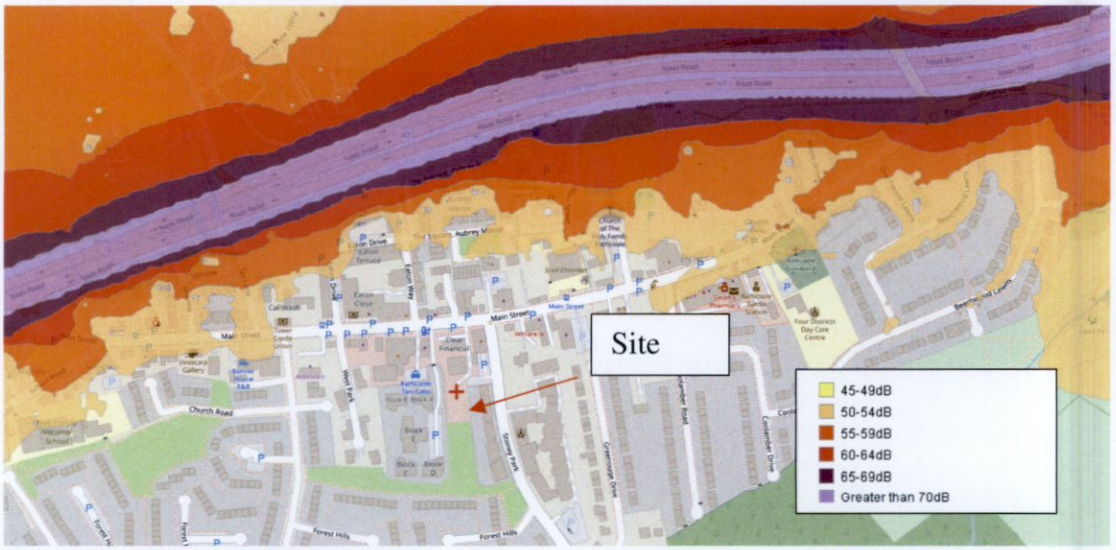
Volume IV of the Environmental Noise Action Plan for the Dublin Agglomeration, December 2018 – July 2023 has been prepared for the South Dublin area. Related traffic noise mapping is available on the EPA's website https://gis.epa.ie/EPAMaps/. The N7 has been mapped. However, it should be noted that the mapping is strategic and therefore it is not intended to replace site specific surveys. Figures 2 and 3 below re-produce the Round 3 road noise mapping in the vicinity of the site.

Figure 2 Latest Round 3 Road Noise Mapping L_{den}



Source: https://gis.epa.ie/EPAMaps/

Figure 3 Latest Round 3 Road Noise Mapping L_{night}



Source: https://gis.epa.ie/EPAMaps/

NMP1 does not fall within the mapped traffic noise bands however the N7 was audible during all site visits but especially during the 2nd visit when the wind direction was from the north/east.

The Noise Action Plan notes the following with regards to desirable and undesirable sound levels:

Desirable Low Sound Levels:

< 50 dB(A) L_{night}

<55 dB(A) L_{day}

Undesirable High Sound Levels:

> 55 dB(A) L_{night}

>70dB(A) L_{day}

Based on the baseline sound survey undertaken and taking into account anthropogenic noise *only* (mainly aircraft and road traffic), it is considered that the site falls within or close to the desirable low sound levels.

Section 8.2.3 of the Plan deals with noise in the planning process. This section refers to the use of the UK Pro-PG Guidance for assessing noise exposure of new residential proposed in an area with an existing climate of environmental noise as there is currently no clear national guidance on appropriate noise exposure levels.

6.4 World Health Organisation Guidelines

The World Health Organisation (WHO) has set guidelines for external road traffic noise and aircraft noise which are as follows:

Road Traffic:

> *For average noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic below 53 dB L_{den}, as road traffic noise above this level is associated with adverse health effects.*
>
> *For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night-time below 45 dB L_{night}, as night-time road traffic noise above this level is associated with adverse effects on sleep.*
>
> *To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure.*

Road traffic noise is likely to be close to the WHO Guideline values, however it was difficult to fully assess as other semi-continuous sources contributed to the ambient sound environment and could not be completely removed from the data.

