14B. Ground noise modelling methodology

14B.1 Introduction

14B.1.1 This replacement appendix of the Environmental Impact Assessment Report (EIAR), prepared by Bickerdike Allen Partners LLP, describes the modelling methodology for the aircraft ground noise predictions. The methodology for road traffic noise predictions is described in Appendix 14F of the 2021 EIAR.

- Section 14B.2 details the scenarios that have been assessed.
- Section 14B.3 sets out the methodology and the assumptions used in the prediction of aircraft ground noise levels and the production of noise contours.
- Section 14B.4 sets out the methodology used to assess the number of people and dwellings within the contours, as well as noise sensitive community buildings such as schools and hospitals.

14B.2 Assessment Scenarios

Scenarios to be Assessed

14B.2.1 Five scenarios have been included in the ground noise assessment, these are:

- 2018
- 2025 Permitted
- 2025 Proposed
- 2035 Permitted
- 2035 Proposed

14B.2.2 The 2018 scenario is based on the actual aircraft movements that occurred during 2018 which have been supplied by the Applicant. The future assessments are based on air traffic movement forecasts which have been supplied by Mott Macdonald.

14B.3 Noise Modelling Methodology

Software

14B.3.1 The modelling of ground noise has been undertaken using Version 2023 MR2 of the Datakustik CadnaA environmental noise prediction software. This software uses the methodology set out in ISO 9613-2:1996 and assumes that the wind is blowing from each source to each receptor and so is a worst case for each receptor. The software is used to produce noise exposure contours as well as predict noise levels at specific user-defined sites. For Dublin Airport the input data has comprised:

- Physical details of the airport, both current and future,
- The topography of the surrounding area,
- The aircraft movements themselves,
- The routes and procedures used by aircraft on the ground,
- Dwelling, population and community building data.

Study Area

14B.3.2 The study area is based on the largest extent of likely impacts due to ground noise, i.e. encompassing an envelope formed by the lowest value noise contours assessment for each metric. The extents of the study area are contained within a rectangle that extends approximately 3 km to the west, 3 km to the east, 3 km to the north and 2 km to the south of the centre of the South Runway (10R/28L) at Dublin Airport.

CadnaA Model

14B.3.3 As a basis for the model a layout drawing of the airport site has been provided by the Applicant and imported into the software.

14B.3.4 Buildings have been included in the model based on the drawings supplied by the Applicant for those on the airport site, and based on building outlines derived from satellite imagery for buildings outside the airport site. Heights have been assigned to the airport buildings, such as the terminals and hangars, based on the drawings supplied by the Applicant. In practice some of the airport buildings are complex shapes and have been simplified in the model, but this is not considered to have any significant effect on the accuracy of the model. A standard height of 7 m has been assumed for residential buildings.

14B.3.5 Terrain data has been acquired for the study area. This was provided by emapsite in the form of a Digital Terrain Model dataset and has been incorporated within the noise model.

14B.3.6 The aircraft ground operations are represented in the noise modelling software by noise sources at locations across the airport. The source locations represent stand locations or segments of an aircraft's taxi route.

14B.3.7 Each activity, such as taxiing after an arrival, is modelled by assigning a noise level and duration to one or more locations. These are then added for all aircraft activities to give a noise level for each source. This information is then fed into the noise modelling software which computes the noise level at each receiver location, for each metric considered.

14B.3.8 The airfield layout including taxiways and stand locations is shown on the AIP Ireland Aerodrome Chart[1]. This information has been used with a construction drawing for the North Runway supplied by daa to locate the noise sources in the model.

Aircraft Ground Noise Sources

14B.3.9 There are a number of potential sources of aircraft ground noise, however this assessment has focussed on only the sources that make significant contributions to the overall ground noise produced at Dublin Airport, when assessed as a long-term average. This is in accordance with *EU Commission Directive 2015/996 Establishing common noise assessment methods according to Directive 2002/49/EC of the European Parliament and of the Council* which states "*Where noise generating activities associated with airport operations do not contribute materially to the overall population exposure to aircraft noise and associated noise contours, they may be excluded*." The directive states that such excluded activities could include helicopters and engine testing, both of which are not considered here.

14B.3.10 The sources considered are aircraft taxiing between the stands and the runways, and the running of Auxiliary Power Units (APUs) on stands.

14B.3.11 The potential sources of noise from aircraft on the ground that have not been considered as part of this assessment are discussed below:

- Start of roll. This refers to the noise produced by aircraft on the runway while stationary, immediately before departing. Although the aircraft is physically on the ground, this noise source is considered as part of the air noise assessment.

