Kinsealy LDA

Teagasc Site

NOISE IMPACT ANALYSIS REPORT

Including DUBLIN AIRPORT AIRCRAFT NOISE IMPACT

Lands at Teagasc
Malahide Road
Kinsealy
Co. Dublin

Project file no
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Contents

1 Introduction

1.1 Report purpose

This report assesses the noise emissions potentially impacting the proposed residential development at the former Teagasc site at the Malahide Road, Kinsealy. Airport noise impacts for future residents were assessed and evaluated using survey data and current data and monitoring results obtained from the Environmental Protection Agency (EPA) and Dublin Airport. Aircraft noise levels within the area are compared against recommendations set out in the relevant standards to establish if any particular mitigation actions are required and if appropriate.

1.2 Instruction

DKPartnership (DKP) have been commissioned by CCK Architects to carry out the analysis and report for the Lands at Teagasc, Malahide Road, Kinsealy, Co. Dublin.

1.3 Development detail

The proposed development consists of the demolition of existing buildings and structures on a site associated with the former Teagasc Research Centre, and the construction of 193 no. residential dwellings comprising 153 no. two storey houses (consisting of 30 no. two-bed; and 123 no. three-bed terraced houses) and 40 no. duplex units (comprising 20 no. two-bed ground floor apartments with 20 no. three-bed duplexes above) arranged in three storey blocks.

The proposed development includes a single storey childcare facility (approx. 283 sqm gross floor area) with the capacity for approximately 50 children.

The proposed development incorporates approximately 1.65 ha of dedicated public open space comprising a series of open spaces and a central east-west green route linear park and parklands along the east boundary. In addition, 2.2 ha of green belt lands are included to the south and south-east of the residential development area to accommodate a playing pitch.

Vehicular access to the site will be via a new vehicular entrance at Gandon Lane to the north (providing access to the northern part of the site) and a new vehicular access from the Malahide Road, located to the south of the existing Malahide Portmarnock Educate Together National School (providing access to the southern part of the site).

The proposed development includes 229 no. car parking spaces (comprising 193 no. residential spaces, 4 no. childcare drop off spaces, 3 no. childcare staff spaces, and 29 no. visitor spaces), and 345 no. bicycle parking spaces (201 no. private secure on-curtilage spaces for houses without independent garden access, 100 no. private secure spaces and 20. no. visitor spaces for duplex units, 20 no. childcare drop-off spaces, and 4 no. childcare staff spaces).

The proposed development facilitates pedestrian and cycle links to existing and proposed adjoining developments, including the provision of an east-west greenway connecting residential lands to the east of the site at Newpark to the Malahide Road and the provision of a north-south link connecting Beechwood in the north to the green belt lands in the south, with provision for a future link to the St Nicholas of Myra national school.

The proposed development has an overall site area of 8.2 ha, and includes bin storage, internal roads, boundary treatments, public lighting, 3 no. ESB unit substations, water supply, surface water drainage and foul water drainage infrastructure, and all associated and ancillary site and development works.

1.4 The Author.

This report was prepared by Gerard van Deventer, ING, BE, CEng, director at DKPartnership. Gerard has a degree in Environmental Engineering (ING) from the Netherlands and bachelor of engineering (BE) from NUIG and has over 35 years experience in consulting engineering and the measurement and assessment of environmental noise including the preparation of noise and vibration impact assessments and EIARs (Noise and Vibration chapter). Furthermore, he has experience in acoustic measurement relating to environmental projects, infrastructure projects and building acoustics.

2 Executive summary

2.1 Analysis conducted

This report analyses potential noise impacts on the Lands at Teagasc mainly as a result of air craft noise from Dublin Airport. Airport and other noise impacts were assessed and evaluated using current data and monitoring results obtained from EPA noise maps, background noise survey and Dublin Airport monitoring stations. Weighted noise levels where assessed representing the day time noise level $L_{Aeq,16h}$ and night-time noise level $L_{Aeq,8h}$ and have been compared with the maximum recommended noise data for residential units published by the EPA (NG4), World Health Organisation (WHO) and BS8233.

2.2 Standards and regulations overview

The following guideline/standards have been applied and used for information:
- The EPA LG4 noise guide & mapping.
- The British Standard BS 8233
- The World health Organisation (WHO),
- Dublin Airport Noise LAP / Fingal development plan 2023-2029.
- ProPG, Professional Practice Guidance on Planning & Noise

2.3 Site location

The lands at proposed residential development at the former Teagasc site is located just South of the Kinsealy Village centre and is situated approximately 14km North-East of Dublin city and 4.85km from Dublin Airport (North runway) . On inspection the proposed development site is located on the outer fringe of the EPA day time airport noise map and outside the EPA night time airport noise map (illustrations 5.1 & 5.2). The Fingal County Council's development plan 2023 - 2029 has zoned the DAA airport noise impact from A to D with zone A having the most potential for noise exposure during airport operations and zone D the least. The Teagasc site is located on the outskirts of zone B (illustration 5.3) which zone is identified as "Noise impact mitigation need to be considered" from an aircraft noise perspective'. We note that although the site location is shown on the County Development plan (2023-2029) noise criterion map as being in the 61-65dB zone (B) the actual monitored noise levels from the DAA Feltrim Noise Monitor which is located ca 1.5km from the Teagasc site and indeed is closer to Dublin Airport then the Teagasc site is measured considerably lower and in the 56-58dB range.

2.4 Back ground noise and relevant impact assessment methodology

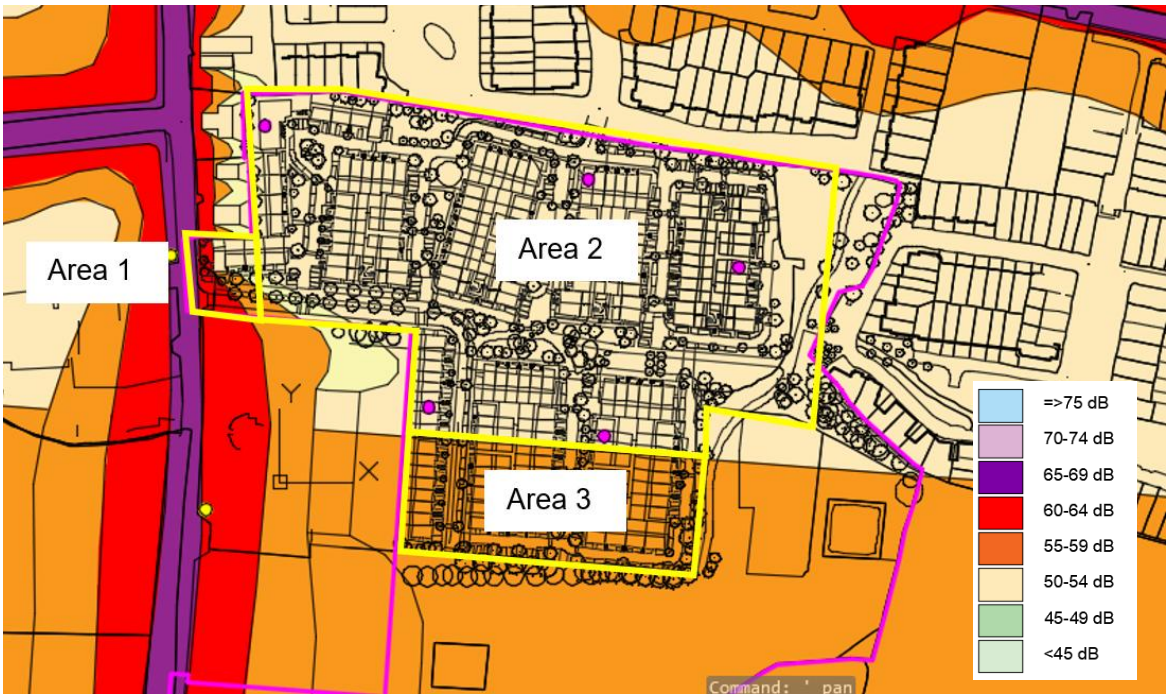
For the report we used the data from a manned (6 hour) and unmanned (24hour) back ground noise survey, the EPA Dublin airport day time and night time flight path noise maps and the DAA available noise data as they have accurate figures available from their Feltrim noise measuring station which is located ca 1.5km from the Teagasc site and as such is ideally located for the noise impact assessment. All of the noise survey data, the Feltrim noise measuring station data and the EPA day time and night time noise maps data are applied to calculate and predict the noise levels at the Teagasc site and assess any potential noise nuisance impacts on the development by comparing the data with the EPA, WHO/BSEN8233 maximum recommended noise exposure and resultant ambient internal noise criteria (NC) for habitable rooms.

2.5 Back ground noise levels and noise levels facades.

Applying the combined data from the EPA aircraft and road traffic noise maps and relevant noise data from the survey and Felltrim station resulted in a combined overall day time and night time noise map with the noise exposure categorised in 3 different exposure areas : Area 1: The site entrance at the Malahide road, Area 2: The general Eastern, Western, Northern and Middle areas of the site and Area 3: The most Southern area of the site. Area 1 adjacent to the Malahide road has the most noise exposure followed by Area 3 the most Southern element and then Area 2.

Average back ground noise level	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Comment
Area 1 Entrance at Malahide Road	60-64	55-59	Dwellings at entrance of site only
Area 2 General East, West, North	50-54	45-49	
Area 3 Due South	55-59	50-54	

Copy of Table 5.4 Area back ground noise exposure at Teagasc lands.



Extract from Image 5.4 Combined traffic and aircraft day time noise map drawn from the EPA air craft and traffic noise maps.

2.6 Façade noise reduction capability and resultant internal ambient noise levels.

Any new proposed development will be of modern construction and as part of the new building regulations and in particular the Part L requirement which will need to have a high level airtightness standard giving the construction a relative high noise reduction capability. For this report we have applied 2 different capabilities, 1 – Conservative "standard" noise reduction of 25dB and 2 – Noise reduction capability based on current construction methods and materials @ 35dB.

The resultant internal ambient room noise levels shown in the tables below are the results of the total combined exposure calculated and shown on the combined day time and night time noise maps and using 2 different façade noise reduction capabilities, i.e. a conservative 25dB representing to current construction standards (2022) achievable standard.

Internal ambient noise levels with a combined facades & roof 25dB noise reduction.

Average back ground noise level	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Environmental noise category
Area 1 Entrance at Malahide Road	35-40	30-34	Reasonable / Urban
Area 2 General East, West, North	25-29	20-24	Very good / Country
Area 3 Due South	30-34	25-29	Good / Suburban

Copy of Table 5.5 Calculated internal average ambient noise level as a result of noise exposure with 25dB façade noise reduction.

When we compare the resultant internal ambient room noise levels with the WHO/BS8233 recommended maximum habitable room noise level shown in table 4.2 below we can categorise all areas to be "Very good / Country" when applying the current achievable construction standards (>=35dB façade & roof noise reduction).

ProPG risk assessment.

From section 4 and in particular table 4.2 (below) where the ProPG maximum internal room noise levels are indicated as 35dB for bed rooms and 40dB for living/other rooms and in particular the noise risk assessment for the night time period where ProPG states that individual noise levels do not normally exceed 45dBLAmax more than 10 times a night. For the ProPG risk assessment we have selected 2 different areas and whereas both areas are exposed to aircraft and traffic noise we note area 1 to have a more distinct traffic noise impact being closer to the Malahide road then area 2/3.

From the internal room noise data calculations and graph's we note that with a roof & façade noise reduction capability of 25dB$D_{Lnt,w}$. the area 1 resultant average day time noise level is predicted at ca 37dB and average night time noise levels is predicted at 26d and are well below the maximum indicated ProGP internal room noise levels of 40dB and

35dB respectively. The no of occurrences of night time noise levels in excess of 45dB is calculated at 2 no. and well below the maximum recommended 10.

