Appendix 9-2: Air Noise Modelling Methodology

9-2. Air noise modelling methodology

9-2.1 Introduction

9-2.1.1 This appendix of the Environmental Impact Assessment Report (EIAR), prepared by Bickerdike Allen Partners LLP, describes the modelling methodology for the air noise modelling.

- Section 9-2.2 details the scenarios that have been modelled and presents summaries of the aircraft movements.
- Section 9-2.3 sets out the methodology and the assumptions used in the modelling of air noise levels and the production of noise contours.
- Section 9-2.4 sets out the methodology used to calculate the number of people and dwellings within the contours, as well as noise sensitive community buildings such as schools and hospitals.

9-2.2 Assessment Scenarios

9-2.2.1 Three scenarios have been included in the air noise assessment, these are:

- Current Receiving Environment (2025)
- 2029 Permitted Operation
- 2029 Proposed Operation

9-2.2.2 As the primary metrics (L_{den} and L_{night}) relate to a calendar year of activity, it is common practice when considering aircraft noise to use the most recently completed calendar year to represent the Current Receiving Environment. Therefore the calendar year of 2025 has been taken to be the Current Receiving Environment.

9-2.2.3 The future assessments are based on air traffic movement forecasts for 2029 which have been supplied by Mott Macdonald. These comprised a forecast “busy day” schedule and scaling factors to convert from the “busy day” to the annual or summer periods required. Separate scaling factors were supplied for the day and night periods based on historical trends. Analysis of the historical data did not show any clear difference between the day and evening periods, so the same scaling factors have been used for both.

9-2.2.4 The modelled annual day, evening and night movements, and the summer day and night movements are given in the tables below by aircraft type for each of the scenarios. Aircraft types with a small number of movements have been grouped under “Other”.

Table 9-2-1: Current Receiving Environment Actual Aircraft Movements

Aircraft Type	Aircraft Movements				
	Annual			92-Day Summer	
	Day 07h-19h	Evening 19h-23h	Night 23h-07h	Day 07h-23h	Night 23h-07h
Airbus A300	0	0	0	0	0
Airbus A306	62	36	84	19	19
Airbus A319	1,532	472	166	430	45
Airbus A320	30,283	6,062	5,394	10,693	1,832
Airbus A320neo	12,683	2,622	906	4,171	347
Airbus A321	1,802	613	1,051	903	294
Airbus A321neo	11,652	427	1,684	3,670	359
Airbus A330	8,400	54	1,092	2,706	296
Airbus A330neo	144	1	1	22	0
Airbus A350	30	2	4	5	0
ATR 42	52	3	1	15	1
ATR 72	20,798	4,240	1,132	7,277	239
BAe 146/Avro RJ	0	0	0	0	0
Boeing 737-400	13	21	110	4	0
Boeing 737-500	11	1	0	4	0
Boeing 737-700	364	66	74	123	11
Boeing 737-800	45,126	15,672	9,946	16,093	2,779
Boeing 737 MAX	24,409	6,284	6,025	9,234	1,954
Boeing 757	2,023	277	322	805	99
Boeing 767	2,112	721	929	674	221
Boeing 777	2,965	591	588	1,098	172
Boeing 777X	0	0	0	0	0
Boeing 787	3,352	124	609	1,168	178
Bombardier CS300	1,760	396	404	546	113
Bombardier Dash 8	311	61	0	68	0
Convair 580	0	0	0	0	0
Embraer E190/195	4,171	1,506	481	1,237	135
Embraer E190-E2	986	85	63	412	62
Airbus A320neo+ (G3)	0	0	0	0	0
Airbus A321neo+ (G3)	0	0	0	0	0
Airbus A350neo (G3)	0	0	0	0	0
Boeing 787 NG (G3)	0	0	0	0	0
Boeing 797 NMA (G3)	0	0	0	0	0
Other	6,883	1,062	793	2,362	252
Total	**181,924**	**41,399**	**31,859**	**63,739**	**9,408**

Table 9-2-2: 2029 Permitted Operation Forecast Aircraft Movements

Aircraft Type	Aircraft Movements				
	Annual			92-Day Summer	
	Day 07h-19h	Evening 19h-23h	Night 23h-07h	Day 07h-23h	Night 23h-07h
Airbus A300	0	0	0	0	0
Airbus A306	0	656	759	182	240
Airbus A319	656	0	0	182	0
Airbus A320	21,969	7,542	5,060	8,203	1,600
Airbus A320neo	21,313	4,591	4,301	7,200	1,360
Airbus A321	1,967	656	506	729	160
Airbus A321neo	6,558	0	1,265	1,823	400
Airbus A330	4,591	0	759	1,276	240
Airbus A330neo	3,935	0	0	1,094	0
Airbus A350	328	0	253	91	80
ATR 42	0	0	0	0	0
ATR 72	12,132	2,623	1,518	4,101	480
BAe 146/Avro RJ	0	0	0	0	0
Boeing 737-400	0	1,639	2,277	456	720
Boeing 737-500	0	0	0	0	0
Boeing 737-700	0	0	0	0	0
Boeing 737-800	9,509	2,623	1,265	3,372	400
Boeing 737 MAX	52,792	21,641	9,361	20,690	2,960
Boeing 757	656	328	253	273	80
Boeing 767	328	656	1,012	273	320
Boeing 777	0	0	0	0	0
Boeing 777X	656	656	506	365	160
Boeing 787	7,870	1,312	2,024	2,552	640
Bombardier CS300	2,295	984	0	911	0
Bombardier Dash 8	656	0	0	182	0
Convair 580	0	0	0	0	0
Embraer E190/195	4,263	2,623	506	1,914	160
Embraer E190-E2	2,295	0	0	638	0
Airbus A320neo+ (G3)	0	0	0	0	0
Airbus A321neo+ (G3)	0	0	0	0	0
Airbus A350neo (G3)	0	0	0	0	0
Boeing 787 NG (G3)	0	0	0	0	0
Boeing 797 NMA (G3)	0	0	0	0	0
Other	1,967	1,639	1,265	1,003	400
Total	**156,735**	**50,168**	**32,890**	**57,512**	**10,400**