[1] EIDW AD 2.24-1, dated 28 March 2019

- Reverse thrust. This refers to the noise produced by aircraft immediately after landing, when the engines are sometimes used in order to slow the aircraft down. Although the aircraft is physically on the ground, this noise source is considered as part of the air noise assessment.
- Engine testing. This refers to the noise produced by aircraft running engines for testing and maintenance purposes. When engines are run at high power, this can cause very high noise levels near the test location. However, this only occurs 1-2 times per day on average, and only during daytime hours. This is considered negligible in the context of the overall airport ground noise. Engine testing at lower power levels also occurs on stands. This occurs more frequently than high power testing, but still relatively rarely compared to the number of aircraft movements, and the noise levels are typically not higher than other activities such as taxiing.
- Aircraft parking on remote stands. The modelling work assumes that all aircraft taxi to one of the main stands and then use their APU for a time on the stand. In practice, a small number of aircraft park in other areas, such as Aircraft Park C to the north of the airfield. For Aircraft Park C in particular, aircraft are towed rather than taxiing when travelling to this area. Details of the exact usage of various non-stand locations were not available, although it is known to be a small percentage of the total aircraft and therefore would have a minimal effect on the overall noise environment.
- Other ground based activities that occur rarely and/or produce low noise levels relative to aircraft taxiing or APUs, such as ground support vehicles or de-icing.

Aircraft Types

14B.3.12 For the purpose of this assessment, aircraft were split into two categories; “Typical” and “Large”. The large aircraft, consisting of twin-aisle jet aircraft such as the Airbus A330 or Boeing 767 or larger, were considered separately as they have higher noise levels and also typically use different taxi routes for certain operations. The typical aircraft, while primarily being made up of the Airbus A320 and Boeing 737-800, also include smaller jet aircraft and propeller aircraft. Although these aircraft are significantly quieter once airborne, they are often found to be of a similar noise level when carrying out ground operations. The full list of aircraft operational codes and modelled aircraft categories are given in Table 14B-1.

Table 14B-1: Aircraft Classification for Ground Noise Modelling

Dublin Airport Operational Code	*Modelled Aircraft Category*	*Dublin Airport Operational Code*	*Modelled Aircraft Category*
100	TYPICAL	73H	TYPICAL
141	TYPICAL	73J	TYPICAL
142	TYPICAL	73P	TYPICAL
14Z	TYPICAL	73W	TYPICAL
223	TYPICAL	73Y	TYPICAL
290	TYPICAL	744	LARGE
295	TYPICAL	74Y	LARGE
313	LARGE	752	TYPICAL
318	TYPICAL	75C	TYPICAL
319	TYPICAL	75F	TYPICAL
31Y	LARGE	75T	TYPICAL
320	TYPICAL	75W	TYPICAL
321	TYPICAL	75X	TYPICAL
322	TYPICAL	763	LARGE
32A	TYPICAL	764	LARGE
32B	TYPICAL	76F	LARGE

Dublin Airport Operational Code	*Modelled Aircraft Category*	*Dublin Airport Operational Code*	*Modelled Aircraft Category*
32D	TYPICAL	76V	LARGE
32N	TYPICAL	76W	LARGE
32Q	TYPICAL	76X	LARGE
332	LARGE	76Y	LARGE
333	LARGE	772	LARGE
339	LARGE	773	LARGE
33F	LARGE	779	LARGE
343	LARGE	77L	LARGE
345	LARGE	77W	LARGE
359	LARGE	77X	LARGE
380	LARGE	781	LARGE
733	TYPICAL	788	LARGE
734	TYPICAL	789	LARGE
735	TYPICAL	7M2	TYPICAL
736	TYPICAL	7M8	TYPICAL
737	TYPICAL	7M9	TYPICAL
738	TYPICAL	A26	TYPICAL
738F	TYPICAL	AB6	LARGE
739	TYPICAL	ABF	LARGE
73C	TYPICAL	ABX	LARGE
73E	TYPICAL	ABY	LARGE
73F	TYPICAL	AN6	TYPICAL
73G	TYPICAL	AN7	TYPICAL
ANF	LARGE	DF2	TYPICAL
AR1	TYPICAL	DF3	TYPICAL
AR8	TYPICAL	DF7	TYPICAL
AT4	TYPICAL	DF8	TYPICAL
AT6	TYPICAL	DF9	TYPICAL
AT7	TYPICAL	DH4	TYPICAL
ATP	TYPICAL	DH8	TYPICAL
ATR	TYPICAL	E3L	TYPICAL
BBJ	TYPICAL	E70	TYPICAL
BE2	TYPICAL	E75	TYPICAL
BE4	TYPICAL	E90	TYPICAL
BEH	TYPICAL	E92	TYPICAL
BEJ	TYPICAL	E95	TYPICAL
CC8	TYPICAL	EM4	TYPICAL
CCJ	TYPICAL	EP1	TYPICAL
CCX	TYPICAL	EP3	TYPICAL
CGX	TYPICAL	ER3	TYPICAL
CJ1	TYPICAL	ER4	TYPICAL