AREA 1

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room *	25	30** 23.00-7.00hrs	35** 7.00-23.00hrs	40
Living room	30	35	40**	45

Copy of Table 4.2 WHO internal room noise environment categories. ** ProPG maximum noise lvels.

From the internal room noise data table 5.5 and table 5.5.1 we note that with a roof & façade noise reduction capability of 25dBDLnt,w. the area 2/3 resultant average day time noise level is predicted at ca 34dB and average night time noise levels is predicted at 22d and are well below the maximum indicated ProGP internal room noise levels of 40dB and 35dB respectively. There are no occurrences of night time noise levels in excess of 45dB.

AREA 2/3

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room *	25	30** 23.00-7.00hrs	35** 7.00-23.00hrs	40
Living room	30	35	40**	45

Copy of Table 4.2 WHO internal room noise environment categories. ** ProPG maximum noise levels.

2.7 Conclusion

The overall site's calculated combined noise exposure from the aircraft noise of Dublin airport and traffic noise from the Malahide road as per noise maps image 5.4 and 5.5 and detailed in table 5.4 are showing the average day time noise exposure of the greater part of site (Area 2) to be in the region of 50dB to 54dB which is within the EPA maximum recommended day time façade exposure guidelines of 55dB. Two smaller area's, one at the site entrance with the Malahide road (Area 1) and the most Southern part of the site (Area 3) are in excess of the guidelines and fall under the noise assessment criterion category "B" where noise impact may have to be considered. The average night time noise exposure of all 3 of the area's ranging from 45dB-49dB to 55dB-59dB are all in excess of the EPA maximum recommended night time façade expose guidelines of 45dB and also fall under the noise assessment criterion category "B" where noise impact may have to be considered. The noise impact on the internal habitable rooms as a result of the façade exposures was calculated and found the resultant ambient internal room noise levels to be between 20dB and 30dB during the day time and between 10dB and 24dB during the night time period using a façade (and roof) noise reduction capability of 35dB representing an achievable reduction with current construction methods and materials with these resultant noise levels categorised as "Very good / Country" under the WHO/BS8233 recommended maximum habitable room noise level guidelines shown in table 4.2. We also conclude the resultant day time and night time internal room noise levels are within the maximum ProPG internal room noise parameters and that only in area 1 we have 2 no calculated night time occurrences in excess 45dB, therefore, based on the above, DKP, deem this to be satisfactory and within the recommendations of the relevant standards and guides.

2.8 Recommendation.

To achieve the projected internal ambient noise levels the following measures would be recommended.

Area 1. Combined roof & façade noise reduction capability 0 >= 32dB DLnt,w)

Element	Sound insulation (dB,DLnt,w)	
External walls	50-55	Typical construction details
Glazing	30-35	
Ventilation openings	30-35	35dB attenuation
Roof (timber/acoustic insulation)	40-50	300mm Rock wool @ 100-120kg/m3

Area 2 & 3. Combined roof & façade noise reduction capability 0 >= 30dB DLnt,w)

Element	Sound insulation (dB,DLnt,w)	
External walls	50-55	Typical construction details
Glazing	30-35	
Ventilation openings	30-35	35dB attenuation
Roof (timber/acoustic insulation)	35-45	300mm Rock wool @ 80-100kg/m3

3 Geographical overview

Project overview. Image 3.1 Google map with approximate site location.

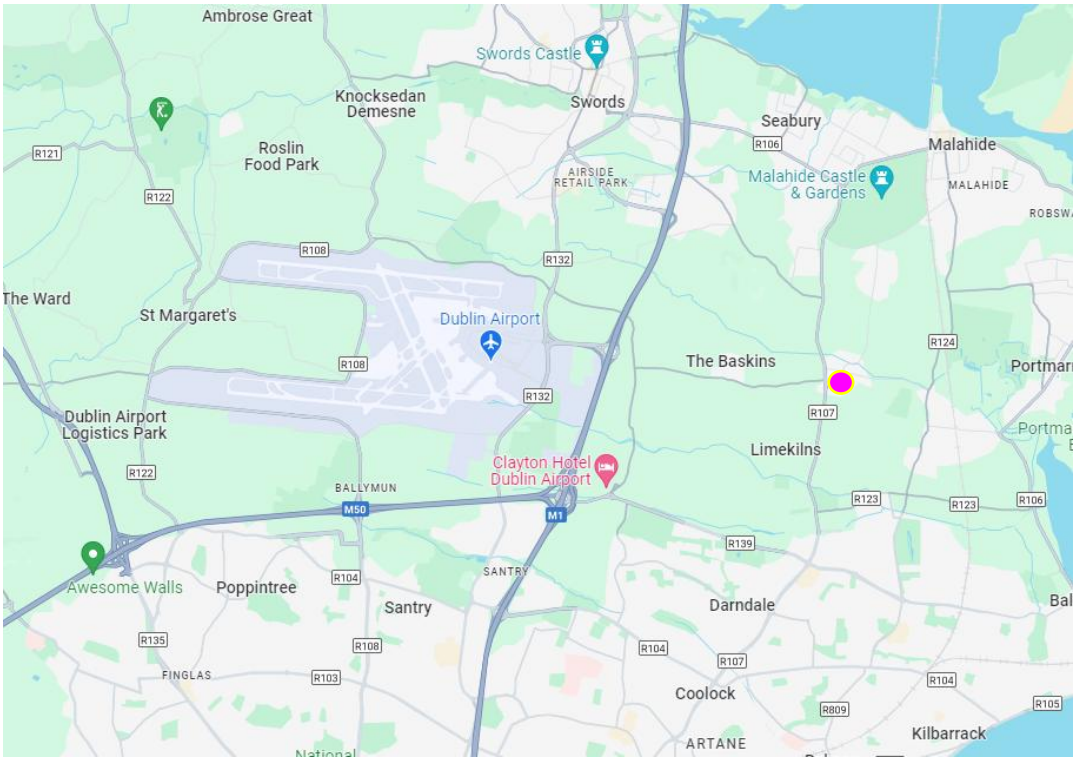


Image 3.1: Approximate "Lands at Kinsealy location in relation to Dublin airport :

Image 3.2: Approximate Kinsealy Housing, Capel Road site map and noise survey point location: Unmanned , manned

4 Approach and methodology.

4.1 Methodology applied

For the report a manned (6 hour) and unmanned (24hour) back ground noise survey was conducted although the DAA have accurate data available from their noise measuring stations with the Feltrim station only ca 1.5km away from the Teagasc site which would be a good measure for the noise impact assessment. The DAA Feltrim noise measuring station, EPA day time and night time noise maps and back ground noise survey data have been considered to ascertain the noise levels at the Teagasc site and assess any potential noise nuisance impacts on the new proposed development by comparing the data with the EPA guide, WHO/BSEN8233 maximum recommended noise exposure and resultant ambient internal noise criteria (NC) for habitable rooms.

4.2 Irelands noise framework

Environmental noise is unwanted sound arising from all areas of human activity such as noise from transport (road, rail, air traffic) as well as from industrial activities. The EPA is the national authority for overseeing the implementation of the Noise Regulations. This role includes noise mapping and action planning. The EPA has made available the strategic noise mapping of agglomeration, major airports, major roads and major rail networks, in the form of noise contours for the L_{den} (day, evening, night) and L_{night} (night) periods. A noise map is a graphical representation of the predicted situation with regards to noise in a particular area with different colours representing different noise levels in decibels dB(A). All noise maps are presented in terms of two noise indicators: L_{den} and L_{night}.

- L_{den} is the day-evening-night noise indicator and it represents the noise indicator for overall annoyance. It is 'weighted' to account for extra annoyance in the evening and night periods. The Environmental Noise Directive defines an L_{den} threshold of 55 dB for reporting on the numbers of people exposed. L_{night} is the night time noise indicator and is used in the assessment of sleep disturbance. An L_{night} threshold of 50 dB is defined for reporting on the numbers of people exposed. These indicators are based on year long averages of the day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) time periods.

4.3 Legislation and guidelines

The following guideline / standards have been applied:

- *National Planning Framework 2040*. Document sets out the Government's planning policies for Ireland and how these are expected to be applied. the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from or being adversely affected by unacceptable levels of noise pollution.
- The EPA LG4 noise guide & mapping.
  As noted in the EPA LG4 guide environmental noise is unwanted sound arising from all areas of human activity such as noise from transport (road, rail, air traffic) as well as from industrial activities. The EPA is the national authority for overseeing the implementation of the Regulations. The EPA has made available the strategic noise mapping of agglomeration, major airports, major roads and major rail networks, in the form of noise contours for the L_{den} (day, evening, night) and L_{night} (night) periods. A noise map is a graphical representation of the predicted situation with regards to noise in a particular area with different colours representing different noise levels in decibels dB(A). All noise maps are presented in terms of two noise indicators: L_{den} and L_{night}.
  L_{den} is the day-evening-night noise indicator and it represents the noise indicator for overall annoyance. It is 'weighted' to account for extra annoyance in the evening and night periods. The Environmental Noise Directive defines an L_{den} threshold of 55 dB for reporting on the numbers of people exposed.
  L_{night} is the night time noise indicator and is used in the assessment of sleep disturbance. An L_{night} threshold of 50 dB is defined for reporting on the numbers of people exposed. These indicators are based on year long averages of the day (07:00-19:00), evening (19:00-23:00) and night (23:00-07:00) time periods.
- British Standard BS 8233 Sound insulation and noise reduction for buildings. BS 8233 contains guidance on the minimum recommended levels of noise reduction from external sources and general guidance on maximum habitable room noise standards.
- British Standard 7445-1. Defines parameters, procedures and instrumentation for noise measurement and analysis.
- World health Organisation(WHO). Published External Environmental Noise Guidelines for the European Region which sets out how noise pollution in towns and cities is increasing, and that excessive noise particularly from transport sources is a health risk.
- Dublin Airport Noise LAP / Fingal Development Plan 2023-2029.
  The Fingal County Council's County Development Plan 2023 - 2029 has defined noise zones A-D representing potential site exposure to aircraft exposure, with zone A having the most potential for noise exposure during airport operations. The proposed development site is located in zone C, where the zone is identified as "Noise sensitive

development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed. The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures. An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise level".