Table 9-2-3: 2029 Proposed Operation Forecast Aircraft Movements

Aircraft Type	Aircraft Movements				
	Annual			92-Day Summer	
	Day 07h-19h	Evening 19h-23h	Night 23h-07h	Day 07h-23h	Night 23h-07h
Airbus A300	0	0	0	0	0
Airbus A306	0	656	759	182	240
Airbus A319	656	0	0	182	0
Airbus A320	23,301	7,548	5,060	8,563	1,600
Airbus A320neo	24,286	4,595	4,301	8,017	1,360
Airbus A321	1,969	656	506	729	160
Airbus A321neo	14,112	1,313	3,036	4,282	960
Airbus A330	6,564	0	759	1,822	240
Airbus A330neo	3,938	0	0	1,093	0
Airbus A350	328	0	253	91	80
ATR 42	0	0	0	0	0
ATR 72	14,440	2,954	1,518	4,828	480
BAe 146/Avro RJ	0	0	0	0	0
Boeing 737-400	0	2,297	2,277	638	720
Boeing 737-500	0	0	0	0	0
Boeing 737-700	0	0	0	0	0
Boeing 737-800	9,517	2,626	1,265	3,371	400
Boeing 737 MAX	63,340	23,630	11,891	24,141	3,760
Boeing 757	656	328	253	273	80
Boeing 767	328	656	1,012	273	320
Boeing 777	0	0	0	0	0
Boeing 777X	1,313	656	506	547	160
Boeing 787	9,517	1,313	2,277	3,006	720
Bombardier CS300	2,297	985	0	911	0
Bombardier Dash 8	656	0	0	182	0
Convair 580	0	0	0	0	0
Embraer E190/195	4,266	2,626	506	1,913	160
Embraer E190-E2	3,282	328	0	1,002	0
Airbus A320neo+ (G3)	0	0	0	0	0
Airbus A321neo+ (G3)	0	0	0	0	0
Airbus A350neo (G3)	0	0	0	0	0
Boeing 787 NG (G3)	0	0	0	0	0
Boeing 797 NMA (G3)	0	0	0	0	0
Other	1,969	1,641	1,265	1,002	400
Total	**186,739**	**54,808**	**37,444**	**67,048**	**11,840**

9-2.3 Noise Modelling Methodology

Software

9-2.3.1 The noise modelling utilises the Federal Aviation Authority Aviation Environmental Design Tool (AEDT) version 4a, which is compliant with *ECAC.CEAC Doc 29 4th Edition Report on Standard Method of Computing Noise Contours around Civil Airports and 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*. This was the latest version of the software when the assessment work began.

9-2.3.2 The AEDT software evaluates aircraft noise in the vicinity of airports using flight track information, aircraft fleet mix, aircraft profiles and terrain. The AEDT 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,
- the topography of the surrounding area,
- the aircraft movements themselves,
- the routes flown by the aircraft movements,
- the flight procedures used by the aircraft movements, and
- dwelling, population and community building data.

Study Area

9-2.3.3 The study area is based on the largest extent of likely impacts due to air noise, i.e. encompassing an envelope formed by the lowest value noise contours assessed for each metric. The extents of the study area for air noise are contained within a rectangle that extends 30 km to the west, 35 km to the east, 20 km to the north and 15 km to the south of the centre of the South Runway (10R/28L) at Dublin Airport. Figure 9-2-1 shows the study area.

AEDT Study

9-2.3.4 The AEDT default weather settings for Dublin Airport and all-soft ground lateral attenuation have been used. The directivity effects of aircraft bank angle have been allowed for in accordance with EU Directive 2015/996.

9-2.3.5 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.

Airport Layout

9-2.3.6 The airfield layout including runways and taxiways is shown on the AIP Ireland Aerodrome Chart[1]. This information (taken from the version dated 16 April 2026) has been used to locate the Dublin Airport runways in the model.

Aircraft Movements

9-2.3.7 The AEDT software includes noise information for many common aircraft types, but it does not include every aircraft type. Therefore, the actual and forecast aircraft types need to be mapped to aircraft types in the AEDT software. For most aircraft, substitutions are proposed by the AEDT software or the ANP

[1] The Aeronautical Information Publication (AIP), https://www.airnav.ie/air-traffic-management/aeronautical-information-management/aip-package

database[2] where a similar alternative aircraft type is used to model the actual type. For larger aircraft this generally does not involve a change but for the smaller aircraft, and in particular the general aviation aircraft, some substitutions occur. Where the AEDT and ANP databases have no guidance, an aircraft type has been assigned based on the aircraft size and engine details.

9-2.3.8 This is in accordance with EU Directive 2015/996 which states that:

"The ANP database provided in Appendix I covers most existing aircraft types. For aircraft types or variants for which data are not currently listed, they can best be represented by data for other, normally similar, aircraft that are listed."

9-2.3.9 The aircraft movements assessed as part of the air noise assessment include all aircraft taking off from or landing at Dublin Airport, except for helicopter and military aircraft. This is the standard approach used for the modelling of airport noise and reflects that operations by helicopter and military aircraft often make up a very small proportion (<1%) of the total and are not able to be assessed to the same level of accuracy. As a result, their inclusion would have a negligible effect on the findings of any assessment.

9-2.3.10 This is in accordance with EU Directive 2015/996 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. These activities include: helicopters, taxiing, engine testing and use of auxiliary power-units."

Runway Usage

9-2.3.11 While the North Runway is operational, Dublin Airport operates 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 Crosswind 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."

9-2.3.12 In practice this means that arrivals use either Runway 10L or Runway 28L and departures use either Runway 10R or Runway 28R depending on wind direction. It has been assumed that mixed mode operations, where for example both runways would be used for departures simultaneously, are not required up to 40 mppa.

9-2.3.13 When the North Runway is not operational, the South Runway (10R/28L) is preferred for all flights.

9-2.3.14 The Crosswind Runway (16/34) is used only for essential use (e.g. when there are strong crosswinds) as stated in Condition 4 of the North Runway Permission. 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.

9-2.3.15 For the Current Receiving Environment, the North Runway was operational between 07:00 and 22:59. For the 2029 Permitted Operation and the 2029 Proposed Operation, it has been assumed that the North Runway will be operational between 06:00 and 23:59.

9-2.3.16 For the Current Receiving Environment the runway used by each individual aircraft movement has been put into the model. A summary of the overall modal split for the Current Receiving Environment is given in Table 9-2-4.

[2] Aircraft Noise and Performance Database, https://www.aircraftnoisemodel.org

Table 9-2-4: Modelled Runway Usage – Current Receiving Environment

Runway	Arrivals	Departures
10L/10R	35.2%	35.6%
28L/28R	64.7%	64.3%
16	0.1%	0.1%
34	0.0%	0.0%

9-2.3.17 For the 2029 Permitted Operation and the 2029 Proposed Operation the modelled distribution between runway ends is based on a 10-year average, as required by the Aircraft Noise Competent Authority (ANCA) for the annual reporting at Dublin Airport. The resulting modelled runway usage for 2029 is summarised in Table 9-2-5 below.

Table 9-2-5: Modelled Runway Usage – 2029

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%

9-2.3.18 When using the North Runway most aircraft do not use the full length on departure, and instead join the runway from the first intermediate taxiway. The exceptions are aircraft which are Code E or larger, which will typically use the full runway length.

9-2.3.19 Consideration has been given to likely exceptions from the typical runway usage as set out below:

- During maintenance activity on the South Runway, the use of the North Runway is required. Based on advice from daa, it has been assumed that maintenance will occur on the South Runway on 8% of nights, between the hours of 23:30 and 04:30. This equates to approximately 4 nights every 7 weeks. During this period all aircraft are assumed to use the North Runway.
- It has been assumed that for 2% of the time when both the North and South Runways would be in operation under the normal circumstances, one will be required to close due to exceptional circumstances. In such cases, the North Runway would be closed in preference to the South Runway, in order to comply with Conditions 3(b) and 3(c).

9-2.3.20 The resulting runway usage by hour on an average annual day for both westerly and easterly operations is shown in the tables below for each modelled scenario.