Dublin Airport Operational Code	*Modelled Aircraft Category*	*Dublin Airport Operational Code*	*Modelled Aircraft Category*
CJ2	TYPICAL	ERJ	TYPICAL
CJ3	TYPICAL	F50	TYPICAL
CJ8	TYPICAL	FDJ	TYPICAL
CJM	TYPICAL	G28	TYPICAL
CL3	TYPICAL	GJ4	TYPICAL
CL6	TYPICAL	GJ5	TYPICAL
CN2	TYPICAL	GJ6	TYPICAL
CN7	TYPICAL	GR2	TYPICAL
CNJ	TYPICAL	GRS	TYPICAL
CNT	TYPICAL	GS4	TYPICAL
CR2	TYPICAL	GS5	TYPICAL
CR9	TYPICAL	GS6	TYPICAL
CRK	TYPICAL	GS7	TYPICAL
CS1	TYPICAL	H25	TYPICAL
CS3	TYPICAL	H28	TYPICAL
D20	TYPICAL	H29	TYPICAL
D38	TYPICAL	H40	TYPICAL
DA1	TYPICAL	IL7	LARGE
DA2	TYPICAL	J32	TYPICAL
DA5	TYPICAL	L35	TYPICAL
DA9	TYPICAL	L45	TYPICAL
ANF	LARGE	DF2	TYPICAL
AR1	TYPICAL	DF3	TYPICAL
L55	TYPICAL	X52	TYPICAL
L60	TYPICAL	X70	TYPICAL
L75	TYPICAL	X75	TYPICAL
M1F	TYPICAL	X83	TYPICAL
M82	TYPICAL	X84	TYPICAL
P18	TYPICAL	X94	TYPICAL
PAG	TYPICAL	X98	TYPICAL
PL2	TYPICAL	Y08	TYPICAL
Q00	TYPICAL	Y58	TYPICAL
Q12	TYPICAL	Y59	TYPICAL
Q22	TYPICAL	Y67	TYPICAL
Q34	TYPICAL	Y72	TYPICAL
Q35	TYPICAL	Y73	TYPICAL
Q36	TYPICAL	Y77	TYPICAL
Q67	TYPICAL	Y82	TYPICAL
Q69	TYPICAL	Y83	TYPICAL
Q70	TYPICAL	Y89	TYPICAL
Q76	TYPICAL	Y93	TYPICAL

Dublin Airport Operational Code	Modelled Aircraft Category	Dublin Airport Operational Code	Modelled Aircraft Category
Q80	TYPICAL	Y98	TYPICAL
Q81	TYPICAL	Y99	TYPICAL
Q82	TYPICAL	Z03	TYPICAL
Q83	TYPICAL	Z06	TYPICAL
Q84	TYPICAL	Z12	TYPICAL
Q85	TYPICAL	Z13	TYPICAL
Q86	TYPICAL	Z14	TYPICAL
S20	TYPICAL	Z15	TYPICAL
SF3	TYPICAL	Z16	TYPICAL
SU9	TYPICAL	Z17	TYPICAL
SWM	TYPICAL	Z18	TYPICAL
X11	TYPICAL	Z20	TYPICAL
X13	TYPICAL	Z21	TYPICAL
X51	TYPICAL		

Number of Aircraft Movements

14B.3.13 The number of modelled aircraft movements in each scenario is given in Table 14B-2 for each relevant time period.

14B.3.14 Helicopters and military aircraft have been excluded from this assessment as they perform less than 1% of the aircraft operations at Dublin Airport and therefore do not materially contribute to the noise produced. They have historically been excluded from aircraft noise contours produced for Dublin Airport.

Table 14B-2: Modelled Aircraft Movements by Period

Scenario	Aircraft Category	Aircraft Movements[1]				
		Annual			92-Day Summer	
		Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
2018	TYPICAL	149,936	38,367	22,844	52,142	7,382
	LARGE	14,143	1,996	5,052	4,972	1,373
2025 Permitted	TYPICAL	141,603	45,414	15,769	52,919	4,462
	LARGE	17,976	2,838	3,154	5,890	892
2025 Proposed	TYPICAL	139,906	44,745	29,305	52,295	8,299
	LARGE	16,385	2,836	6,617	5,444	1,874
2035 Permitted	TYPICAL	140,639	45,724	15,767	52,741	4,462
	LARGE	19,866	2,838	3,153	6,425	892
2035 Proposed	TYPICAL	138,015	44,745	29,305	51,759	8,299
	LARGE	18,276	2,836	6,617	5,979	1,874

[1] Movements derived from busy day forecast and expressed to nearest whole number.

Runway Usage

14B.3.15 For 2018 the runway used by each individual aircraft movement has been put into the model. A summary of the overall runway split for the 2018 annual period is given in Table 14B-3.