- ProPG. Professional Practice Guidance on Planning & Noise

The primary goal of this ProPG is to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise. The two sequential stages of the overall approach are:

• Stage 1 – an initial noise risk assessment of the proposed development site; and

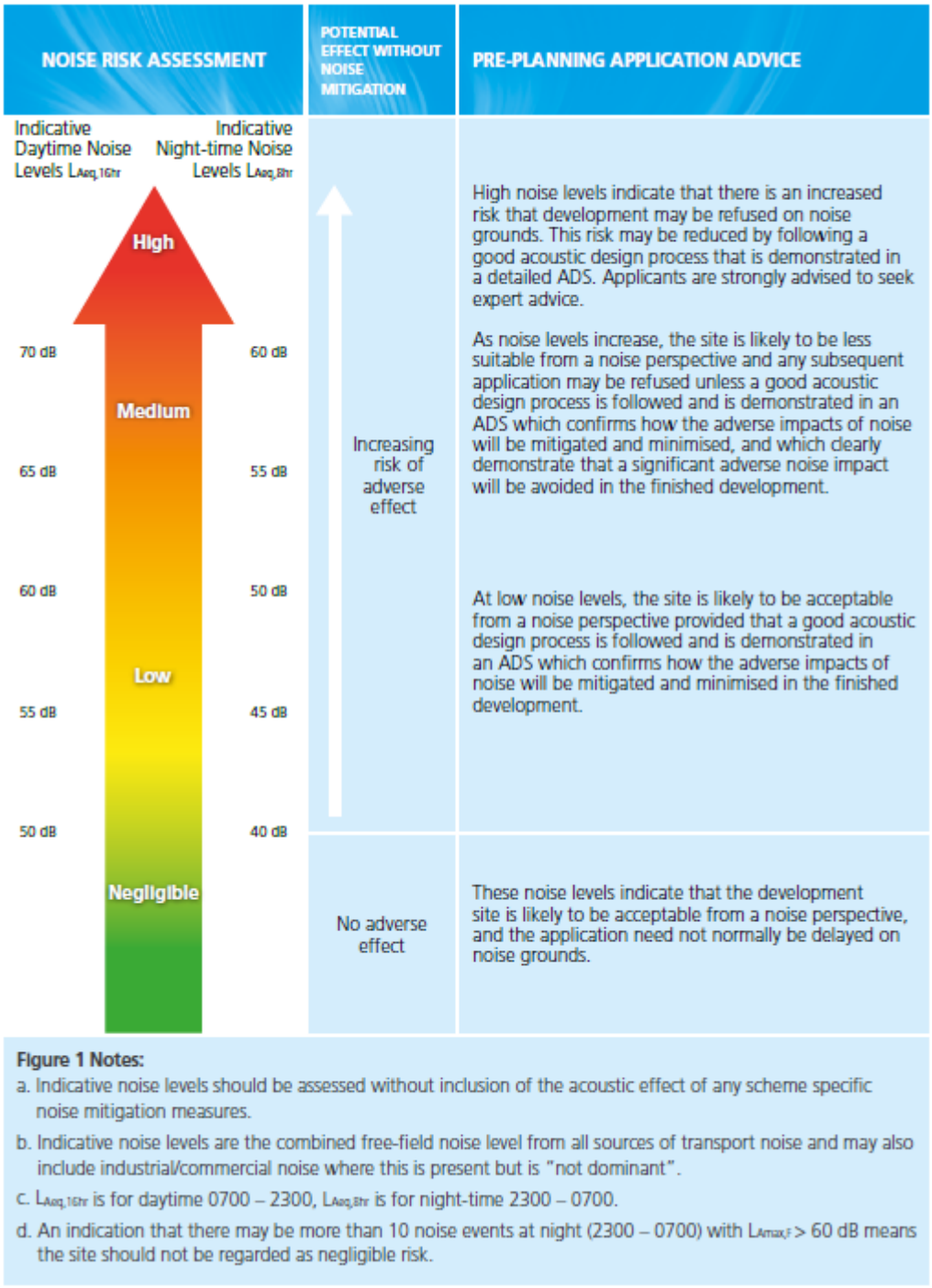


Illustration 4.1 Extract from ProPG chapter 2 Fif Stage 1 – Initial noise Risk Assessment.

• Stage 2 – a systematic consideration of four key elements.
Element 1 – demonstrating a "Good Acoustic Design Process";
Element 2 – observing internal "Noise Level Guidelines";
Element 3 – undertaking an "External Amenity Area Noise Assessment"; and
Element 4 – consideration of "Other Relevant Issues".

4.4 Back ground noise criterion at the facades of residential receptors

The table below shows the different noise categories as published by BS 8233 in residential area's for the day time and night time periods with the relevant assessment criterion.

Background noise	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Assessment / Action.
Cat "A"	<= 55 dB	<= 45 dB	Noise need not to be considered
Cat "B"	55 – 66 dB	45 – 59 dB	Noise impact need to be considered
Cat "C"	66 – 72 dB	59 – 66 dB	Noise impact mitigation need to be considered
Cat "D"	> 72 dB	> 66 dB	Unless quieter sites are not available residential use should not be considered

Table 4.1

4.5 Maximum recommended room noise level guidelines

The table below shows the maximum recommended noise levels for residential dwellings as published by BS 8233 and the world Health Organisation for habitable rooms in different environments as illustrated below;

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room *	25	30	35**	40
Living room	30	35	40**	45

Table 4.2 WHO internal room noise environment categories.
*ProPG states that individual noise levels do not normally exceed 45dBLAmax more than 10 times a night.
**ProPG Internal ambient criteria suitable of internal noise levels.

4.6 Predicted noise nuisance complaints

The table below shows the predicted level of compliant for residential dwellings as a result of exceeding the particular sound level. This table is an appraisal in terms of both the margin of excess above the measured back ground noise and existing sound environment which may already have a high ambient or residual sound level. It is also noted that not all differences or impacts lead to complaints and that not every complaint is proof of an adverse impact.

Level over the back ground noise	Compliant indication
10 dB or more	Likely to cause noise nuisance complaints
5 dB	May give rise to some extend of noise nuisance complaints
0 dB	Unlikely to give rise to noise nuisance complaints

Table 4.3 Change to noise environment noise complaints prediction indication.

4.7 Façade noise reduction capability

All facades have a noise reduction capability and whereas the reduction capability is not actually known at this point of time each of the relevant facades should have a noise reduction capability of at least 30dB with closed windows and doors. Typical façade noise reduction capabilities are tabled below.

Noise reduction capability	Solid structure (dB,DLnt,w)	Glazing (dB,DLnt,w)	Façade average (dB,DLnt,w)
2021 Current new build	56 dB	Triple glazing 40 dB(A)	43.5 dB(L_{AEQ16})
2021 Current new build	56 dB	Double glazing 33 dB(A)	35.5 dB(L_{AEQ16})
2002 Building regulations	52 dB	28 dB(A)	30.0 dB(L_{AEQ16})
1982 Building regulations	47 dB	21 dB(A)	22.4 dB(L_{AEQ16})
Prior to 1982	41 dB	17 dB(A)	19.1 dB(L_{AEQ16})

Table 4.4 Typical façade noise reduction averages.

5 Development noise exposure assessment

5.1 EPA Dublin Airport noise contour maps

EPA noise contour maps available show Lden and Lnight contours. Lnight is the A-weighted long-term average sound level for the night time period (23.00 to 07.00). Lden – is the A-weighted long-term average sound level for the day-evening-night noise indicator in decibels (24 hours).

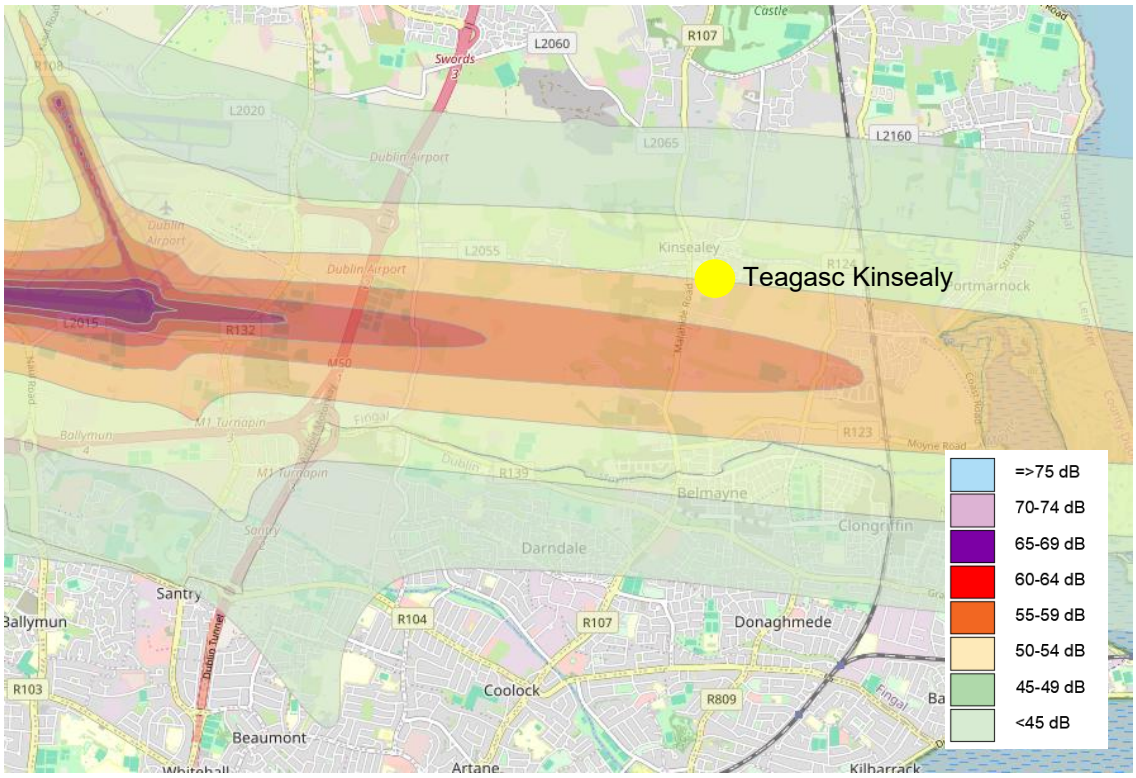


Image 5.1 EPA airport noise map – Lden Day time 7.00 – 23.00 noise map

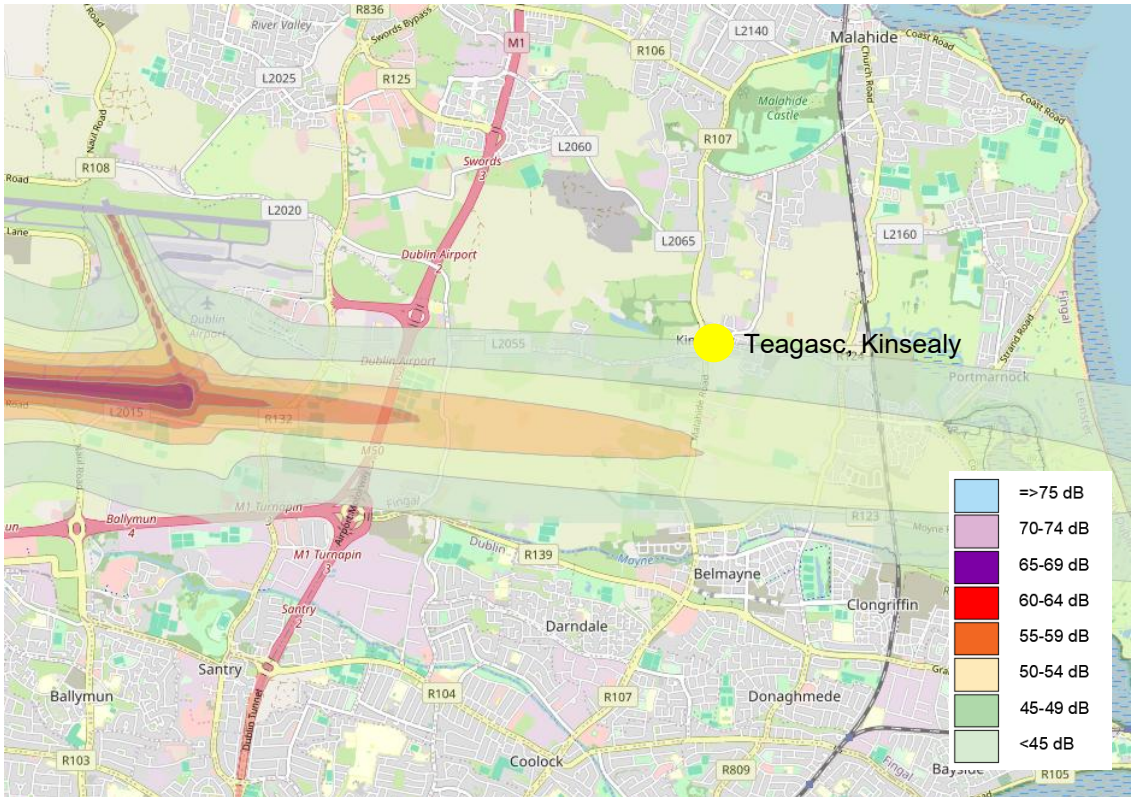


Image 5.2 EPA airport noise map – Lnight Night time 23.00 – 7.00 noise map

5.2 Local authority Dublin Airport noise zones.

The Dublin Airport LAP is a land use plan for the purposes of effective land-use planning and safeguarding the use of the Airport. Noise zones relating to Dublin Airport have been in place for many years to aid land use planning, with the current noise zones first contained in the Fingal Development Plan 2023-2029. The current noise zones are based on noise exposure from an expanded Dublin Airport including the north runway. The basis of the noise zones was underpinned by relevant guidance in relation to aircraft noise and its effects available at that time. Since the publication of those zones in 2005, and over the last decade, further evidence has emerged that has updated understanding of how aircraft noise can affect health and quality of life. For these reasons, it is considered appropriate to continuously update the noise zones for Dublin Airport to allow for more effective land use planning for development within airport noise zones.