Table 9-2-6: Modelled Average Annual Day Runway Usage By Hour and Operation – Current Receiving Environment Westerly Operations

Hour	Arrivals		Departures	
	28L (South)	28R (North)	28L (South)	28R (North)
00:00-00:59	11.4	1.0	1.3	0.1
01:00-01:59	5.9	0.4	0.3	0.0
02:00-02:59	1.4	0.1	0.9	0.1
03:00-03:59	1.3	0.1	0.4	0.0
04:00-04:59	5.5	0.3	0.7	0.1
05:00-05:59	3.7	0.0	5.8	0.0
06:00-06:59	4.3	0.0	25.7	0.0
07:00-07:59	16.0	0.0	0.4	33.9
08:00-08:59	21.1	0.0	0.0	21.0
09:00-09:59	20.8	0.0	0.0	19.6
10:00-10:59	21.2	0.0	0.0	21.0
11:00-11:59	22.4	0.0	0.0	22.2
12:00-12:59	21.2	0.0	0.0	20.3
13:00-13:59	20.2	0.0	0.0	23.2
14:00-14:59	19.6	0.0	0.0	21.4
15:00-15:59	16.9	0.0	0.0	20.3
16:00-16:59	15.5	0.0	0.0	20.8
17:00-17:59	19.6	0.0	0.0	19.3
18:00-18:59	19.1	0.0	0.0	21.1
19:00-19:59	14.3	0.0	0.0	18.0
20:00-20:59	14.8	0.0	0.0	13.1
21:00-21:59	18.4	0.0	0.2	9.7
22:00-22:59	19.0	0.0	0.3	5.7
23:00-23:59	12.9	1.2	2.1	0.2

Note: All values rounded to 1 decimal place

Table 9-2-7: Modelled Average Annual Day Runway Usage By Hour and Operation – Current Receiving Environment Easterly Operations

Hour	Arrivals		Departures	
	10L (North)	10R (South)	10L (North)	10R (South)
00:00-00:59	0.3	11.0	0.1	1.1
01:00-01:59	0.3	5.2	0.0	0.3
02:00-02:59	0.1	1.0	0.1	1.1
03:00-03:59	0.1	1.3	0.0	0.4
04:00-04:59	0.3	8.0	0.1	1.1
05:00-05:59	0.0	4.5	0.0	5.2
06:00-06:59	0.0	4.6	0.0	25.6
07:00-07:59	11.4	0.1	0.0	27.2
08:00-08:59	16.0	0.2	0.0	16.7
09:00-09:59	17.5	0.1	0.0	16.8
10:00-10:59	19.8	0.0	0.0	18.6
11:00-11:59	21.6	0.0	0.0	21.7
12:00-12:59	21.6	0.1	0.0	21.5
13:00-13:59	23.4	0.0	0.0	26.5
14:00-14:59	22.7	0.1	0.0	23.7
15:00-15:59	18.5	0.2	0.0	24.0
16:00-16:59	17.7	0.1	0.0	23.5
17:00-17:59	22.3	0.1	0.0	21.1
18:00-18:59	20.4	0.2	0.0	23.1
19:00-19:59	15.7	0.1	0.0	21.0
20:00-20:59	14.6	0.2	0.0	13.7
21:00-21:59	16.1	1.8	0.0	8.7
22:00-22:59	14.7	1.8	0.0	5.0
23:00-23:59	0.7	12.7	0.1	2.2

Note: All values rounded to 1 decimal place

Table 9-2-8: Modelled Average Annual Day Runway Usage By Hour and Operation – 2029 Permitted Operation Westerly Operations

Hour	Arrivals		Departures	
	28L (South)	28R (North)	28L (South)	28R (North)
00:00-00:59	14.0	1.2	1.3	0.1
01:00-01:59	3.8	0.3	0.6	0.1
02:00-02:59	0.6	0.1	0.6	0.1
03:00-03:59	1.3	0.1	1.3	0.1
04:00-04:59	7.5	0.2	1.3	0.1
05:00-05:59	6.9	0.0	2.8	0.0
06:00-06:59	2.8	0.0	0.5	23.8
07:00-07:59	11.7	0.0	0.6	29.1
08:00-08:59	18.9	0.0	0.3	15.0
09:00-09:59	18.0	0.0	0.3	15.8
10:00-10:59	13.5	0.0	0.3	15.8
11:00-11:59	16.2	0.0	0.3	15.8
12:00-12:59	22.5	0.0	0.3	14.1
13:00-13:59	20.7	0.0	0.4	22.0
14:00-14:59	15.3	0.0	0.3	13.2
15:00-15:59	16.2	0.0	0.5	25.5
16:00-16:59	11.7	0.0	0.4	19.4
17:00-17:59	14.4	0.0	0.4	17.6
18:00-18:59	24.3	0.0	0.4	18.5
19:00-19:59	18.0	0.0	0.5	24.7
20:00-20:59	16.2	0.0	0.4	18.5
21:00-21:59	10.8	0.0	0.3	15.0
22:00-22:59	24.3	0.0	0.2	8.8
23:00-23:59	14.1	0.4	0.1	4.1

Note: All values rounded to 1 decimal place

Table 9-2-9: Modelled Average Annual Day Runway Usage By Hour and Operation – 2029 Permitted Operation Easterly Operations

Hour	Arrivals		Departures	
	10L (North)	10R (South)	10L (North)	10R (South)
00:00-00:59	1.2	14.0	0.1	1.3
01:00-01:59	0.3	3.8	0.1	0.6
02:00-02:59	0.1	0.6	0.1	0.6
03:00-03:59	0.1	1.3	0.1	1.3
04:00-04:59	0.2	7.5	0.1	1.3
05:00-05:59	0.0	6.9	0.0	2.8
06:00-06:59	2.7	0.1	0.0	24.3
07:00-07:59	11.4	0.2	0.0	29.6
08:00-08:59	18.5	0.4	0.0	15.3
09:00-09:59	17.6	0.4	0.0	16.2
10:00-10:59	13.2	0.3	0.0	16.2
11:00-11:59	15.8	0.3	0.0	16.2
12:00-12:59	22.0	0.4	0.0	14.4
13:00-13:59	20.2	0.4	0.0	22.5
14:00-14:59	15.0	0.3	0.0	13.5
15:00-15:59	15.8	0.3	0.0	26.1
16:00-16:59	11.4	0.2	0.0	19.8
17:00-17:59	14.1	0.3	0.0	18.0
18:00-18:59	23.8	0.5	0.0	18.9
19:00-19:59	17.6	0.4	0.0	25.2
20:00-20:59	15.8	0.3	0.0	18.9
21:00-21:59	10.6	0.2	0.0	15.3
22:00-22:59	23.8	0.5	0.0	9.0
23:00-23:59	14.3	0.3	0.1	4.0

Note: All values rounded to 1 decimal place

Table 9-2-10: Modelled Average Annual Day Runway Usage By Hour and Operation – 2029 Proposed Operation Westerly Operations