Table 14B-3: 2018 Annual Runway Usage

Runway	Arrivals	Departures
10	23.3%	24.1%
28	72.2%	71.4%
16	3.8%	2.4%
34	0.6%	2.1%

14B.3.16 Now the North Runway is operational the Crosswind Runway (16/34) continues to be used, however only for essential use (e.g. when there are strong crosswinds) as stated in Condition 4 of the North Runway Permission. The past use of the crosswind runway has been reviewed and is reported in *Crosswind Runway Information, Requested by ANCA RFI Appendix A, Request H and Table 4 Items 79, 80 and 81, Ricondo, May 2021*. Allowing for this, for the purposes of noise modelling the future usage of the Crosswind Runway is assumed to be 1% of aircraft movements, with the remaining 99% of movements on the two main runways.

14B.3.17 The distribution between runway ends is based on the 10-year average (2013-2022), as required by the Aircraft Noise Competent Authority (ANCA) for the annual reporting at Dublin Airport. The resulting modelled future runway usage over a given year is summarised in Table 14B-4 below.

Table 14B-4: Future Runway Usage

Runway	Arrivals	Departures
10L/10R	22.6%	22.6%
28L/28R	76.4%	76.4%
16	0.71%	0.71%
34	0.29%	0.29%

14B.3.18 Now that the North Runway is operational Dublin Airport operates during the daytime (07:00 – 23:00) in accordance with Conditions 3a-3c per the mode of operation Option 7b, as detailed in the Environmental Impact Statement Addendum, Section 16 as received by the planning authority on the 9th day of August, 2005. This provides that:

a. “the parallel runways (10R-28L and 10L-28R) shall be used in preference to the cross runway, 16-34,

b. when winds are westerly, Runway 28L shall be preferred for arriving aircraft. Either Runway 28L or 28R shall be used for departing aircraft as determined by air traffic control,

c. when winds are easterly, either Runway 10L or 10R as determined by air traffic control shall be preferred for arriving aircraft. Runway 10R shall be preferred for departing aircraft,

except in cases of safety, maintenance considerations, exceptional air traffic conditions, adverse weather, technical faults in air traffic control systems or declared emergencies at other airports.”

14B.3.19 In practice it is expected that, unless capacity requires mixed mode or there are exceptional circumstances, the runways will operate in segregated mode during the daytime with arrivals using either Runway 10L or Runway 28L and departures using either Runway 10R or Runway 28R depending on wind direction.

14B.3.20 An exception to this is maintenance activity on the South Runway, requiring the use of the North Runway. This is expected to occur for around 4 nights every 6-8 weeks, and has therefore been assumed to occur on 8% of nights. When maintenance is required for the South Runway, it is expected the North Runway will be used for all flights in the period 23:30 to 04:29. It has been assumed that any maintenance required on the North Runway will occur during the night hours when the South Runway is preferred.

14B.3.21 Any movements by Code F aircraft are expected to always use the North Runway. However, there are no Code F aircraft in the latest forecasts .

14B.3.22 A method of determining mixed mode runway usage on the main runways (North and South) for modelling purposes has been developed. The modelled runway usage has been determined on an hourly basis.

14B.3.23 Most of the time the runways will operate in segregated mode, i.e. one runway for all arrivals, the other for all departures. However, may be occasions during peak hours when runways will need to operate in some degree of mixed mode, i.e. both runways used simultaneously for arrivals and/or departures.

14B.3.24 The method assumes activity switches from segregated mode to mixed mode where activity is such that any of the three following single runway capacity limits are exceeded:

- More than 35 arrivals in one hour.
- More than 44 departures in one hour.
- More than 48 movements (combined arrivals and departures) on one runway in one hour.

14B.3.25 In mixed mode, where each individual runway handles both arrivals and departures, departures will operate using the compass departure principle. This means that if a departure is using a route that turns to the north then the North Runway will be used, and conversely if it is using a route that turns to the south, the South Runway will be used.

14B.3.26 For westerly operations when in mixed mode as few arrivals as possible will use 28R, while not exceeding the single runway capacity limit of 48 combined arrivals and departures on runway 28L. For easterly operations when in mixed mode as few arrivals as possible will use 10R, while not exceeding the single runway capacity limit of 48 combined arrivals and departures on runway 10L.

14B.3.27 When using the North Runway most aircraft will not use the full length on departure, and instead join the runway from the 1st intermediate taxiway. The exceptions are Code E and any Code F aircraft, which will typically use the full runway length. All departures on the South Runway are assumed to use the full runway length.

14B.3.28 During the night-time period (23:00 – 07:00) for the Permitted Scenarios the South Runway is the preferred runway, except when it is closed for maintenance. For the Proposed Scenarios the South Runway is the preferred runway in the core night period (00:00-06:00). Between 23:00 and 00:00 and between 06:00-07:00 the runway usage follows the same principles as in the daytime, i.e. Option 7b.

14B.3.29 The total number of modelled flights using each runway is given for each scenario and relevant assessment period in Table 14B-5 to Table 14B-9.