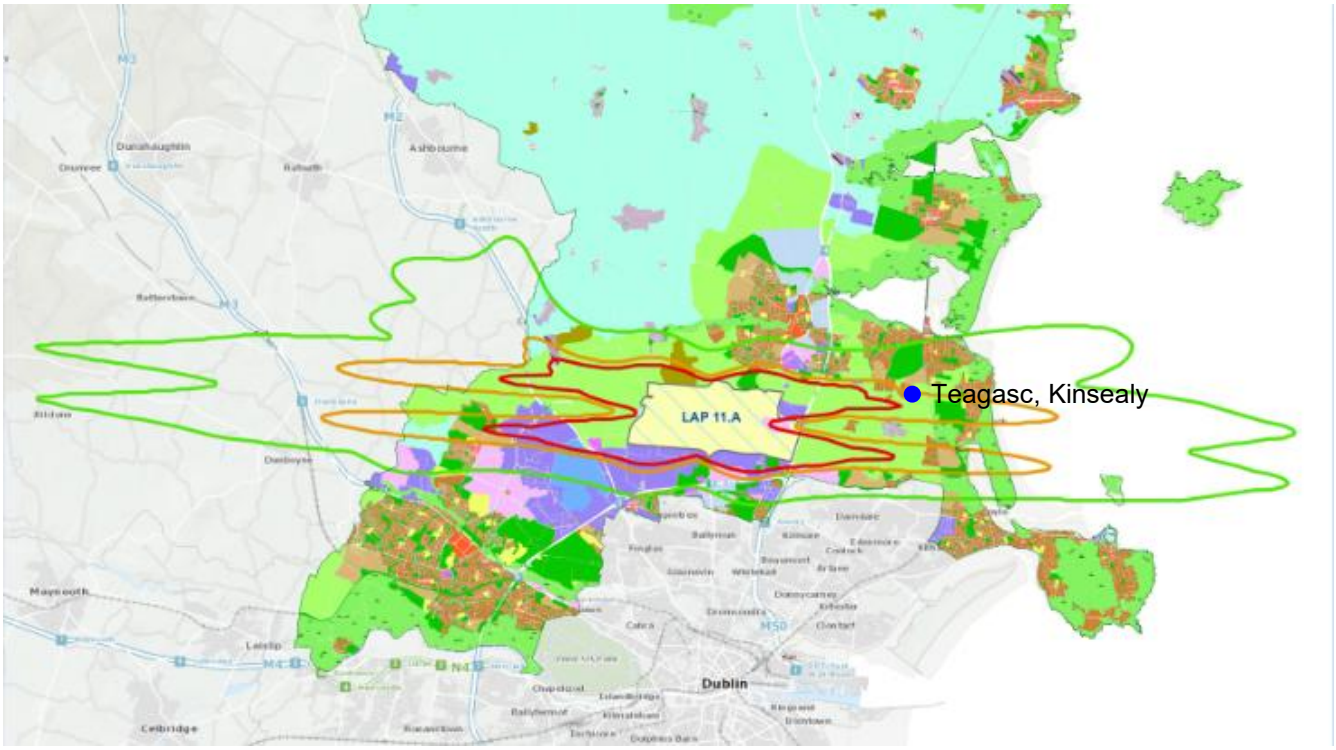


Image 5.3 LA airport noise zone map.

Background noise	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Assessment / Action.
Zone D	<= 55 dB	<= 45 dB	Noise need not to be considered
Zone C	56 – 60 dB	46 – 50 dB	Noise impact need to be considered
Zone B	61 – 65 dB	51 - 55 dB	Noise impact mitigation need to be considered
Zone A	> 65 dB	> 55 dB	Noise impact mitigation required

Table 5.1 LA airport noise zone criterion.

5.3 DAA Noise monitoring facilities.

Dublin Airport have recently installed a noise monitoring system to ensure minimum disruption to the local community. This system is comprised of a number of fixed monitoring locations. Two monitoring stations are targeted specially for local communities, these include Feltrim monitoring station (@4.6km) and Bishopswood monitoring station (@6.5km). The Teagasc site is ca 1.5km from the Feltrim station.

5.4 Noise monitoring station Feltrim results

DAA publish half year reports on monitoring stations, the years 2017-2022 is available for public information. Summary of Feltrim noise monitoring data is presented in table 5.2.1/2 showing the different noise events types, namely the percentage of noise in either, weather, human activity of aircraft related events. The impact of covid-19 lockdown can be seen in the data for the year 2020/21 with a significant drop in aircraft noise recordings. Depending on the season, weather events have a significant input also. Table 5.2 summarises the average measured noise levels at Feltrim, (Daytime noise level $L_{Aeq,16h}$ and Night-time noise level $L_{Aeq,8h}$).

Month / Year	Daytime noise level $L_{Aeq,16h}$ (dB)		Night-time noise level $L_{Aeq,8h}$ (dB)	
	Total	Aircraft	Total	Aircraft
07-12 / 2017	55.4	44.3	53.0	35.6
01-06 / 2018	57.2	46.9	54.2	36.7
07-12 / 2018	55.3	43.8	51.0	33.7
01-06 / 2019	56.2	46.0	53.1	39.0
07-12 / 2019	55.7	45.0	50.8	36.7
01-06 / 2020	57.0	43.2	53.3	35.3
07-12 / 2020	54.8	38.1	50.8	33.3
01-06 / 2021	52.2	42.9	50.2	33.7
07-12 / 2021	53.2	42.0	51.8	32.1
01-06 / 2022	57.6	46.9	54.3	36.9
07-12 / 2022 pre-covid levels	57.8	47.1	54.9	37.1
01-06 / 2023	57.9	47.3	55.1	37.9

Table 5.2 Feltrim monitoring station noise data.

5.5 Back ground noise level.

To establish the back ground noise in the general area of the proposed development we conducted a manned noise level survey over a 6 hour period and 2 no unmanned surveys over a 1 day 24 hour (16hour + 8hour) period using 3 no. separate locations on the Malahide Road and New Park Drive (End of cul-de-sac of residential development East of the Teagasc lands) as indicated on illustration 3.1 (page 7) Thursday January 11th. The table below details the summarised noise survey data from the noise survey location covering the maximum sound exposure and maximum noise level measured together with the average weighted equivalent noise levels for daytime (16h) and night time (8h) periods. We note that the sound exposure and maximum noise level data is only given for general information as this relates to a single (short time) event whereas the Leq16 and Leq8 are weighted averages across the respective periods and will be used to compare against the above noted standards, regulations and guidelines.

Location	Sound exposure (incident)	Maximum noise level	LAFmax	16 hour noise indicator (LAeq16)	8 hour noise indicator LAeq8
Station 1 Malahide Road *	90.1 dB	72.1 dB(A)	69	67.6 dB(L_{AEQ16})	
Station 2 Malahide Road	89.4 dB	71.2 dB(A)	68	66.7 dB(L_{AEQ16})	56.3 dB(L_{AEQ16})
Station 3 New park Drive	69.7 dB	63.8 dB(A)	61	56.2 dB(L_{AEQ16})	50.9 dB(L_{AEQ16})

Table 5.3 Survey record data. * Manned station 12 hour.

The measurements taken are considered representative of typical noise levels in the study area. The noise survey measurements have been performed using a Bruel & Kjaer Type 2260 sound level meter/recorder and data logger. Calibration was conducted using a Bruel & Kjaer 4231 sound level calibrator. All measurements were carried out in accordance with ISO 1996: 'Acoustics-Description and measurement of environmental noise'. Weather conditions during the survey were in line with the conditions described within ISO 1996, Acoustics 'Description and Measurements of Environmental Noise'. Weather conditions were dry and cool with a moderate SW wind. Average air craft noise only was measured at 47.4dBLeq6 with a total of 221 no air craft incidents between 7.00 and 13.00 hrs..

5.5 Noise prediction at the Teagasc site.

For the noise level prediction as a result of the combined noise exposure including the aircraft and traffic noise the receptor locations within the Teagasc lands have been assumed to be at the same vertical receiver distance to air craft as the Feltrim monitoring site which gives the highest possible exposure.

5.6 Back ground noise levels and noise levels at facades.

Applying the combined data from the EPA aircraft and road traffic noise maps and confirmations of the noise data from the survey and Felltrim station resulted in a combined overall day time and night time noise map with the noise exposure categorised in 3 different exposure areas : Area 1 the site entrance at the Malahide road, Area 2 : The general Eastern, Westers, Northern and Middle areas of the site and Area 3 : The most Southern area of the site. Area 1 adjacent to the Malahide road has the most noise exposure followed by area 3 the most Southern element and then Area 2.

Average back ground noise level	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	LAmax / LAFmax
Area 1 Entrance at Malahide Road	60-64	55-59	71 (dB)
Area 2 General East, West, North	50-54	45-49	63 (dB)
Area 3 Due South	55-59	50-54	62 (dB)

Table 5.4 Area back ground noise exposure at Teagasc lands.

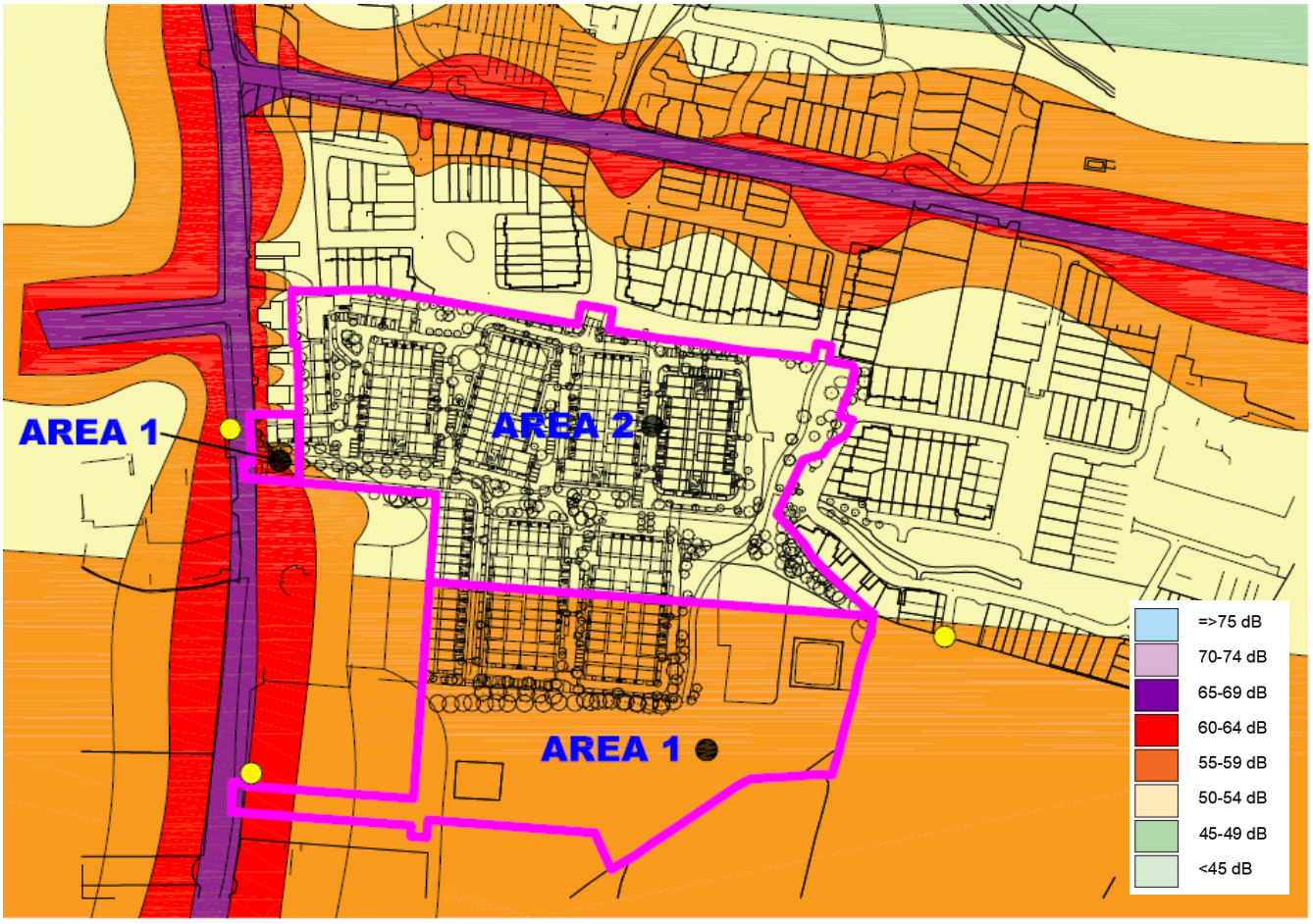


Image 5.4 Combined traffic and aircraft day time noise map drawn from the EPA air craft and traffic noise maps.