Hour	Arrivals		Departures	
	28L (South)	28R (North)	28L (South)	28R (North)
00:00-00:59	14.0	1.2	1.3	0.1
01:00-01:59	3.8	0.3	0.6	0.1
02:00-02:59	0.6	0.1	0.6	0.1
03:00-03:59	1.3	0.1	1.3	0.1
04:00-04:59	8.2	0.2	1.3	0.1
05:00-05:59	9.0	0.0	2.8	0.0
06:00-06:59	3.5	0.0	0.6	27.9
07:00-07:59	14.4	0.0	0.7	36.1
08:00-08:59	24.3	0.0	0.3	16.7
09:00-09:59	22.5	0.0	0.4	20.3
10:00-10:59	18.0	0.0	0.4	19.4
11:00-11:59	17.1	0.0	0.3	16.7
12:00-12:59	26.1	0.0	0.4	18.5
13:00-13:59	26.1	0.0	0.5	25.6
14:00-14:59	19.8	0.0	0.4	18.5
15:00-15:59	17.1	0.0	0.7	32.6
16:00-16:59	14.4	0.0	0.4	21.1
17:00-17:59	16.2	0.0	0.4	18.5
18:00-18:59	26.1	0.0	0.4	20.3
19:00-19:59	18.9	0.0	0.6	28.2
20:00-20:59	17.1	0.0	0.4	19.4
21:00-21:59	13.5	0.0	0.3	15.0
22:00-22:59	26.1	0.0	0.2	10.6
23:00-23:59	18.1	0.6	0.1	4.8

Note: All values rounded to 1 decimal place

Table 9-2-11: Modelled Average Annual Day Runway Usage By Hour and Operation – 2029 Proposed Operation Easterly Operations

Hour	Arrivals		Departures	
	10L (North)	10R (South)	10L (North)	10R (South)
00:00-00:59	1.2	14.0	0.1	1.3
01:00-01:59	0.3	3.8	0.1	0.6
02:00-02:59	0.1	0.6	0.1	0.6
03:00-03:59	0.1	1.3	0.1	1.3
04:00-04:59	0.2	8.2	0.1	1.3
05:00-05:59	0.0	9.0	0.0	2.8
06:00-06:59	3.4	0.1	0.0	28.4
07:00-07:59	14.1	0.3	0.0	36.9
08:00-08:59	23.8	0.5	0.0	17.1
09:00-09:59	22.0	0.4	0.0	20.7
10:00-10:59	17.6	0.4	0.0	19.8
11:00-11:59	16.7	0.3	0.0	17.1
12:00-12:59	25.6	0.5	0.0	18.9
13:00-13:59	25.6	0.5	0.0	26.1
14:00-14:59	19.4	0.4	0.0	18.9
15:00-15:59	16.7	0.3	0.0	33.3
16:00-16:59	14.1	0.3	0.0	21.6
17:00-17:59	15.9	0.3	0.0	18.9
18:00-18:59	25.6	0.5	0.0	20.7
19:00-19:59	18.5	0.4	0.0	28.8
20:00-20:59	16.7	0.3	0.0	19.8
21:00-21:59	13.2	0.3	0.0	15.3
22:00-22:59	25.6	0.5	0.0	10.8
23:00-23:59	18.4	0.4	0.1	4.7

Note: All values rounded to 1 decimal place

Flight Routes

9-2.3.21 Flight routes refer to the ground tracks followed by aircraft. In practice every aircraft follows a slightly different route, depending on the weather conditions and aircraft characteristics. For modelling purposes, it is typically considered sufficient to model each distinct route using what is known as a backbone track, as well as a number of sub-tracks either side of the backbone tracks to represent the variation in actual routes flown.

9-2.3.22 This approach is in accordance with EU Directive 2015/996 which states that:

"It is common practice to treat the data for a single route as a sample from a single population; i.e. to be represented by one backbone track and one set of dispersed subtracks".

9-2.3.23 This approach has the benefit of reducing the complexity of the noise model without significantly affecting its accuracy, as well as enabling current and future operations to be modelled using the same approach.

9-2.3.24 Due to the expected limited use of the Crosswind Runway in the future, the areas exposed to the minimum noise levels of interest do not reach the point where aircraft turn off the extended runway centreline. Straight arrival and departure routes have therefore been used for the Crosswind Runway in the interests of reducing the complexity of the model.

9-2.3.25 Based on a review of radar data, approaching aircraft are generally lined up with the extended centreline of the runway at least 17 km from the runway threshold. Consequently, the approach routes on the two main runways have been modelled as straight from this point to the runway. Before this point arrivals are modelled using 7 routes which cover the broad swathe of directions that the arriving aircraft approach from. Flights have been equally distributed between the 7 routes. The modelled arrival routes are shown in pink on Figure 9-2-2 and 9-2-3.

9-2.3.26 Commercial fixed-wing aircraft fall into one of four categories based on their approach speed. These are denoted A, B, C and D, with A being the slowest and D being the fastest. Dublin Airport operates two sets of departure routes, one for category A and B aircraft and another for category C and D aircraft. In general, categories A and B contain general aviation and propeller aircraft, with jet aircraft falling into categories C or D. It is therefore relevant to consider these two categories of aircraft separately with respect to departure routes.

9-2.3.27 Departure routes have been based on radar data for the calendar year of 2025.

9-2.3.28 The process followed to convert the radar data into a set of average departure tracks is outlined below:

i. Assign each radar track to a route group. The route groups combine some of the initially similar Standard Instrument Departures (SIDs) in use at the airport. In some cases, it was necessary to subdivide route groups to account for the range of locations where aircraft turn. The route groups are given in Table 9-2-12 below.

Table 9-2-12: Route Groups

Route Group (Track Name)	Description
DEXEN	Initial turn south, heading east
INKUR	Heading west
LIFFY	Initial turn north, heading east
NEPOD	Heading south
OLONO	Heading south-south-west
PELIG	Heading southwest
ROTEV	Heading north
SUROX	Heading northwest

i. For each route group determine a proxy mean flight track from the radar data.

ii. For each route group, create a series of “gates” along the proxy mean flight track.

iii. For each gate, calculate the point at which each track (in the same route group) goes through the gate.