Table 14B-5: Aircraft Movements by Runway, Annual Day

Scenario	Number of Aircraft Movements by Runway, Annual Day (07:00-19:00)					
	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2018	0	0	41,923	117,351	3,299	1,506
2025 Permitted	17,605	62,405	18,460	59,514	1,133	463
2025 Proposed	16,664	63,074	18,658	56,333	1,110	453
2035 Permitted	17,674	62,879	18,600	59,747	1,140	465
2035 Proposed	16,664	63,074	18,658	56,333	1,110	453

Table 14B-6: Aircraft Movements by Runway, Annual Evening

Scenario	Number of Aircraft Movements by Runway, Annual Evening (19:00-23:00)					
	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2018	0	0	9,015	29,526	1,570	252
2025 Permitted	6,058	16,384	4,847	20,480	343	140
2025 Proposed	5,626	17,333	5,127	19,018	338	138
2035 Permitted	6,129	16,382	4,846	20,719	345	141
2035 Proposed	5,626	17,333	5,127	19,018	338	138

Table 14B-7: Aircraft Movements by Runway, Annual Night

Scenario	Number of Aircraft Movements by Runway, Annual Night (23:00-07:00)					
	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2018	0	0	4,155	19,897	2,396	1,448

Scenario	Number of Aircraft Movements by Runway, Annual Night (23:00-07:00)					
	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2025 Permitted	784	241	3,492	14,216	134	55
2025 Proposed	1,826	9,061	6,292	18,383	255	104
2035 Permitted	784	241	3,492	14,214	134	55
2035 Proposed	1,826	9,061	6,292	18,383	255	104

Table 14B-8: Aircraft Movements by Runway, Summer Day

Scenario	Number of Aircraft Movements by Runway, Summer Day (07:00-23:00)					
	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2018	0	0	9,582	47,026	3	503
2025 Permitted	6,696	22,295	6,595	22,636	418	171
2025 Proposed	6,313	22,772	6,736	21,340	410	167
2035 Permitted	6,736	22,431	6,635	22,772	420	172
2035 Proposed	6,313	22,772	6,736	21,340	410	167

Table 14B-9: Aircraft Movements by Runway, Summer Night

Scenario	Number of Aircraft Movements by Runway, Summer Night (23:00-07:00)					
	10L (North)	28R (North)	10R (South)	28L (South)	16	34
2018	0	0	342	7,144	757	512
2025 Permitted	222	68	988	4,023	38	16
2025 Proposed	517	2,566	1,782	5,206	72	30
2035 Permitted	222	68	988	4,023	38	16
2035 Proposed	517	2,566	1,782	5,206	72	30

Taxi Routes

14B.3.30 When using the North Runway most aircraft will not use the full length on departure, and instead join the runway from the 1st intermediate taxiway. The exceptions are Code E and any Code F aircraft, which will typically use the full runway length. All departures on the existing South Runway are assumed to use the full runway length.

14B.3.31 To develop the modelled taxi routes it was necessary to rationalise the stands into groups, with the same taxi route being followed for all stands in the same group. This grouping is described in Table 14B-10 where the stand numbers are taken from the Dublin Airport Aircraft Parking/Docking Chart. The Apron 5H development was completed after 2018 and resulted in stands 101-104 being replaced.

Table 14B-10: Aircraft Stand Groups

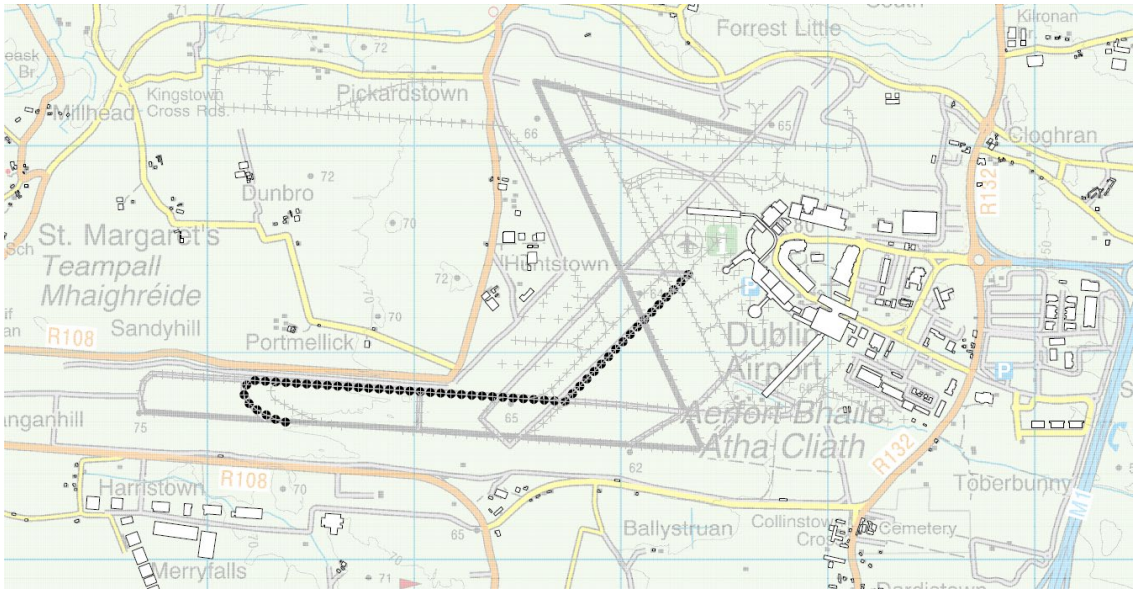
Stand Number	Modelled Stand Group	Stand Number	Modelled Stand Group
101	NORTHEAST	314	PIER3
102	NORTHEAST	315	PIER3
103	NORTHEAST	316	PIER3
104	NORTHEAST	317	PIER3
107	PIER1	318	PIER3
108	PIER1	400	PIER4
109	PIER1	401	PIER4
110	PIER1	402	PIER4
111	PIER1	403	PIER4
118	PIER1	404	PIER4
119	PIER1	405	PIER4