We note from illustration 5.4 that Area's 1 and 3 are shown as having noise exposure in excess of the EPA maximum day time amenity space and façade exposure quoted at 55dB.

We note from illustration 5.5 that Area's 1, 2 and 3 are shown as having noise exposure in excess of the EPA maximum night time amenity space and façade exposure quoted at 45dB.

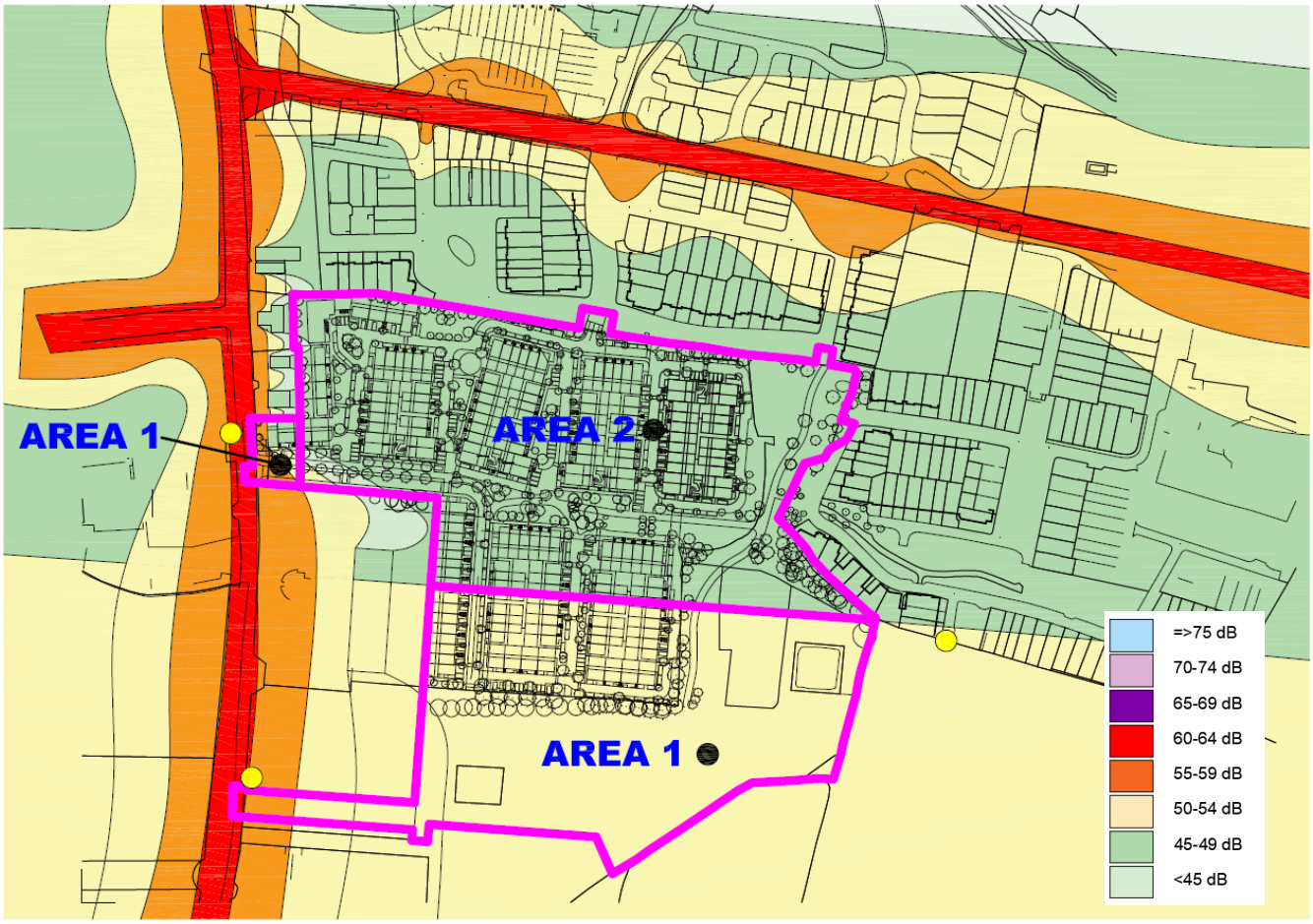


Image 5.5 EPA Combined traffic and aircraft night time noise map drawn from EPA air craft and traffic noise maps.

5.7 Proposed site noise impact assessment criterion

To determine any possible actions from the identified day time back ground (façade exposure) noise levels from all 3 area's of +/- 55 to 64dB and night time noise levels of between +/- 45dB to 59dB we compare these with the noise impact assessment criterion table 4.1 and note the noise levels of all areas to fall in the "B" category where the noise impact would need to be considered.

Back ground noise	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Assessment / Action.
Category "A"	<= 55 dB	<= 45 dB	Noise impact need not to be considered
Category "B"	55 – 66 dB	45 – 59 dB	Noise impact need to be considered

Copy (section) of Table 4.1: EPA/BS8233 Noise assessment criterion table.

5.8 Façade noise reduction capability.

Any new proposed development will be of modern construction and as part of the new building regulations and in particular the Part L requirement which will need to have a high level airtightness standard giving the construction a relative high noise reduction capability. For this report we have applied 2 different capabilities, 1 – Conservative "standard" noise reduction of 25dB and 2 – Noise reduction capability based on current construction methods and materials @ 35dB.

	Solid external walls	Glazing	Façade average	Comments
Noise reduction capability conservative	> 45 dB	25 dB	25.2 dB	25dB **applied**

Copy (section) of Table 4.4. Typical new construction noise façade reduction capability.

5.9 Predicted noise levels in habitable rooms

The resultant internal ambient room noise levels shown in the tables below are the results of the total combined exposure calculated and shown on the combined day time and night time noise maps and using 2 different façade noise reduction capabilities, i.e. a conservative 25dB representing to current construction standards (2022) achievable standard.

Average back ground noise level	7.00-23.00 L_{den} / L_{AEQ16}	23.00-7.00 L_{night} / L_{AEQ8}	Environmental noise category
Area 1 Entrance at Malahide Road	35-40	30-34	Reasonable / Urban
Area 2 General East, West, North	25-29	20-24	Very good / Country
Area 3 Due South	30-34	25-29	Good / Suburban

Table 5.5 Calculated internal average ambient noise level as a result of noise exposure with 25dB façade noise reduction.

5.10 ProPG risk assessment.

From section 4 and in particular table 4.2 (below) where the ProPG maximum internal room noise levels are indicated as 35dB for bed rooms and 40dB for living/other rooms and in particular the noise risk assessment for the night time period where ProPG states that individual noise levels do not normally exceed 45dBLAmax more than 10 times a night. For the ProPG risk assessment we have selected 2 different areas and whereas both areas are exposed to aircraft and traffic noise we note area 1 to have a more distinct traffic noise impact being close to the Malahide road then area 2/3.

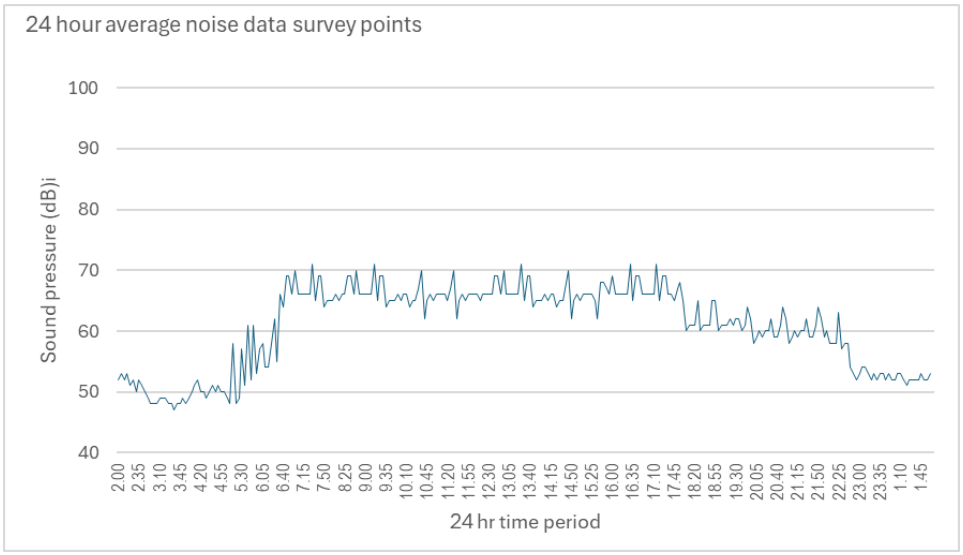


Image 5.6.1 24 Hour noise level data Area 1 closest to the Malahide road.

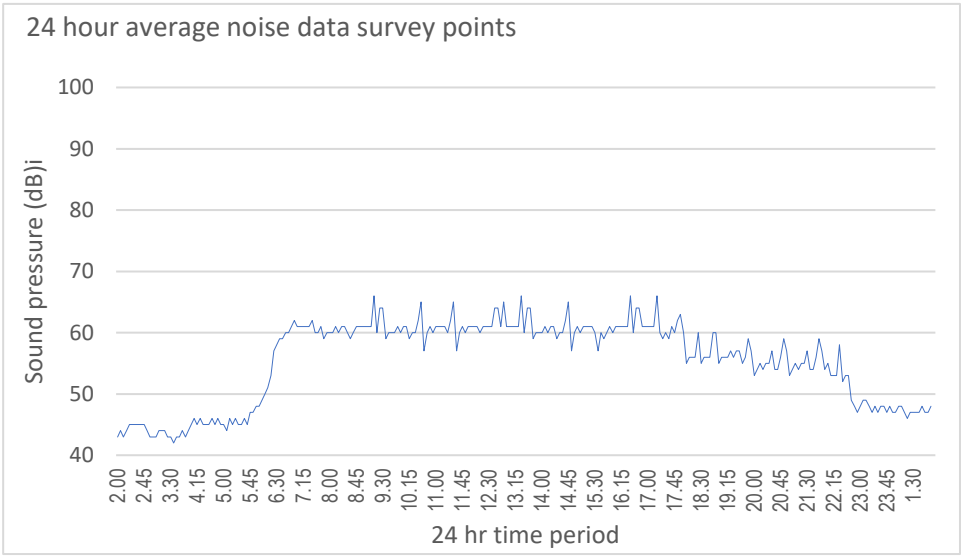


Image 5.6.2 24 Hour noise level data Area 2 & 3.