Aircraft:

> *For average noise exposure, the GDG strongly recommends reducing noise levels produced by aircraft below 45 dB L_{den}, as aircraft noise above this level is associated with adverse health effects.*

> *For night noise exposure, the GDG strongly recommends reducing noise levels produced by aircraft during night-time below 40 dB L_{night}, as night-time aircraft noise above this level is associated with adverse effects on sleep.*
>
> *To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from aircraft in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends implementing suitable changes in infrastructure.*

Based on the survey undertaken, the site is likely to fall at (L_{den}) or under (L_{night}) the WHO Guidelines for aircraft noise.

7.0 Description of Development

7.1 General Project Description

The Project consists of the following:

- Retention of the existing 2-storey protected structure;
- Demolition of modern sheds;
- Construction of 11 No. 2-storey dwellings within the southern or grassed portion of the site;
- Provision of car-parking and landscaping.

Traditional or timber frame construction methods are being considered. All units will be fitted with mechanical ventilation and air to water heat pumps.

8.0 Inward Noise Risk Assessment – Future Residents

Noise can have a significant effect on the health and well-being of individuals and communities. Therefore, noise is a material consideration in the planning process and a key aspect of sustainable development. This is recognised in the Noise Action Plan as discussed earlier in Section 6.0. The Plan makes reference to the UK ProPG: Planning & Noise, New Residential Development, May 2017[2] which is a guidance document now widely used to provide a methodology to assess the potential for noise exposure risk future residents. This document outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development.

Stage 1 comprises an initial noise risk assessment of sites proposed for residential development considering either measured and/or predicted noise levels. A site is then characterised as negligible to high risk in terms of exposure to noise of future residents. A full stage 2 assessment including implementing a good

[2] This document was prepared by a working group comprising members of the UK Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption, it has been generally considered as a best practice guidance for assessing inward noise risk for new residential development.

acoustic design process is triggered depending on the existing ambient noise/predicted future transportation noise environment and findings of the Stage 1 Noise Risk Assessment.

Figure 4, as shown overleaf, is taken from the Guidance and illustrates the potential noise exposure risk relative to indicative daytime ($L_{Aeq,16hr}$) and night-time ($L_{Aeq,8hr}$) noise levels.

ProPG requires that the site be assessed for noise exposure risk without any potential screening from existing buildings or structures (within the site) that do not form part of the proposed development. The existing protected structure will be retained and will continue to provide traffic noise screening to the proposed residential development which will be set back approx. 85m from the centre line of Main St. The removal of the sheds will not affect future noise levels. NMP1 was placed in an open location in proximity to the proposed dwellings location with the microphone at 4m in height above ground (new dwellings are 2-storey). Based on the monitoring undertaken at NMP1, the noise risk exposure of the site is classified as low.

The number of L_{Amax} values due to anthropogenic sources above 60 dB during the night-time was <10 on the 23rd-24th February but > 10 on 27th-28th February however this was due to wet road conditions/wind direction. Of these, 5 no. were due to aircraft noise during the night-time.

