13.4.1 Noise Surveys

The baseline noise surveys comprised a combination of attended and unattended noise monitoring. Attended noise monitoring was undertaken at various locations during periods in August, September and October 2016. Appendix 13D contains details of the noise monitoring procedures, survey dates, observations and results and, identifies the nature of the key contributors to the noise environment for each position.

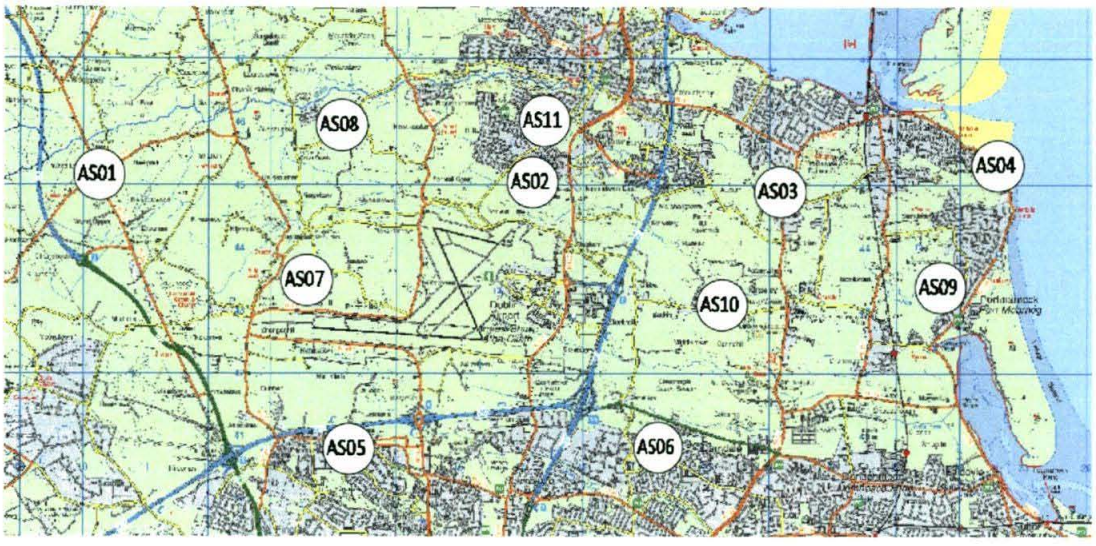
Unattended monitoring was carried out during similar periods to the attended monitoring.

In addition, the long-term monitoring data measured by Dublin Airport's Noise Monitoring Terminals (NMTs) has been utilised for the calendar year of 2018. A comparison of the NMT data for 2016 and 2018 has also been carried out in order to check if the conditions in 2016 were significantly different to those in 2018.

13.4.1.1 Measurement Locations

The locations of the attended and unattended monitoring are shown in Figure 13-1.

Figure 13-1: Baseline Noise Measurement Locations



13.4.1.2 Attended Survey Measurements

All attended noise monitoring measurements were undertaken in general accordance with the British Standard BS 7445 (BS, 2003). This comprised positions with free field conditions and a series of 5 minute measurement samples taken at a specified position for typically at least 30 minutes. Repeat measurements were made at each position on a given day or night. The microphone of the noise monitor was positioned approximately 1.5 m above ground level with the monitor mounted on a tripod and away from any reflective surfaces. Observations were made of the noise climate prevailing at the time. These attended measurements include the noise contribution of aircraft activity as well as non-aircraft related activities. This procedure is commonly used to obtain attended environmental noise information, supplemented where possible with unattended noise measurement data.

13.4.1.3 Unattended Survey Measurements

During the unattended surveys noise measurements were obtained over a period of around three weeks at each position. At four of the positions, locations #7, #8 and #9, noise measurements were obtained under free field conditions. At two of the positions, locations #10 and #11, measurements were made approximately 1 m from a reflective surface and therefore a reflection effect was included in the measurements. Unattended measurements comprised a series of continuous 15 minute measurement samples over the full survey period. The noise monitors were located in environmental cases with the microphones connected via extension cables. The microphones were fitted with windshields and attached to tripods positioned approximately 1.5 m above local ground level with the exception of Portmarnock Community School where the tripod was on a first floor flat roof.