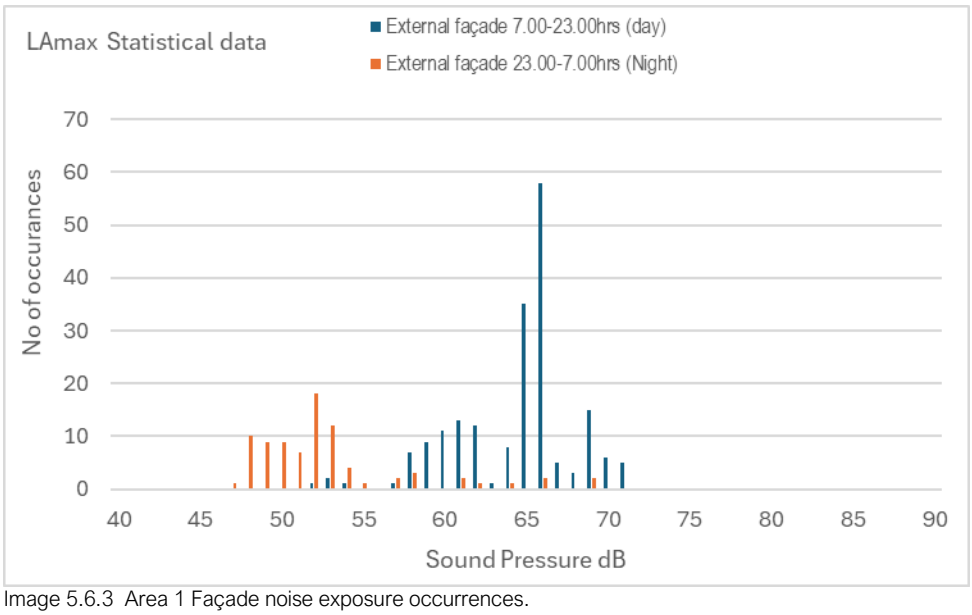


Image 5.6.3 Area 1 Façade noise exposure occurrences.

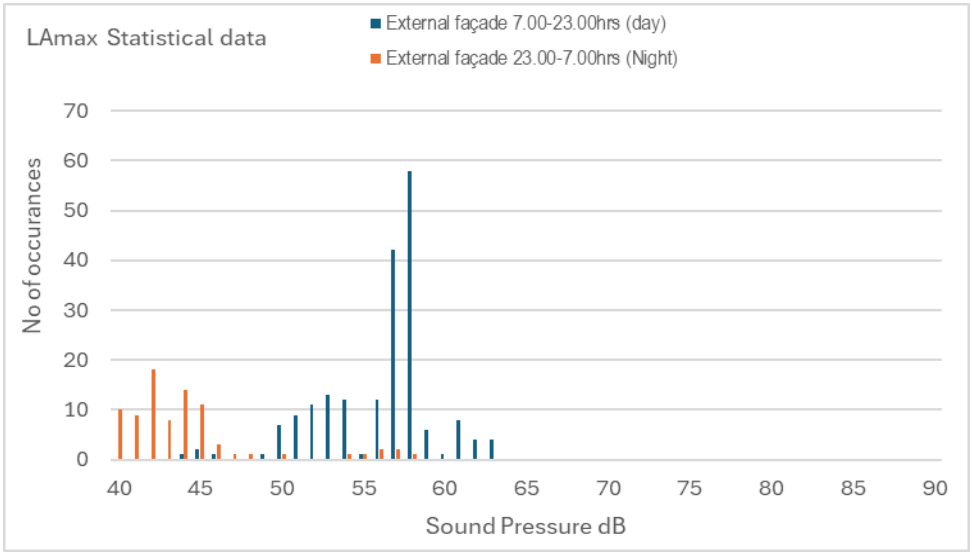


Image 5.6.4 Area 2 & 3 Façade noise exposure occurrences.

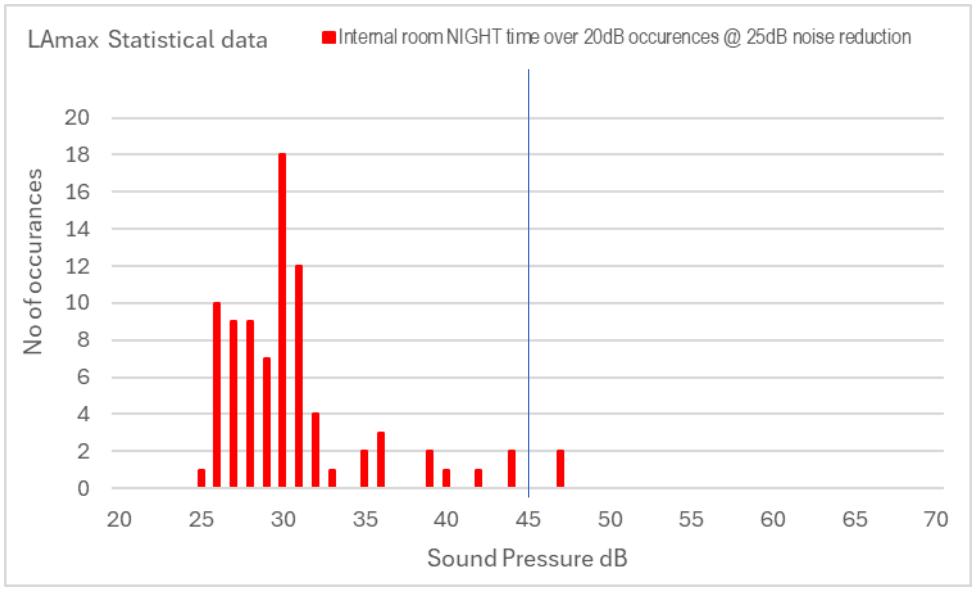


Image 5.6.5 Area 1 night time internal room noise level exposure occurrences over 45dB @ 25dB roof & façade noise reduction..

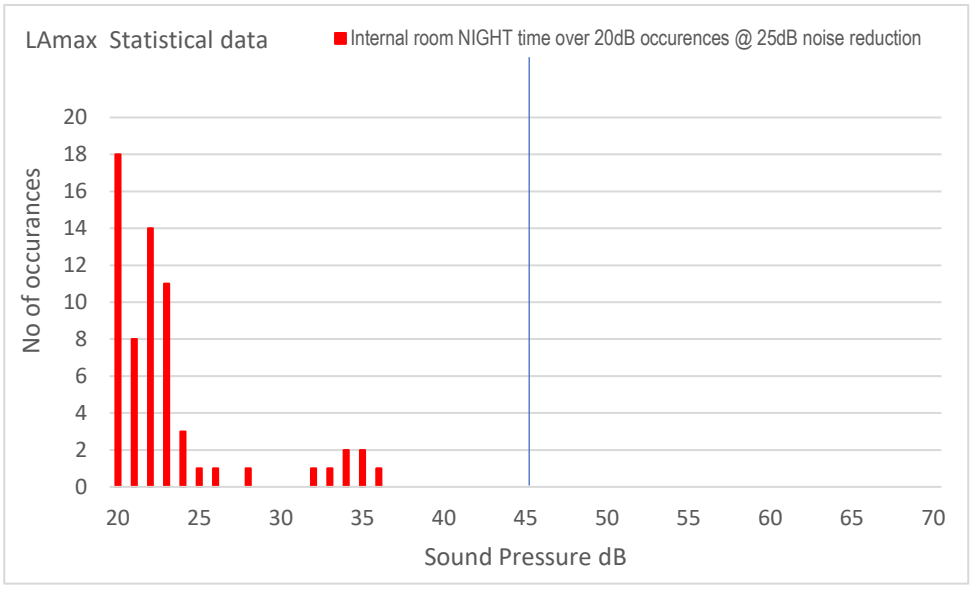


Image 5.6.6 Area 2 & 3 night time internal room noise level exposure occurrences over 25dB @ 25dB roof & façade noise reduction..

From graph's 5.5.1 to 5.5.6 we note the following noise levels.

	Façade / Roof noise levels (dB)				Internal room noise levels (dB)				
	Average day time	Average night	Maximum day time	Maximum night time	Average day time	Average night time	Maximum day time	Maximum night time	Occurrences > 45dB
Area 1	67	56	74	72	37	30	48	46	2
Area 2/3	59	47	66	61	34	22	41	36	0

Table 5.5.1 Internal room and façade maximum and average day time & night time levels.

We note that that there are 2 no occurrences of internal room noise levels in excess of 45dB as a result of the measured night time noise level data in area 1 and no occurrences in area 2/3 with a façade & roof noise reduction capability of 25dB.

From the internal room noise data table 5.5 and table 5.5.1 we note that with a roof & façade noise reduction capability of 25dBDLnt,w. the area 1 resultant average day time noise level is predicted at ca 37dB and average night time noise levels is predicted at 26d and are well below the maximum indicated ProGP internal room noise levels of 40dB and 35dB respectively. The no of occurrences of night time noise levels in excess of 45dB is calculated at 2 no. and well below the maximum recommended 10.

AREA 1

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room *	25	30** 23.00-7.00hrs	35** 7.00-23.00hrs	40
Living room	30	35	40**	45

Copy of Table 4.2 WHO internal room noise environment categories. ** ProPG maximum noise lvels.

From the internal room noise data table 5.5 and table 5.5.1 we note that with a roof & façade noise reduction capability of 25dBDLnt,w. the area 2/3 resultant average day time noise level is predicted at ca 34dB and average night time noise levels is predicted at 22d and are well below the maximum indicated ProGP internal room noise levels of 40dB and 35dB respectively. There are no occurrences of night time noise levels in excess of 45dB.

AREA 2/3

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room *	25	30** 23.00-7.00hrs	35** 7.00-23.00hrs	40
Living room	30	35	40**	45

Copy of Table 4.2 WHO internal room noise environment categories. ** ProPG maximum noise lvels.

5.11 Conclusion

The overall site's calculated combined noise exposure from the aircraft noise of Dublin airport and traffic noise from the Malahide road as per noise maps image 5.4 and 5.5 and detailed in table 5.4 are showing the average day time noise exposure of the greater part of site (Area 2) to be in the region of 50dB to 54dB which is within the EPA maximum recommended day time façade exposure guidelines of 55dB. Two smaller area's, one at the site entrance with the Malahide road (Area 1) and the most Southern part of the site (Area 3) are in excess of the guidelines and fall under the noise assessment criterion category "B" where noise impact may have to be considered. The average night time noise exposure of all 3 of the area's ranging from 45dB-49dB to 55dB-59dB are all in excess of the EPA maximum recommended night time façade expose guidelines of 45dB and also fall under the noise assessment criterion category "B" where noise impact may have to be considered. The noise impact on the internal habitable rooms as a result of the façade exposures was calculated and found the resultant ambient internal room noise levels to be between 20dB and 30dB during the day time and between 10dB and 24dB during the night time period using a façade (and roof) noise reduction capability of 35dB representing an achievable reduction with current construction methods and materials with these resultant noise levels categorised as "Very good / Country" under the WHO/BS8233 recommended maximum habitable room noise level guidelines shown in table 4.2.

ProPG:

Area 1 : From the internal room noise data table 5.5 and table 5.5.1 we note that with a roof & façade noise reduction capability of 25dB$D_{Lnt,w}$. the area 1 resultant average day time noise level is predicted at ca 37dB and average night time noise levels is predicted at 26dB and are well below the maximum indicated ProGP internal room noise levels of 40dB and 35dB respectively. The no of occurrences of night time noise levels in excess of 45dB is calculated at 2 no. and well below the maximum recommended 10.