Figure 4 Stage 1 Risk Assessment

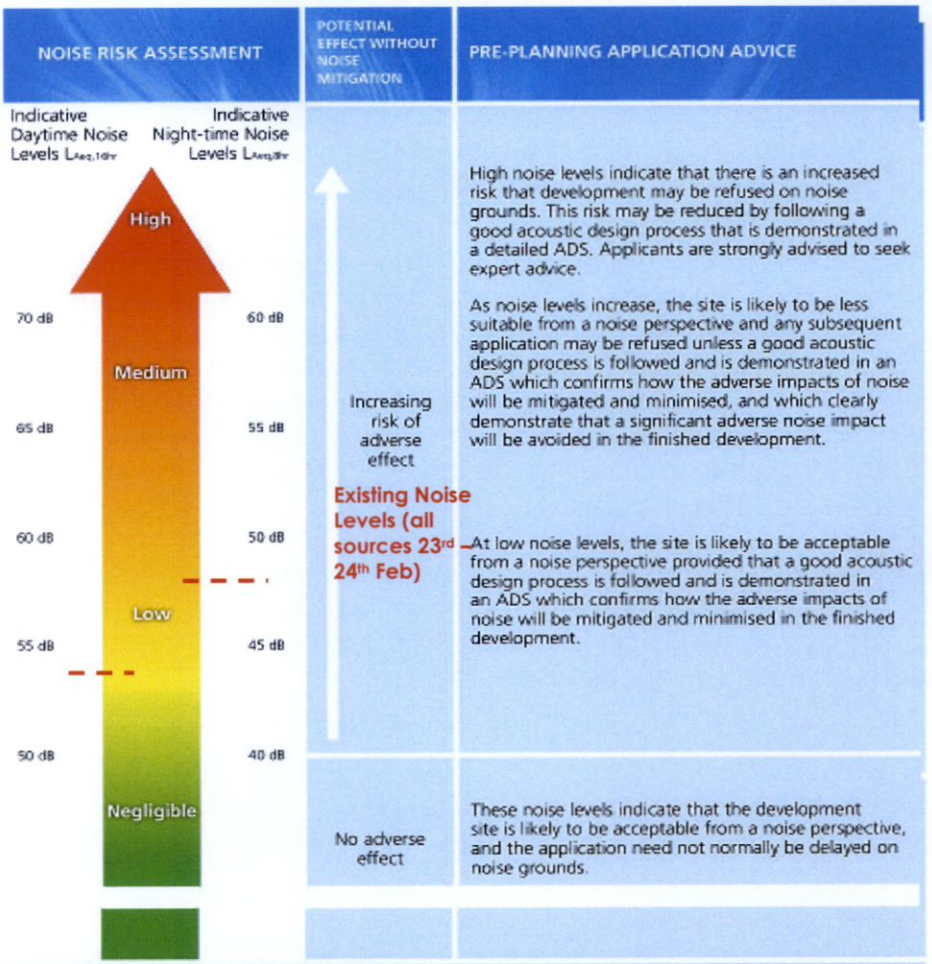


Figure 1 Notes:

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.

d. An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F}$ > 60 dB means the site should not be regarded as negligible risk.

Source: UK ProPG: Planning & Noise, New Residential Development, May 2017

8.1 Internal Noise

Appropriate guidance in relation to noise intrusion in residential and other buildings is contained within BS8233:2014 – *Guidance on Sound Insulation and Noise Reduction for Buildings*. This British standard sets out recommended noise limits for indoor ambient noise levels and takes account of guidelines issued by bodies such as the WHO. Details taken from the standard are presented in Table 8 below.

Table 8 Recommended Indoor Ambient Noise Levels

Criteria	Typical Situation	Design Range $L_{Aeq,T}$	
		07.00-23.00	23.00 -07.00
Resting	Living Room	35 $L_{Aeq,16hr}$	-
Dining	Dining Room	40 $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 $L_{Aeq,16hr}$	30 $L_{Aeq,8hr}$ 45 $L_{Amax,f}$*

Source: BS8233:2014 and Pro-PG

Column 4 in the table above includes for an additional $L_{Amax,f}$ value as per Pro-PG guidelines. The following is noted in this regard:

Note 4:

> *"Regular individual noise events (for example scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,f}$ depending on the character or number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night time (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,f}$ more than 10 times a night.*

Pro-PG also notes the following with regards to achieving internal target levels:

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 values subject to the further advice in Note 7.*

Note 7:

> *Where development is considered necessary or desirable, despite external noise levels above WHO Guidelines, the internal L_{Aeq} target*

levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

Taking account of a 10 -15 decibel reduction of external noise levels to internal across a partially open window, the following external noise levels apply:

Table 9 External Noise Levels to Achieve Internal Criteria with Partially Open Windows

Internal Condition	$L_{Aeq,16hr}$ (dB)	$L_{Aeq,8hr}$ (dB)
Good	50 - 55	45
Reasonable	55 - 60	50

Based on the overall monitoring undertaken, it is expected that good to reasonable internal conditions will be met with open or partially open windows.