Stand Number	*Modelled Stand Group*	***Stand Number***	*Modelled Stand Group*
120	PIER1	406	PIER4
121	PIER1	407	PIER4
122	PIER1	408	PIER4
123	PIER1	409	PIER4
124	PIER1	410	PIER4
125	PIER1	411	SOUTH
126	PIER1	412	SOUTH
127	PIER1	413	SOUTH
130	TRIANGLE	414	SOUTH
131	TRIANGLE	415	SOUTH
132	TRIANGLE	416	SOUTH
133	TRIANGLE	417	SOUTH
137	NORTH	418	SOUTH
138	NORTH	600	WEST
139	NORTH	601	WEST
140	NORTH	602	WEST
141	NORTH	603	WEST
142	NORTH	604	WEST
143	NORTH	605	WEST
200	PIER2	606	WEST
201	PIER2	607	WEST
202	PIER2	610	WEST
203	PIER2	611	WEST
205	PIER2	612	WEST
206	PIER2	613	WEST
207	PIER2	614	WEST
311	PIER3	615	WEST
312	PIER3	616	WEST
313	PIER3	617	WEST

14B.3.32 With the stands rationalised, typical taxi routes for the different aircraft categories from each runway end to each stand group were developed through discussion with the Applicant. There are 216 potential different routes in total allowing for the runway ends, stand groups, and arrivals and departures. All of the modelled taxi routes are shown in Figure 14B-1. An example of a single route is shown in Figure 14B-2.

Figure 14B-1: Modelled taxi routes, all

Figure 14B-2: Modelled taxi route, typical aircraft, runway 28L arrival to Pier 2 stand group



Stand Usage

14B.3.33 For 2018, the log of aircraft movements supplied included the stand used by each aircraft. Aircraft logged as using Light Aircraft Park B, HP1, or HP2, were distributed equally among the stands 101-104 for modelling purposes. In a small number of cases (<1%) the stand used was not clear from the data, and in those cases the movements were distributed equally among all stands for modelling purposes.

14B.3.34 For the future Permitted and Proposed Scenarios, the relative stand usage for a given aircraft type and runway was assumed to remain the same as 2018.

14B.3.35 For the future Permitted and Proposed Scenarios, the aircraft modelled as using the former northeast stands 101-104 and an additional 12 arrivals and 12 departures per day were equally distributed between the 10 new Apron 5H stands. The number of aircraft modelled as using all other stands was reduced pro-rata such that the total aircraft movements were unchanged and match that forecast.

14B.3.36 The modelled number of aircraft using each stand is given for each scenario in Table 14B-11 to Table 14B-15.

Table 14B-11: Modelled Aircraft Movements by Stand Group, 2018

Modelled Stand Group	Aircraft Movements, 2018				
	Annual			92-Day Summer	
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
NORTH	1,289	1,391	2,055	589	542
NORTHEAST	3,819	641	375	1,152	103
PIER1	59,542	16,869	8,971	20,644	2,595
PIER2	23,961	7,051	2,792	8,482	869
PIER3	21,005	2,809	3,605	7,219	1,359
PIER4	32,634	7,208	5,926	11,429	1,961
SOUTH	7,510	1,605	1,648	2,624	626
TRIANGLE	13,590	2,182	546	4,604	174
WEST	729	607	1,977	371	526

Table 14B-12: Modelled Aircraft Movements by Stand Group, 2025 Permitted Scenario

Modelled Stand Group	Aircraft Movements, 2025 Permitted Scenario				
	Annual			92-Day Summer	
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
NORTH	3,132	947	371	1,159	106
NORTHEAST	9,506	2,878	1,125	3,256	296
PIER1	56,305	17,024	6,677	20,843	1,898
PIER2	22,310	6,745	2,646	8,259	752
PIER3	18,093	5,470	2,146	6,698	610
PIER4	30,186	9,127	3,580	11,174	1,017
SOUTH	7,104	2,148	843	2,630	239
TRIANGLE	10,786	3,261	1,279	3,993	364
WEST	2,156	652	256	798	73