Area 2&3 : From the internal room noise data table 5.5 and table 5.5.1 we note that with a roof & façade noise reduction capability of 25dB$D_{Lnt,w}$. the area 2&3 resultant average day time noise level is predicted at ca 34dB and average night time noise levels is predicted at 22dB and are well below the maximum indicated ProGP internal room noise levels of 40dB and 35dB respectively. There are no occurrences of night time noise levels in excess of 45dB.

Based on the above, DKP, deem this to be satisfactory and within the recommendations of the relevant standards and guides.

5.12 *Recommendation*.

To achieve the projected internal ambient noise levels the following measures would be recommended.

Area 1. Combined roof & façade noise reduction capability 0 >= 32dB $D_{Lnt,w}$)

Element	Sound insulation (dB,$D_{Lnt,w}$)	
External walls	50-55	Typical construction details
Glazing	32-36	
Ventilation openings	30-35	35dB attenuation
Roof (timber/acoustic insulation)	40-50	300mm Rock wool @ 100-120kg/m3

Area 2 & 3. Combined roof & façade noise reduction capability 0 >= 30dB $D_{Lnt,w}$)

Element	Sound insulation (dB,$D_{Lnt,w}$)	
External walls	50-55	Typical construction details
Glazing	30-34	
Ventilation openings	30-35	35dB attenuation
Roof (timber/acoustic insulation)	40-50	300mm Rock wool @ 100-120kg/m3

Appendix A Design Statement.

Appendix A Design Statement.

Noise impact :

From the above sections we note the overall development site is effected by traffic and aircraft noise and is located in airport noise zone B where noise impact needs mitigation to be considered.

Zone B	61 – 65 dB	51 - 55 dB	Noise impact mitigation need to be considered

Whereas the noise impact is generally speaking reasonably even across the proposed development site the residential units closest to the Malahide are subject a slightly increased noise impact as a result of traffic noise from the Malahide Road. We have therefore categorised the noise impacts for any mitigation as Area 1 (units closets to the Malahide Road) and area 2&3 the remainder of the development site. See image 5.4 & 5.5 for area details.

Requirements :

The main objective is to provide an acceptable noise level within the residential units for both the living and sleeping quarters in both noise areas 1 and 2&3 in line with the various standards as noted in the report referencing the WHO, BS 8233 and ProPG. See table 4.2 in section 4.5.

Room type	Very good / Country	Good / Suburban	Reasonable / Urban	City centre
Bed room *	25	30	35**	40
Living room	30	35	40**	45

The noise level categories are referenced from the WHO/BS 8233 data with the ProPG (**) recommendations noted at 35dB for sleeping rooms and 40dB for living/day rooms.

To achieve these internal noise levels noise impact is to be reduced by providing noise reduction across the facades and roof.

Mitigation :

Area 1

To achieve acceptable internal noise levels complying to the WHO/BS8233 and ProPG the roof & façade need to have a combined overall noise reduction capability of >=32dB which maybe achieved by the following construction methodology;

Element	Sound insulation (dB,DLnt,w)	
External walls	50-55	Typical construction details
Glazing	32-36	
Ventilation openings	30-35	35dB attenuation
Roof (timber/acoustic insulation)	40-50	300mm Rock wool @ 100-120kg/m3
Air tightness		<= 1.5 m3/m2h

Area 2&3

To achieve acceptable internal noise levels complying to the WHO/BS8233 and ProPG the roof & façade need to have a combined overall noise reduction capability of >=30dB which maybe achieved by the following construction methodology;

Element	Sound insulation (dB,DLnt,w)	
External walls	50-55	Typical construction details
Glazing	30-34	
Ventilation openings	30-35	35dB attenuation
Roof (timber/acoustic insulation)	40-50	300mm Rock wool @ 100-120kg/m3
Air tightness		<= 1.5 m3/m2h

Appendix B Manned noise survey data.

	Operator	Linius Kowalski	11-Jan-24	Bruel & Kjaer 2260	
	Averages	70.6	67.6	47.4	
	Specific event when identifiable	Incident noise (dB) @ 4m	Back ground noise (dB)Leq6 @ 4m	Ari craft only noise (dB)Leq6 @ 4m	Comment
7.00	Lorry	72.3	70.5	n/a	
7.01	Noisy car	90.1	70.3	n/a	Exhaust !
7.02	Lorry	79.3	68.6	n/a	
7.03	Aircraft	69.8	67.8	49.8	
7.04	Mot bike	75.2	67.8	n/a	
7.05	Mot bike	69.2	67.5	n/a	
7.06	Lorry	72.9	67.5	n/a	
7.07	Mot bike	73.1	67.1	n/a	
7.08	Aircraft	68.2	66.9	48.2	
7.09	Aircraft	68.8	67.4	48.8	
7.10	Aircraft	68.5	67.7	48.5	
7.11	Lorry	69.4	67.8	n/a	
7.12	Aircraft	70.2	67.8	50.2	
7.13	Aircraft	69.2	67.7	49.2	
7.14	Aircraft	69.8	67.8	49.8	
7.15	Aircraft	69.9	67.8	49.9	
7.16	Lorry	72.2	67.8	n/a	
7.17	Aircraft	68.8	67.7	48.8	
7.18	Aircraft	68.7	67.8	48.7	
7.19	Lorry	70.8	68.3	n/a	
7.20	Mot bike	74.1	68.2	n/a	
7.21	Lorry	72.3	68.6	n/a	
7.22	Aircraft	69.2	68.4	49.2	
7.23	Aircraft	69.8	68.4	49.8	
7.24	Tractor	69.2	68.4	n/a	
7.25	Aircraft	69.8	68.5	49.8	
7.26	Aircraft	69.9	68.9	49.9	
7.27	Aircraft	69.8	68.9	49.8	
7.28	Aircraft	69.9	68.9	49.9	
7.29	Lorry	68.9	69.1	n/a	
7.30	Lorry	73.8	69.4	n/a	
7.31	Aircraft	68.4	69.2	48.4	
7.32	Mot bike	78.1	69.2	n/a	
7.33	Aircraft	68.9	68.5	48.9	
7.34	Aircraft	68.8	68.5	48.8	
7.35	Aircraft	68.9	68.6	48.9	
7.36	Aircraft	68.9	68.9	48.9	
7.37	Lorry	74.1	69.1	n/a	
7.38	Aircraft	68.4	68.6	48.4	
7.39	Aircraft	69.3	68.8	49.3	
7.40	Lorry	72.1	68.8	n/a	
7.41	Mot bike	72.3	68.6	n/a	
7.42	Lorry	70.8	68.3	n/a	
7.43	Aircraft	69.1	68.8	49.1	
7.44	Lorry	69.3	68.8	n/a	
7.45	Lorry	69.5	68.8	n/a	
7.46	Aircraft	69.2	68.9	49.2	
7.47	Lorry	72.7	68.9	n/a	
7.48	Lorry	71.3	68.6	n/a	
7.49	Aircraft	68.8	68.5	48.8	
7.50	Mot bike	70.9	69.1	n/a	
7.51	Aircraft	69.2	69.0	49.2	
7.52	Aircraft	69.2	69.1	49.2	
7.53	Aircraft	69.1	69.2	49.1	
7.54	Lorry	76.1	69.3	n/a	
7.55	Lorry	69.7	69.1	n/a	
7.56	Aircraft	69.4	69.6	49.4	

7.57	Mot bike	70.5	69.7	n/a
7.58	Aircraft	69.1	69.8	49.1
7.59	Aircraft	69.0	70.2	49.0
8.00	Aircraft	69.7	70.6	48.7
8.01	Tractor	74.1	71.0	n/a
8.02	Aircraft	69.3	70.6	48.3
8.03	Aircraft	68.9	70.7	47.9
8.04	Aircraft	69.5	70.7	48.5
8.05	Aircraft	69.5	70.8	48.5
8.06	Lorry	73.1	71.1	n/a
8.07	Lorry	74.2	71.1	n/a
8.08	Aircraft	70.2	70.7	49.2
8.09	Aircraft	70.1	71.1	49.1
8.10	Lorry	72.8	71.1	n/a
8.11	Mot bike	73.1	70.9	n/a
8.12	Lorry	74.1	70.6	n/a
8.13	Aircraft	69.7	70.2	48.7
8.14	Aircraft	69.9	70.2	48.9
8.15	Aircraft	69.8	70.7	48.8
8.16	Aircraft	69.9	70.6	48.9
8.17	Lorry	73.2	70.9	n/a
8.18	Lorry	73.1	70.9	n/a
8.19	Aircraft	70.2	70.5	49.2
8.20	Mot bike	74.2	70.4	n/a
8.21	Aircraft	70.1	69.9	49.1
8.22	Aircraft	70.1	69.8	49.1
8.23	Aircraft	69.9	69.9	48.9
8.24	Lorry	69.8	69.8	n/a
8.25	Aircraft	69.9	69.8	48.9
8.26	Aircraft	75.3	69.8	54.3
8.27	Tractor	69.3	69.2	n/a
8.28	Aircraft	73.0	69.2	52.0
8.29	Aircraft	73.2	68.9	52.2
8.30	Aircraft	68.3	68.7	47.3
8.31	Aircraft	68.9	69.2	47.9
8.32	Lorry	68.6	68.9	n/a
8.33	Aircraft	69.5	69.0	48.5
8.34	Aircraft	70.3	69.0	49.3
8.35	Aircraft	69.3	68.9	48.3
8.36	Lorry	69.9	69.0	n/a
8.37	Lorry	70.0	69.0	n/a
8.38	Aircraft	68.3	69.0	47.3
8.39	Aircraft	68.9	69.1	47.9
8.40	Lorry	68.8	69.1	n/a
8.41	Mot bike	70.9	68.9	n/a
8.42	Lorry	74.2	68.7	n/a
8.43	Aircraft	65.8	68.4	44.8
8.44	Tractor	69.3	68.8	n/a
8.45	Tractor	69.9	68.7	n/a
8.46	Aircraft	69.3	68.7	48.3
8.47	Lorry	69.9	68.6	n/a
8.48	Lorry	70.0	69.0	n/a
8.49	Lorry	69.9	68.9	n/a
8.50	Aircraft	70.0	68.8	48.0
8.51	Mot bike	69.0	69.0	n/a
8.52	Aircraft	66.2	69.3	44.2
8.53	Aircraft	68.5	69.7	46.5
8.54	Aircraft	70.5	69.8	48.5
8.55	Lorry	70.5	69.7	n/a
8.56	Lorry	68.9	69.6	n/a
8.57	Aircraft	69.0	69.6	47.0
8.58	Mot bike	69.0	69.9	n/a
8.59	Aircraft	74.2	70.1	52.2
9.00	Aircraft	68.5	69.7	46.5
9.01	Aircraft	69.4	69.9	47.4