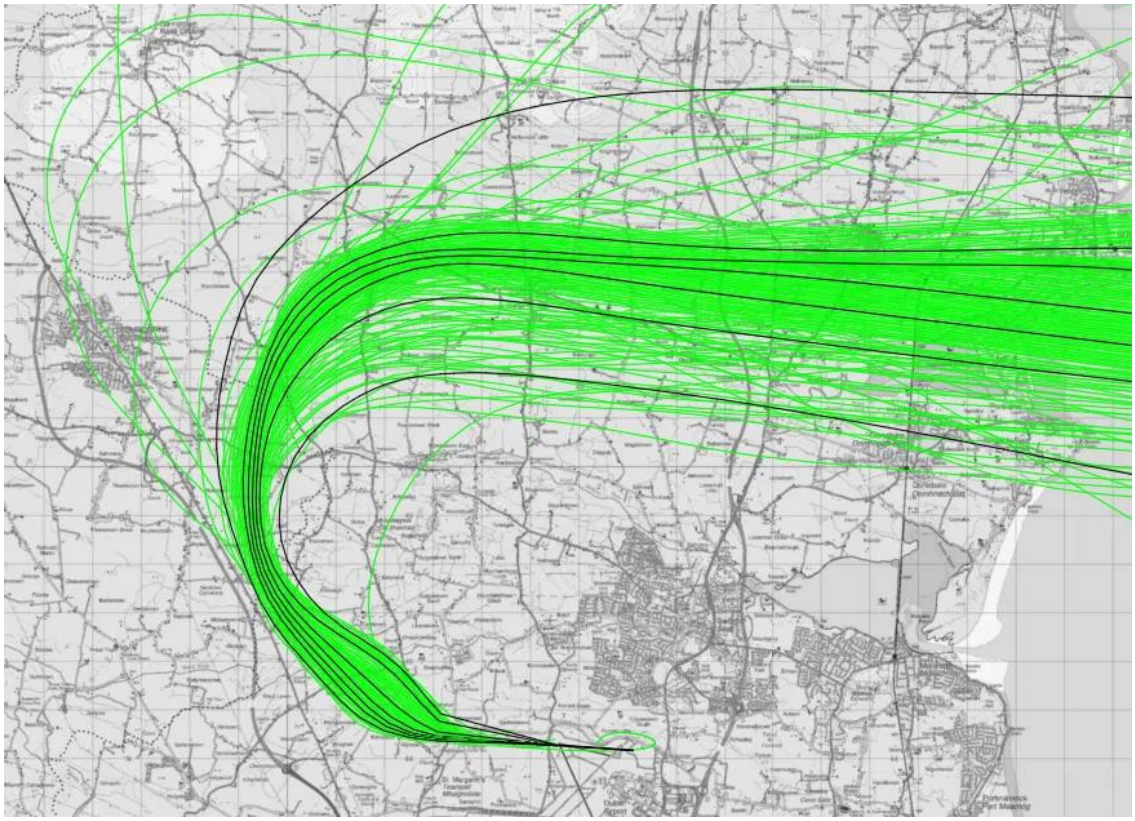
iv. For each route group, create a mean track and a number of sub-tracks. The route for each sub-track has been based on the average of the tracks within the relevant percentiles at each gate. The number of sub-tracks and percentiles used has been based on the values given in ECAC Doc 29 4th Edition Volume 2, Appendix C.

9-2.3.29 The ECAC document recommends that normally 7 discrete sub-tracks (including the mean track) will be adequate. This has been followed except where a limited number of actual tracks are available to base them on, and in these cases a lower number of sub-tracks have been used.

9-2.3.30 The percentages in the ECAC document are based on a normal distribution and mean that the area within the outermost sub tracks will contain the large majority of the radar tracks, but not every single one.

9-2.3.31 An example of a resulting set of dispersed modelled flight tracks overlaid on the actual radar tracks is given in Plate 9-2-1, which shows a sample of 500 tracks which followed the Runway 28 ROTEV route for Category C/D aircraft. The seven dispersed modelled flight tracks are shown in black, with the actual radar tracks shown in green.

Plate 9-2-1: Example of Modelled and Actual Flight Tracks



9-2.3.32 The modelled departure routes are shown in Figure 9-2-2 and 9-2-3.

Route Usage

9-2.3.33 For the Current Receiving Environment, each departure movement has been assigned to a route group based on the radar data.

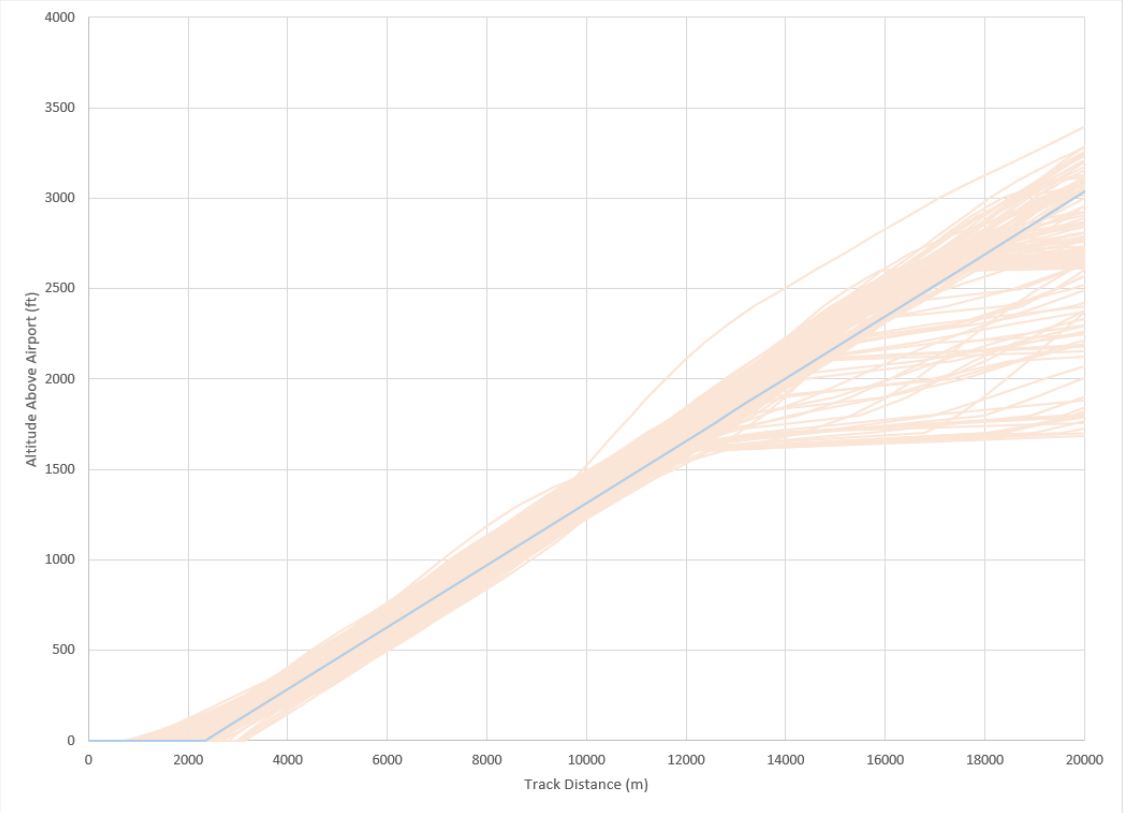
9-2.3.34 For the future forecasts, destination airports have been given for each departure movement. This has been used to initially assign each movement to a compass direction, i.e. North (ROTEV/SUROX), South (NEPOD/OLONO/PELIG), East (LIFFY/DEXEN) and west (INKUR). The distribution between routes for each compass direction has then been based on what occurred in 2025.

Flight Profiles

Arrival Profiles

9-2.3.35 The standard arrival profiles for many of the aircraft in the AEDT database include level sections. Advice from the Irish Aviation Authority (IAA) is that aircraft routinely carry out continuous descent approach (CDA) procedures at Dublin Airport. Analysis of radar data confirms that this is the case for the large majority of arrivals in the vicinity of the airport. Therefore 3 degree CDA profiles have been created and used for all aircraft types. Plate 9-2-2 below compares the modelled “USER” profile for the Airbus A320ceo (shown in blue) with the radar tracks for a representative sample of arrivals by this aircraft. The Airbus A320ceo is one of the most common types operating at the airport. Any level sections also end at least 12 km from the airport, which for arrivals from the east (i.e. the majority), means the aircraft are over the sea at the time.