Table 14B-13: Modelled Aircraft Movements by Stand Group, 2025 Proposed Scenario

Modelled Stand Group	Aircraft Movements, 2025 Proposed Scenario				
	Annual			92-Day Summer	
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
NORTH	3,074	936	707	1,141	201
NORTHEAST	8,983	2,735	2,065	3,087	544
PIER1	55,268	16,825	12,702	20,504	3,613
PIER2	21,899	6,667	5,033	8,125	1,432
PIER3	17,760	5,407	4,082	6,589	1,161
PIER4	29,630	9,020	6,810	10,993	1,937

Modelled Stand Group	Aircraft Movements, 2025 Proposed Scenario				
	Annual			92-Day Summer	
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
SOUTH	6,974	2,123	1,603	2,587	456
TRIANGLE	10,588	3,223	2,433	3,928	692
WEST	2,116	644	486	785	138

Table 14B-14: Modelled Aircraft Movements by Stand Group, 2035 Permitted Scenario

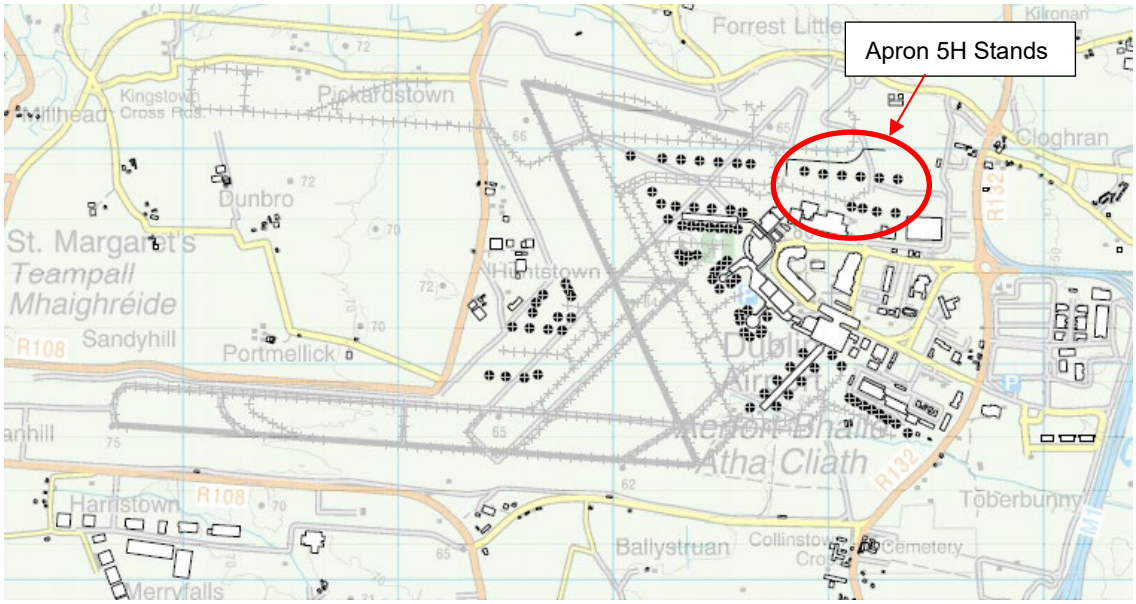
Modelled Stand Group	Aircraft Movements, 2035 Permitted Scenario				
	Annual			92-Day Summer	
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
NORTH	3,151	953	371	1,167	106
NORTHEAST	9,528	2,886	1,121	3,265	295
PIER1	56,644	17,137	6,678	20,973	1,898
PIER2	22,445	6,790	2,646	8,310	752
PIER3	18,202	5,507	2,146	6,740	610
PIER4	30,368	9,187	3,580	11,244	1,018
SOUTH	7,147	2,162	843	2,646	240
TRIANGLE	10,851	3,283	1,279	4,018	364
WEST	2,169	656	256	803	73

Table 14B-15: Modelled Aircraft Movements by Stand Group, 2035 Proposed Scenario

Modelled Stand Group	Aircraft Movements, 2035 Proposed Scenario				
	Annual			92-Day Summer	
	Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-23:00)	Night (23:00-07:00)
NORTH	3,074	936	707	1,141	201
NORTHEAST	8,983	2,735	2,065	3,087	544
PIER1	55,268	16,825	12,702	20,504	3,613
PIER2	21,899	6,667	5,033	8,125	1,432
PIER3	17,760	5,407	4,082	6,589	1,161
PIER4	29,630	9,020	6,810	10,993	1,937
SOUTH	6,974	2,123	1,603	2,587	456
TRIANGLE	10,588	3,223	2,433	3,928	692
WEST	2,116	644	486	785	138

14B.3.37 The modelled stands for the scenarios are shown in Figure 14B-3, with the Apron 5H stands highlighted. Stands 101-104, which are used in 2018, are not shown as they overlap with the southern Apron 5H stands.