8.1.1 Glazed Elements and Ventilation

The site is low risk however, to future proof the development, the L_{Amax} values for training planes or jets have been taken into account in specifying the window, wall, glazing, roof and ventilation specifications to achieve the good internal noise level criteria as set out in Table 8. The specification has been determined in accordance with EN ISO 12354-3: 2017 based on the measured L_{Amax} levels (Tables 6 and 7) and the room and facade dimensions from the drawings provided.

The glazed elements and ventilation openings are typically the acoustically weakest elements of any façade. The required sound insulation performance of the façade glazed elements and ventilation openings is outlined in Table 10 below.

It is required that the glazing, frame and seals as a whole achieve the performance when the window is in the closed position. The performance requirements outlined in Table 10 below are considered to provide adequate sound insulation to achieve the relevant day and night internal design goals respectively.

Table 10 Sound Insulation performance requirements for glazed elements and ventilation

Façade	Glazed Elements (Frame & Glazing) Sound Insulation Requirements (Indicative requirements equal or approved)							Façade Ventilation
	Octave Band Frequency Requirements[1]						Glazing Acoustic Performance R_W	
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz		
GREEN	20	18	24	34	40	36	30	Mechanical Ventilation[1]

1) Assumes fully sealed system with no passive openings or trickle vents.

The marked-up performance requirements for each façade is set out in Attachment 4.

It is important to note that the requirements outlined above are the minimum requirements for the glazed element as a whole. The octave band values are indicative and specific to the assessed glazing type, equal or approved to meet the minimum project requirements is acceptable.

We understand the ventilation strategy is proposed as a fully mechanical ventilation system. Based on the information provided to us on the ventilation system, it has been assumed that this system is fully sealed with no passive openings or trickle vents. Should the ventilation strategy change to natural ventilation strategy an acoustic consultant should be engaged to provide an appropriate natural ventilation sound insulation performance requirements for any passive ventilation openings including trickle vents. Typically, the use of a natural ventilation strategy will lead to an enhanced glazing specification compared to a sealed mechanical ventilation system. This assessment is based on the windows in closed position.

It should be noted that the above façade specification for glazing and ventilation units is intended for the purpose of habitable spaces and is not a requirement for WCs and communal space corridors.

It is recommended that the window supplier provide laboratory tests confirming the airborne sound insulation performance in the absence of suitable laboratory data a composite sound reduction index calculation undertaken by a suitably qualified acoustic consultant can be used to demonstrate compliance.

8.1.2 External Wall Construction

The façade wall construction has been assumed to achieve a sound insulation performance of 55dB R_W. Typical façade construction such as concrete, blockwork, timber frame and brick offer high levels of sound insulation and will meet this requirement.

8.1.3 Roof Construction

The roof construction has been assumed to achieve a sound insulation performance of 50dB R_W. Any skylights and glazing in the roof system inside habitable spaces should be of standard double-glazed construction to meet a minimum of 30 dB R_w as per Table 10.

8.2 External Amenity Areas

BS8233:2014 states that "*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* $L_{Aeq,16hr}$."

ProPG goes further to extend the advice contained within BS8233:2014 to include:

"Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process."

Based on the ambient monitoring undertaken, it is expected that all public and private open space associated with the residential development will comply with the ideal range *50 -55 dB* $L_{Aeq,16hr}$.

9.0 Conclusions

The site of the proposed development is located in an area of mixed noise sources, both anthropogenic, natural and typical neighbourhood sounds.

A comprehensive baseline survey has been undertaken to identify and assess aircraft noise affecting the site. Liaison with the Air Corps was undertaken as part of the characterization. Road traffic noise has also been considered as part of best practice.

The site is considered to be low risk in terms of transportation noise exposure to future residents and is at or lower than the WHO Guidelines for aircraft noise.

Measures have been specified in Section 8.1 of this report to ensure that good internal criteria are achieved during the day and night-time based on a conservative approach using L_{Amax} values for the loudest planes recorded; even though these did not occur at night-time.

10.0 References

- BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings.
- Environmental Noise Guidelines for the European Region, World Health Organisation (WHO), Oct 2018.
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, Environmental Protection Agency, May 2022.
- ISO 9613.-2 – 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.
- ProPG: Planning and Noise: Professional Practice Guidance on Planning and Noise, New Residential Development, ANC, IOA and UK CIEH, May 2017.

Attachment 1