Plate 9-2-2: Comparison of "USER" Arrival Profile and Radar Tracks for Airbus A320ceo



Departure Profiles

9-2.3.36 For departure movements the AEDT software offers a number of flight profiles for most aircraft types, and in particular for the larger aircraft types. These relate to different departure weights which are greatly affected by the length of the flight, and consequently the fuel load. In the AEDT software this is referred to as the stage length and is in increments of 500 nm up to 1,500 nm and then in increments of 1,000 nm. As the stage length increases the aircraft has to depart with greater fuel and so its flight profile is slightly lower than when a shorter stage length is flown.

9-2.3.37 For some of the aircraft types, in particular the smaller aircraft, only one stage length is available in the AEDT software. For the remainder a stage length was chosen based on the distance to the destination airport.

9-2.3.38 This approach complies with EU Directive 2015/996 which states that:

"Vertical dispersion is usually represented satisfactorily by accounting for the effects of varying aircraft weights on the vertical profiles."

9-2.3.39 For each of the main noise-dominant aircraft types, radar data was reviewed and a custom profile created to match the actual flown profile as closely as possible. In particular this involved changes to the default initial departure thrust and the initial climb altitude for many aircraft types. The same set of radar data was used for departure profiles as for departure routes, i.e. the calendar year of 2025.

9-2.3.40 This was done separately for each runway end and for each stage length option available. Where limited data was available, assumptions were made based on other data for that aircraft type and runway end.

9-2.3.41 For the most common aircraft, the Airbus A320 and the Boeing 737-800, airlines have previously been consulted to check that the resulting assumptions used were in line with what occurs in practice. As specific departure procedures are commercially sensitive information, this is not repeated here, but they were broadly in line with the assumptions.

9-2.3.42 Based on the airline responses, intersection departures are rarely used for Runway 28L, but are commonly used for Runway 10R and the North Runway. Based on this advice and analysis of the radar data, the following assumptions have been made in relation to intersection departures:

- All aircraft departing from Runway 10R used the intersection with Taxiway S6, with the exception of the following operations:
  - Airbus A320 neo, Airbus A321 neo and Airbus A220-300 departures to all destinations.
  - Boeing 777-200 and Boeing 787-900 departures to destinations further than 2,500 nautical miles.
  - Airbus A330-200 and Boeing 777-300 departures to destinations further than 3,000 nautical miles.
  - Airbus A330-300 departures to destinations further than 3,500 nautical miles.
- All aircraft departing from Runway 10L used the intersection with Taxiway N6
- All aircraft departing from Runway 28L used the full runway length
- All aircraft departing from Runway 28R used the intersection with Taxiway N2, with the exception of the following operations:
  - Airbus A321 departures to destinations further than 2,500 nautical miles
  - Boeing 777-200 departures to destinations further than 3,000 nautical miles.
  - Boeing 777-200 and Boeing 787-900 departures to destinations further than 2,500 nautical miles.
  - Airbus A321 neo, Airbus A330-200 and Boeing 777-300 departures to destinations further than 3,000 nautical miles.
  - Airbus A330-300 departures to destinations further than 3,500 nautical miles.

9-2.3.43 For aircraft types other than the main noise-dominant types, the “STANDARD” or “MODIFIED_AW” profiles available in AEDT were used, depending on the stage length.

9-2.3.44 The aircraft profiles for all the aircraft types reviewed at Dublin Airport can be broadly described by the following phases:

1. Takeoff

This starts with the aircraft stationary on the ground, it will then use takeoff thrust (which can be maximum thrust or a percentage of it) to accelerate on the runway and get off the ground. This phase ends when the aircraft reaches the desired speed for the initial climb phase, which should be shortly after leaving the ground.

2. Initial climb

Still using takeoff thrust, the aircraft continues to climb, with a constant speed.

3. Flap retraction

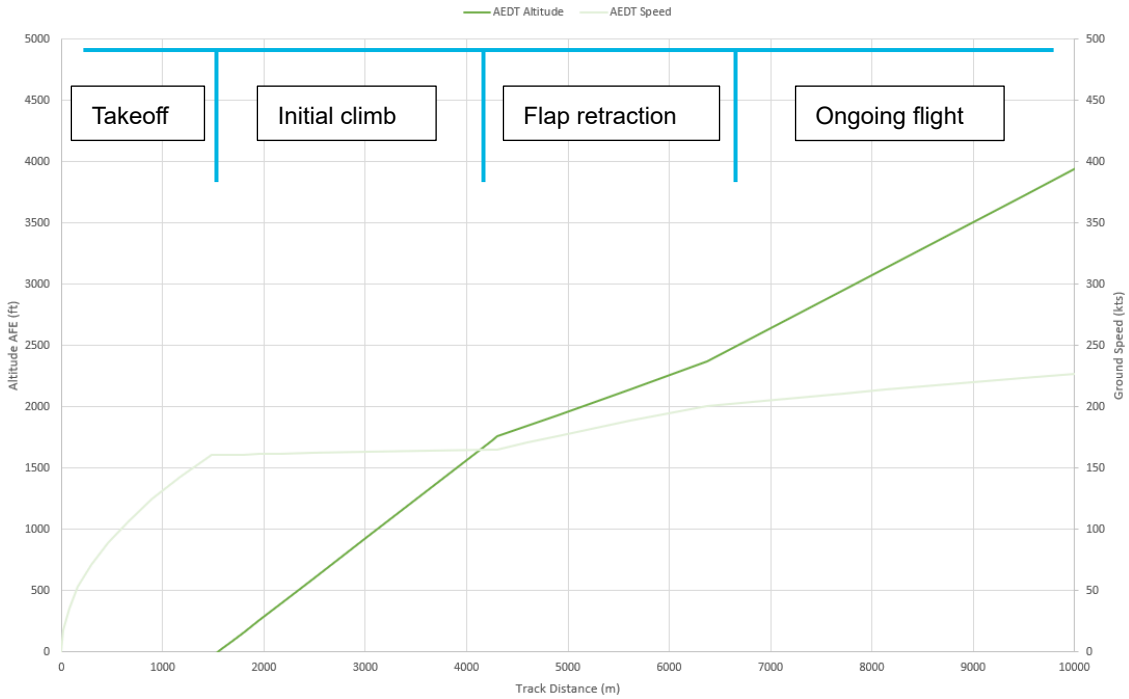
The aircraft will now switch to climb thrust and will gain both altitude and speed. Within the model this is represented by a certain percentage of the available thrust being used for acceleration, with the remainder being used for climbing. Flaps are retracted at certain speeds, often in stages.

4. Ongoing flight

With flaps fully retracted, the aircraft continues to gain both altitude and speed using climb thrust. The percentage of thrust being used for acceleration is typically reduced from the previous phase. This phase continues until the aircraft is outside the modelled area.

9-2.3.45 An example profile showing these phases is presented in Plate 9-2-3.

Plate 9-2-3: Phases of Flight Profile



9-2.3.46 The general steps followed to produce the modelled profiles are outlined below. In some cases, other adjustments were required. A profile was created separately for each combination of runway end, aircraft type, and stage length, where sufficient data was available.