Figure 14B-3: Modelled stand locations



Aircraft Activity Locations and Noise Levels

Noise Source Locations - APU

14B.3.38 APUs are assumed to only be run on aircraft stands. These are modelled at the locations given in the Dublin Airport Aircraft Parking/Docking Chart. Apron 5H stand locations were taken from plans supplied by the Applicant.

Noise Source Locations – Taxi

14B.3.39 For the modelled taxi routes, source locations were assigned at 50 m intervals along each taxi route.

Reference Activity Noise Levels and Durations

14B.3.40 Reference noise levels and durations for each aircraft category and for each activity were derived from reviewing available data from other studies, as well as on-site measurements of taxiing noise. Specifically, results from the following other ground noise studies were used to inform this assessment:

- "Heathrow's North-West Runway Air and Ground Noise Assessment", prepared by AMEC Environment & Infrastructure UK Limited, 2014
- Environmental Statement supporting London City Airport's most recent planning application (London Borough of Newham planning reference 13/01228/FUL), prepared by Bickerdike Allen Partners, 2015.

14B.3.41 The relevant results from these studies have been converted to sound power level, where necessary, and are reproduced in Table 14B-16 below.

Table 14B-16: Summary of Noise Level Data from Other Assessments

Activity	Aircraft	Sound Power Level, dB(A)	Source
APU	Propeller Aircraft (typically Dash-8)	122	London City Airport
APU	A319/A320	118	Heathrow
APU	Boeing 777	118	Heathrow

Activity	Aircraft	Sound Power Level, dB(A)	Source
APU	Airbus A380	123	Heathrow
Taxi	Propeller Aircraft (typically Dash-8)	129	London City Airport
Taxi	A319/A320	128	Heathrow
Taxi	Boeing 777	132	Heathrow
Taxi	Airbus A380	132	Heathrow

14B.3.42 Measurements have also been taken of activities at Dublin Airport by Bickerdike Allen Partners in 2019. The results from this survey were sound power levels of 128-129 dB(A) for Airbus A320/Boeing 737-800 aircraft taxiing. This is consistent with the results from the Heathrow and London City Airport assessments.

14B.3.43 The sources have been assumed to be omnidirectional with the levels and durations given in Table 14B-17. The durations are based on advice from the Applicant regarding typical activity. It is noted that at a number of stands, Fixed Electrical Ground Power (FEGP) is typically used, and therefore the assumed durations of APU usage are likely to be conservative from a noise perspective.

Table 14B-17: Reference Noise Levels for Ground Noise Assessment

Activity	Aircraft Category	Sound Power Level, dB(A)	Duration (s)
APU Usage - Arrivals	Typical	119	300
	Large	123	300
APU Usage - Departures	Typical	119	600
	Large	123	600
Taxi	Typical	128	5[1]
	Large	132	5[1]

[1] Source locations for taxi routes have a 50 m spacing. With an assumed speed of 10 m/s this equates to 5 s at each location.

14B.4 Population and Demographics Assessment Methodology

Dwelling and Population Data

14B.4.1 Dwelling data has been acquired from GeoDirectory for 2019 Q2, which was the dataset utilised in the original EIAR. The same dataset has been used for all assessment scenarios in this EIAR Supplement for consistency.

14B.4.2 An assessment of not yet built dwellings, which have already been granted planning permission, has been carried out. This has utilised information on permitted developments provided by Tom Phillips and Associates (TPA) covering the period 2019 to 2023, which has been compared to the 2019 Q2 data from GeoDirectory, to ensure that developments are not counted twice if they have already commenced. This resulted in a separate consented dwellings database.

14B.4.3 Population data has been estimated using the average dwelling occupancy by small area. This has been obtained for 2016 based on Census data from the Central Statistics Office[2], by dividing the number of people by the number of dwellings for each small area. It has then been determined into which of the small areas each of the dwellings falls, based upon which they have been assigned the average dwelling occupancy for the relevant area.

[2] http://www.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=EP008 [Checked 11/09/2023]

14B.4.4 An assessment of zoned land has also been undertaken. This did not identify any areas which are designated for residential use within the study area.

Community Buildings

14B.4.5 Noise sensitive community buildings have been identified through a review of the GeoDirectory data. For the purposes of this assessment noise sensitive education buildings include nurseries, schools, colleges and universities, but not day-care or creches. Noise sensitive healthcare buildings include healthcare facilities where people may have an overnight stay such as hospitals or nursing homes, but not GP surgeries or dentists.

Noise prediction

14B.4.6 Each dwelling and community building has been included in the noise model as a receptor. A representative set of receptors has been created for each permitted development based on site plans and other publicly available information. Noise levels have been predicted at each of these receptor locations.