9.02	Aircraft	72.2	69.9	50.2
9.03	Aircraft	72.4	69.6	50.4
9.04	Lorry	70.9	69.4	n/a
9.05	Aircraft	69.2	69.8	47.2
9.06	Lorry	69.4	69.9	n/a
9.07	Lorry	69.6	69.9	n/a
9.08	Aircraft	69.3	70.0	47.3
9.09	Aircraft	72.8	70.0	50.8
9.10	Aircraft	71.4	69.6	49.4
9.11	Aircraft	68.9	69.5	46.9
9.12	Lorry	71.0	70.0	n/a
9.13	Lorry	69.3	69.8	n/a
9.14	Lorry	69.3	69.8	n/a
9.15	Aircraft	69.2	69.8	47.2
9.16	Mot bike	76.2	69.9	n/a
9.17	Aircraft	69.8	69.6	47.8
9.18	Aircraft	69.5	69.9	47.5
9.19	Aircraft	70.6	69.9	48.6
9.20	Lorry	69.2	69.8	n/a
9.21	Lorry	69.1	70.0	n/a
9.22	Aircraft	69.8	70.2	47.8
9.23	Mot bike	74.2	70.5	n/a
9.24	Aircraft	69.4	70.1	47.4
9.25	Aircraft	69.0	70.0	47.0
9.26	Aircraft	69.6	70.0	47.6
9.27	Aircraft	69.6	70.0	47.6
9.28	Aircraft	73.2	70.2	51.2
9.29	Lorry	74.3	70.1	n/a
9.30	Aircraft	70.3	69.8	47.3
9.31	Aircraft	70.2	70.1	47.2
9.32	Aircraft	72.9	70.1	49.9
9.33	Aircraft	73.2	69.9	50.2
9.34	Aircraft	74.2	69.6	51.2
9.35	Aircraft	69.8	69.2	46.8
9.36	Aircraft	70.0	69.2	47.0
9.37	Lorry	69.9	69.7	n/a
9.38	Aircraft	70.0	69.6	47.0
9.39	Mot bike	73.3	69.9	n/a
9.40	Aircraft	73.1	69.9	50.1
9.41	Aircraft	70.2	69.5	47.2
9.42	Aircraft	74.2	69.4	51.2
9.43	Lorry	70.1	68.9	n/a
9.44	Mot bike	70.1	68.8	n/a
9.45	Aircraft	69.9	68.8	46.9
9.46	Aircraft	69.8	68.8	46.8
9.47	Aircraft	69.8	68.7	46.8
9.48	Aircraft	75.2	68.6	52.2
9.49	Aircraft	69.2	68.3	46.2
9.50	Lorry	72.9	68.2	n/a
9.51	Lorry	73.1	67.7	n/a
9.52	Aircraft	68.2	67.5	45.2
9.53	Aircraft	68.8	67.9	45.8
9.54	Aircraft	68.5	68.1	45.5
9.55	Mot bike	69.4	68.1	n/a
9.56	Aircraft	70.2	68.0	47.2
9.57	Aircraft	69.2	67.8	46.2
9.58	Aircraft	69.8	67.8	46.8
9.59	Aircraft	69.9	67.8	46.9
10.00	Lorry	72.2	67.8	n/a
10.01	Aircraft	68.8	67.6	45.8
10.02	Aircraft	68.7	67.6	45.7
10.03	Aircraft	70.8	68.0	47.8
10.04	Lorry	74.1	67.8	n/a
10.05	Mot bike	72.3	68.2	n/a
10.06	Aircraft	69.2	67.9	46.2

10.07	Aircraft	69.8	67.9	46.8
10.08	Aircraft	69.2	67.8	46.2
10.09	Aircraft	69.8	67.8	46.8
10.10	Aircraft	69.9	68.1	46.9
10.11	Aircraft	69.8	68.0	46.8
10.12	Aircraft	69.9	67.9	46.9
10.13	Aircraft	68.9	68.1	45.9
10.14	Lorry	73.8	68.4	n/a
10.15	Aircraft	68.4	68.2	45.4
10.16	Mot bike	78.1	68.2	n/a
10.17	Aircraft	68.9	67.4	45.9
10.18	Aircraft	68.8	67.4	45.8
10.19	Aircraft	68.9	67.3	45.9
10.20	Aircraft	68.9	67.6	45.9
10.21	Lorry	74.1	67.7	n/a
10.22	Aircraft	68.4	67.1	45.4
10.23	Aircraft	69.3	67.3	46.3
10.24	Aircraft	72.1	67.2	49.1
10.25	Aircraft	72.3	66.9	49.3
10.26	Aircraft	70.8	66.5	47.8
10.27	Aircraft	69.1	66.9	46.1
10.28	Aircraft	69.3	66.8	46.3
10.29	Aircraft	69.5	66.8	46.5
10.30	Aircraft	69.2	66.9	46.2
10.31	Lorry	72.7	66.9	n/a
10.32	Lorry	71.3	66.6	n/a
10.33	Aircraft	68.8	66.5	45.8
10.34	Aircraft	70.9	66.9	47.9
10.35	Aircraft	69.2	66.8	46.2
10.36	Aircraft	69.2	66.7	46.2
10.37	Aircraft	69.1	66.8	46.1
10.38	Lorry	76.1	66.8	n/a
10.39	Aircraft	69.7	66.5	46.7
10.40	Aircraft	69.4	66.9	46.4
10.41	Lorry	70.5	67.0	n/a
10.42	Aircraft	69.1	66.9	46.1
10.43	Aircraft	69.0	67.3	46.0
10.44	Aircraft	69.7	67.6	46.7
10.45	Tractor	74.1	68.0	n/a
10.46	Aircraft	69.3	67.6	46.3
10.47	Aircraft	68.9	67.6	45.9
10.48	Aircraft	69.5	67.6	46.5
10.49	Aircraft	69.5	67.6	46.5
10.50	Lorry	73.1	67.8	n/a
10.51	Lorry	74.2	67.7	n/a
10.52	Aircraft	70.2	67.3	47.2
10.53	Aircraft	70.1	67.5	47.1
10.54	Aircraft	72.8	67.5	49.8
10.55	Lorry	73.1	67.1	n/a
10.56	Lorry	74.1	66.8	n/a
10.57	Aircraft	69.7	66.3	46.7
10.58	Aircraft	69.9	66.3	46.9
10.59	Aircraft	69.8	66.6	46.8
11.00	Aircraft	69.9	66.6	46.9
11.01	Lorry	73.2	66.8	n/a
11.02	Lorry	73.0	66.8	n/a
11.03	Aircraft	70.1	66.4	47.1
11.04	Lorry	74.1	66.3	n/a
11.05	Aircraft	70.0	65.8	47.0
11.06	Aircraft	70.0	65.8	47.0
11.07	Aircraft	69.8	65.8	46.8
11.08	Aircraft	69.7	65.7	46.7
11.09	Lorry	69.8	65.7	n/a
11.10	Lorry	75.2	65.7	n/a
11.11	Aircraft	69.2	65.5	46.2

11.12	Lorry	72.9	65.4	n/a
11.13	Aircraft	73.1	65.1	50.1
11.14	Aircraft	68.2	64.9	45.2
11.15	Aircraft	68.8	65.4	45.8
11.16	Aircraft	68.5	65.7	45.5
11.17	Aircraft	69.4	65.7	46.4
11.18	Aircraft	70.2	65.8	47.2
11.19	Lorry	69.2	65.6	n/a
11.20	Aircraft	69.8	65.6	46.8
11.21	Aircraft	69.9	65.5	46.9
11.22	Lorry	72.2	65.4	n/a
11.23	Aircraft	68.8	65.1	45.8
11.24	Aircraft	68.7	65.0	45.7
11.25	Aircraft	70.8	65.4	47.8
11.26	Aircraft	74.1	65.1	51.1
11.27	Lorry	72.3	65.3	n/a
11.28	Aircraft	69.2	65.0	46.2
11.29	Aircraft	69.8	64.9	46.8
11.30	Aircraft	69.2	64.7	45.2
11.31	Aircraft	69.8	64.7	45.8
11.32	Aircraft	69.8	65.0	45.8
11.33	Aircraft	69.7	64.9	45.7
11.34	Aircraft	69.8	64.9	45.8
11.35	Aircraft	68.8	65.0	44.8
11.36	Lorry	73.7	65.3	n/a
11.37	Aircraft	68.3	65.1	44.3
11.38	Lorry	78.0	65.1	n/a
11.39	Aircraft	68.8	64.4	44.8
11.40	Aircraft	68.7	64.4	44.7
11.41	Aircraft	68.8	64.5	44.8
11.42	Aircraft	68.8	64.8	44.8
11.43	Lorry	74.0	65.0	n/a
11.44	Aircraft	68.3	64.5	44.3
11.45	Aircraft	69.2	64.7	45.2
11.46	Lorry	72.0	64.7	n/a
11.47	Lorry	72.2	64.5	n/a
11.48	Aircraft	70.7	64.2	46.7
11.49	Aircraft	69.0	64.7	45.0
11.50	Aircraft	69.2	64.7	45.2
11.51	Aircraft	69.4	64.7	45.4
11.52	Aircraft	69.1	64.8	45.1
11.53	Lorry	72.6	64.9	n/a
11.54	Aircraft	71.2	64.6	47.2
11.55	Aircraft	68.7	64.5	44.7
11.56	Aircraft	70.8	65.0	46.8
11.57	Lorry	69.1	64.9	n/a
11.58	Aircraft	69.1	64.9	45.1
11.59	Aircraft	69.0	65.0	45.0
12.00	Aircraft	76.0	65.0	52.0
12.01	Aircraft	69.6	64.8	45.6
12.02	Aircraft	69.3	65.3	45.3
12.03	Aircraft	70.4	65.4	47.4
12.04	Aircraft	69.0	65.3	46.0
12.05	Aircraft	68.9	65.6	45.9
12.06	Aircraft	69.6	66.0	46.6
12.07	Lorry	74.0	66.3	n/a
12.08	Lorry	69.2	66.0	n/a
12.09	Aircraft	68.8	66.0	45.8
12.10	Aircraft	69.4	66.1	46.4
12.11	Aircraft	69.4	66.1	46.4
12.12	Lorry	73.0	66.4	n/a
12.13	Lorry	74.1	66.4	n/a
12.14	Aircraft	70.1	66.1	47.1
12.15	Aircraft	70.0	66.4	47.0
12.16	Lorry	72.7	66.4	n/a

12.17	Lorry	73.0	66.2	n/a
12.18	Lorry	74.0	65.9	n/a
12.19	Aircraft	69.6	65.6	46.6
12.20	Aircraft	69.8	65.6	46.8
12.21	Aircraft	69.7	66.1	46.7
12.22	Aircraft	69.8	66.1	46.8
12.23	Lorry	73.1	66.4	n/a
12.24	Lorry	72.9	66.4	n/a
12.25	Aircraft	70.0	66.0	47.0
12.26	Lorry	74.0	66.0	n/a
12.27	Aircraft	69.9	65.5	46.9
12.28	Aircraft	69.9	65.5	46.9
12.29	Aircraft	69.7	65.6	46.7
12.30	Aircraft	69.6	65.5	46.6
12.31	Aircraft	69.7	65.6	46.7
12.32	Lorry	75.0	65.6	n/a
12.33	Aircraft	69.0	65.3	46.0
12.34	Aircraft	72.7	65.3	49.7
12.35	Lorry	72.9	65.0	n/a
12.36	Aircraft	68.0	64.8	45.0
12.37	Aircraft	68.6	65.3	45.6
12.38	Aircraft	68.3	65.6	45.3
12.39	Aircraft	69.2	65.6	46.2
12.40	Aircraft	70.0	65.6	47.0
12.41	Aircraft	69.0	65.6	46.0
12.42	Aircraft	69.6	65.6	46.6
12.43	Aircraft	69.7	65.6	46.7
12.44	Lorry	72.0	65.6	n/a
12.45	Aircraft	68.6	65.4	45.6
12.46	Aircraft	68.5	65.4	45.5
12.47	Aircraft	70.6	65.8	47.6
12.48	Lorry	73.9	65.6	n/a
12.49	Mot bike	72.1	65.3	n/a
12.50	Aircraft	69.0	65.1	46.0
12.51	Aircraft	69.6	65.2	46.6
12.52	Aircraft	69.0	65.2	46.0
12.53	Lorry	69.6	65.3	n/a
12.54	Aircraft	69.7	65.3	46.7
12.55	Aircraft	69.6	65.4	46.6
12.56	Aircraft	69.7	65.5	46.7
12.57	Aircraft	68.7	65.6	45.7
12.58	Lorry	73.6	66.3	n/a
12.59	Aircraft	68.2	63.6	45.2