- Identify the base AEDT type for each actual aircraft type.
- Compare the average radar profile (altitude and ground speed) with the model output from AEDT.
- If necessary, reduce takeoff thrust from maximum to better match the climb gradient in the initial climb phase. The takeoff thrust was never reduced lower than 75% of the AEDT default value, based on the guidance in ECAC Doc 29 that this is often stipulated as a lower limit by airworthiness authorities. For many aircraft types, in particular larger aircraft such as the Boeing 767, a higher value of minimum thrust was used.
- If necessary, adjust the initial climb altitude to better match the radar data.
- Leaving the flap retraction speeds as per the default profiles, set the percentage of thrust used for accelerating in the flap retraction phase to match the altitude and speed from the radar data as closely as possible. If necessary, adjust the default climb thrust.
- Set the percentage of thrust used for accelerating in the continued flight phase to match the altitude and speed from the radar data as closely as possible.

9-2.3.47 The AEDT departure profiles for many of the aircraft in the AEDT database finish at 10,000 ft. To allow predictions over the whole of the study area the departure profiles for all aircraft have been extended to 30,000 ft or for certain aircraft the maximum altitude AEDT calculates to be achievable for the particular aircraft type.

9-2.3.48 For stage lengths with insufficient data, the same approach was adopted, with the takeoff thrust extrapolated based on the relative modelled departure weights from the modelled profiles of stage lengths which had sufficient data for the same runway end and aircraft type.

9-2.3.49 In cases where there was insufficient data for a runway end, the North and South Runway profiles were assumed to be the same as for Runway 28R, and the Cross Runway profiles were assumed the be the same as Runway 28R, but with no reduction in thrust. This is because the Cross Runway is significantly shorter, and the available data suggests that most aircraft use close to the maximum thrust available.

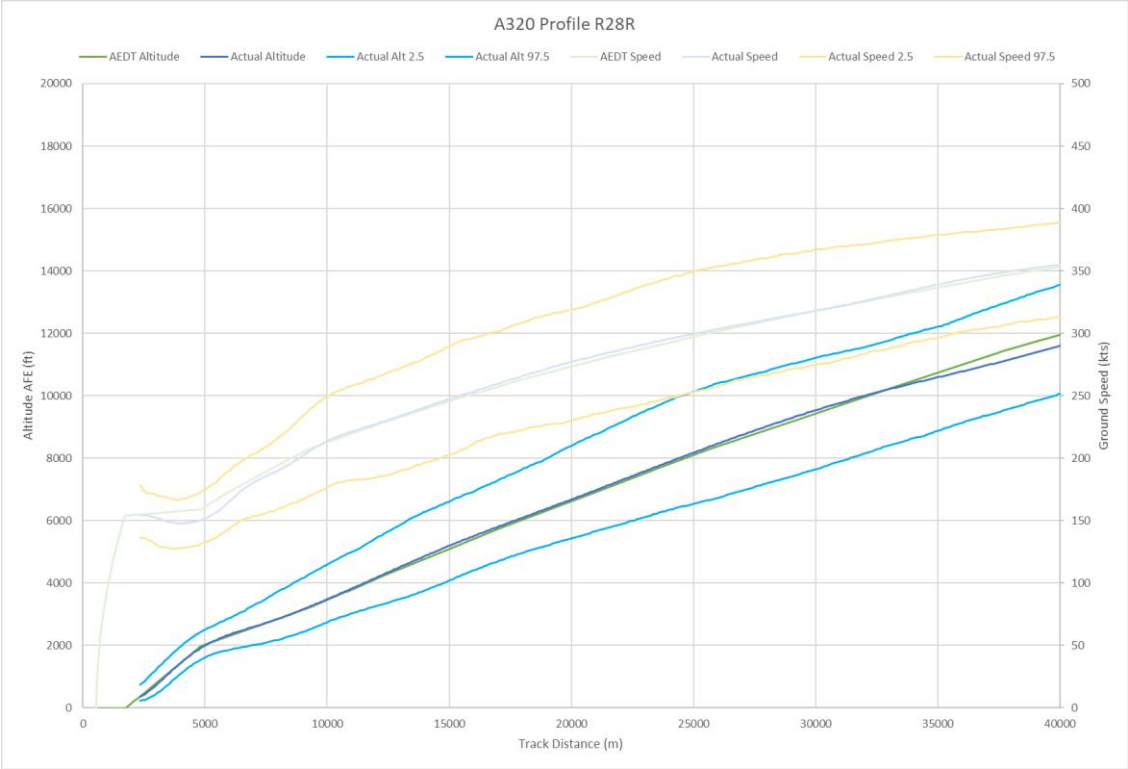
9-2.3.50 The base AEDT types for each actual aircraft type considered are given in Table 9-2-13 below.

Table 9-2-13: Operational Aircraft Types and Base AEDT Types

Aircraft Type Description	Base AEDT Type
Airbus A300-600	A300-622R
Airbus A319	A319-131
Airbus A320	A320-211
Airbus A320neo	A320-271N
Airbus A321	A321-232
Airbus A321neo	A320-271N
Airbus A330-300	A330-301
Airbus A350	A350-941
ATR 72	ATR72-212A
Boeing 737-400	737400
Boeing 737-800	737800
Boeing 757-200	757RR
Boeing 767-300	767300
Boeing 767-400	767400
Boeing 777-200	777200
Boeing 777-300	777300
Boeing 787	7878R
Boeing 737 MAX 8	7378MAX
Embraer E190	EMB190

9-2.3.51 An example of a resulting modelled aircraft profile compared with actual radar profiles is given in Plate 9-2-4, which shows the modelled profile by an Airbus A320 Runway 28R Stage 1 departure, alongside the average and percentiles containing 95% of the flights.

Plate 9-2-4: Example of Modelled and Actual Flight Profiles – Altitude



9-2.3.52 This approach to departure profiles is in line with EU Directive 2015/996 which advises that:

"Caution must be exercised before adopting default procedural steps provided in the ANP database (customarily assumed when actual procedures are not known). These are standardised procedures that are widely followed but which may or may not be used by operators in particular cases".

AEDT Validation

9-2.3.53 Measured noise levels taken by the Dublin Airport Noise and Track Keeping (NTK) system have been used to carry out a noise validation exercise. A number of additional Noise Monitoring Terminals (NMTs) have been added to the NTK system in recent years. The NMTs used in this assessment are listed in Table 9-2-14 below.

Table 9-2-14: NMT Locations

NMT ID	Location Name	Latitude	Longitude
1	Bay Lane	53.425080	-6.346360
2	St. Doolagh's	53.414360	-6.186940
3	Bishopswood	53.438620	-6.332740
4	Feltrim	53.431800	-6.177770
10	St. Margaret's	53.430295	-6.300554
20	Coast Road	53.414040	-6.138170
26	Kilcoskan National School	53.463556	-6.344889
28	Newpark	53.446937	-6.329015
31	Dunboyne	53.426421	-6.475562
34	Portmarnock	53.420830	-6.134660

9-2.3.54 The noise levels from the monitors are automatically correlated with aircraft movements using the radar track keeping system and the average determined by aircraft type and operation. A number of parameters are measured by the system, and for this validation the Sound Exposure Level (SEL) and maximum noise level (L_{Amax}) of the individual aircraft movements has been used.

9-2.3.55 Results from 1 January 2025 to 31 December 2025 were used with the following exceptions:

- NMT26 excluded results between 12:00 and 14:00 as it was noted that there were a number of noisy events during this period which could be related to the school's lunch break.
- For each aircraft type, results from a monitor were only used if noise measurements were recorded for at least 75% of the relevant aircraft movements (for example at NMT3, the relevant aircraft movements are Runway 10L arrivals).

9-2.3.56 To take into account the measured levels the AEDT software has been used to predict the level at the NMT locations using the recommended AEDT aircraft type. This has been compared to the measured averages (logarithmic average for SEL, mean for L_{Amax}) for the aircraft types when separately arriving and departing. Adjustments were then made to the modelled aircraft noise levels to minimise differences between the measured and predicted results. This was done by adjusting the AEDT NPD data for the modelled aircraft types so that the movement-weighted average modelled noise levels at the NMTs matched that measured.

9-2.3.57 The SEL adjustments have been used when calculating L_{Aeq} based metrics, such as L_{den} and L_{night}, and the L_{Amax} adjustments have been used when calculating L_{Amax} based metrics, such as N65 and awakenings.

9-2.3.58 Twenty aircraft have had modifications made to their arrival and departure noise assumptions. The modifications are detailed in Table 9-2-15 below.

Table 9-2-15: Modifications to AEDT Default Assumptions

Aircraft Type	Base AEDT Type	SEL Adjustment (dB)		L_{Amax} Adjustment (dB)	
		Arrivals	Departures	Arrivals	Departures
Airbus A320neo	A320-270N	+0.3	-0.4	+0.7	-1.5
Airbus A321neo	A321-270N	-1.4	+0.3	-0.4	+1.1
Airbus A220-300	A320-270N	-0.8	+0.7	-0.3	+0.4
Airbus A319	A319-131	-0.8	+3.2	+0.6	+4.7
Airbus A320	A320-211	-0.1	+2.1	+1.6	+4.2
Airbus A321	A321-232	+0.2	+0.2	+1.0	+1.7
Airbus A330-200	A330-301	-0.6	+1.3	+0.8	+2.7
Airbus A330-300	A330-301	-0.2	+1.8	+1.3	+3.6
ATR 72	ATR72	+3.6	+1.3	+5.1	+2.0
Boeing 737 MAX 8	7378MAX	+0.2	+2.1	+1.2	+2.4
Boeing 737-800	737800	-0.4	+0.0	+1.0	+0.9
Boeing 757-200	757RR	+0.6	+0.3	+1.6	+1.5
Boeing 767-300	767300	-1.4	-2.4	-2.9	-3.3
Boeing 767-400	767400	+0.8	+4.2	+0.9	+4.6
Boeing 777-200	777200	+1.1	+4.0	+1.3	+5.2
Boeing 777-300	777300	+0.4	+1.0	+1.2	+2.1
Boeing 787-8	7878R	+0.4	+2.9	+0.8	+4.1
Boeing 787-9	7879	+0.9	+1.3	+1.0	+2.4
Embraer E190	EMB190	-0.6	+1.9	+0.8	+3.5
Embraer E195	EMB195	-0.2	+3.2	+1.1	+4.1

9-2.3.59 These modifications achieve a better correlation between predicted and measured noise at the airport, resulting in differences between predicted and measured levels of less than 2 dB in most situations. The exception was for arrivals which show an over-prediction of around 3 dB SEL and 4 dB L_{Amax} at NMT3 for most aircraft types.

9-2.3.60 Other than these exceptions, this is in line with EU Directive 2015/996, which requires that:

"All input values affecting the emission level of a source, including the position of the source, shall be determined with at least the accuracy corresponding to an uncertainty of ± 2dB(A) in the emission level of the source".

Performance of Modernised Aircraft Types

9-2.3.61 For the recently introduced and future aircraft types in the forecasts which are not contained within the AEDT model, assumptions have been made for their expected noise levels.

9-2.3.62 This is based on a comparison with either the current generation aircraft that is being directly replaced, or the most similar aircraft type available in AEDT. The expected changes in noise levels are based on a comparison of average certification noise levels between the current and modernised aircraft types from the *EASA Approved Noise Levels database*[3].

9-2.3.63 A summary of the EASA data utilised for this purpose is given in Table 9-2-16.

Table 9-2-16: Summary of Entries in EASA Database for Relevant Aircraft Types

Aircraft Type	# Entries in EASA Database	Average of EASA Noise Certification Levels (EPNdB)		
		Lateral	**Flyover**	**Approach**
Airbus A330-300	835	98.3	91.1	98.4
Airbus A330neo	103	92.0	87.5	97.9
Boeing 777-200	364	96.4	89.4	99.2

9-2.3.64 For arrivals the approach level was utilised. For departures the average of the lateral and flyover levels was utilised. For each modernised aircraft type where an assumption was needed, the arrival and departure noise levels were separately compared with the relevant current aircraft type. The resulting adjustments are given in Table 9-2-17. These differences were applied after the adjustments to the existing types set out in Table 9-2-15.

Table 9-2-17: Expected Change in Noise Levels between Current and Modernised Aircraft Types

Current Aircraft Type	Modernised Aircraft Type	Expected Change in Noise Levels between Current and Modernised Aircraft Types (dB)	
		Arrival	Departure
Airbus A330-300	Airbus A330neo	-0.5	-5.0
Boeing 777-200	Boeing 777X	-1.6	-6.4

9-2.4 Population and Demographics Assessment Methodology

Dwelling and Population Data

9-2.4.1 Dwelling data has been acquired from GeoDirectory, who produce an updated dataset every quarter. The 2026 Q1 dataset has been used for this assessment. Calculations in relation to the NAO have also utilised the 2023 Q3 and 2019 Q2 datasets.

[3] Latest version available at https://www.easa.europa.eu/easa-and-you/environment/easa-certification-noise-levels. Assessment used version dated 5th June 2023

9-2.4.2 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) in 2023, which has been supplemented by the list of developments in Appendix 20-1 of Chapter 20: In-Combination and Cumulative Effects. This has been compared to the data from GeoDirectory, to ensure that developments are not counted twice if they have already been partly or fully completed. This resulted in a separate consented dwellings database.

9-2.4.3 Population data has been estimated using the average dwelling occupancy by small area. This has been based on Census data from the Central Statistics Office, 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. The 2016 Census data has been utilised for the 2019 Q2 dataset, and the 2022 Census data has been used for the 2023 Q3 and 2026 Q1 datasets.

9-2.4.4 Dwellings marked as vacant in the GeoDirectory data have been included in the dwelling totals, but excluded from the population totals.

9-2.4.5 An assessment of zoned land has also been undertaken. This identified a number of areas which are designated for residential use. Some of these already contain existing or permitted dwellings and so are included in those datasets. The remaining areas have been assumed to have future developments with an average density of 35 dwellings per hectare and 3 people per dwelling. The dwelling density is based on a recent planning history search for the various sites and relevant local area plans. 3 people per dwelling is a conservative estimate based on the 2022 Census data, which found an average occupancy of 2.7 people per dwelling for the study area.

Community Buildings

9-2.4.6 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

9-2.4.7 Noise levels at each residential receptor have been interpolated from a 50m spaced grid.

9-2.4.8 Each community building has been included in the AEDT model as a receptor. A representative set of receptors has been created for each permitted development and zoned land area based on site plans and other publicly available information. Noise levels have been predicted at each of these receptor locations.