13.4.1.4 Measurement Parameters and Results

The results of the baseline monitoring at survey locations are summarised in Table 13-5 and

Table 13-6, which show the attended and unattended results respectively. The survey results are presented in terms of the following parameters:

- $L_{Aeq,T}$ which is commonly used to denote the ambient noise level, signifies the single steady average noise exposure level which is equivalent in energy terms to that produced by the various fluctuating noise levels that occur in the given measurement period.
- $L_{A90,T}$ which represents the prevailing background noise level in the absence of any noise from aircraft in flight or other individual noise sources, such as passing cars. This index denotes the level of noise which is exceeded for 90% of the time.

Table 13-5: Baseline Noise Measurements – Attended – Dublin Airport

Reference	Location	Daytime (07:00-23:00)		Night-time (23:00-07:00)		Location Description and Observations	Survey dates
		LAeq,T dB	LA90,T dB	LAeq,T dB	LA90,T dB		
AS01	The Ward Cross	61	52	59	44	Measurement position located approximately 60 metres from R135	9th and 11th August 2016
AS02	Ridgewood	61	47	57	39	Residential area with infrequent local road traffic	9th and 11th August 2016
AS03	South Malahide	50	40	47	32	Residential area, measurement position located approximately 90 metres from Swords Road	16th 17th and 18th August 2016
AS04	Malahide	69	54	55	40	Coastal area, adjacent to the sea and R106	17th and 18th August 2016
AS05	Belcamp Park	57	53	52	46	Residential area with infrequent local road traffic	9th 10th and 11th August 2016
AS06	Hampton Wood	59	56	48	44	Residential area with infrequent local road traffic	10th and 11th August 2016

Table 13-6: Baseline Noise Measurements – Unattended – Dublin Airport

Reference	Location	Daytime (07:00-23:00)		Night-time (23:00-07:00)		Location Description and Observations	Survey dates
		LAeq,T dB	LA90,T dB	LAeq,T dB	LA90,T dB		
AS07	St Margaret's Dunsoghly	64	45	59	39	Small village in rural area. Aircraft activity the dominant noise source	11th to 29th August 2016
		64	47	57	42		15th to 26th September 2016
AS08	Kilbrook	50	40	44	33	Quiet residential area. No obvious dominant noise source	11th to 29th August 2016
AS09	Portmarnock Community School	51	40	44	33	Measurement position located within the school grounds. No obvious dominant noise source	19th August to 5th September 2016
AS10	The Baskins	58	43	52	37	Residential area Aircraft activity occasionally the dominant noise source	11th to 29th August 2016

AS11	River Valley	56	45	45	39	Measurement position located within the school grounds	10th to 30th October 2016

As illustrated in the tables above, noise levels vary considerably depending on the proximity to noise sources such as roads and aircraft flight paths in the surrounding environment. Consideration is therefore given below to the areas in the vicinity of the airport in turn.

13.4.1.5 Noise Environment Description

This section describes the general noise environment in the vicinity of the attended and unattended monitoring locations based on observations made on site and the results presented in Table 13-5 and

Table 13-6. Reference is made below to ambient noise levels, depicted by the $L_{Aeq,T}$ index, and background noise levels, depicted by the L_{A90} index.

North (Locations #2 & #11)

River Valley is a residential area located just under 2 km north of the airport. The R132 and M1 are located approximately 1km and 2.5km from measurement positions D and M. Daytime ambient and background noise levels ranged between 56 dB – 61 dB $L_{Aeq,T}$ and 45 dB – 47 dB L_{A90} respectively. Night-time ambient noise levels ranged between 45 – 57 dB and background noise levels were around 39 dB at both locations. Local road traffic dominated noise sources, however, at location #2 between 06:30 and 07:00 frequent plane activity was the dominant noise source.

North east (Locations #3 & #4)

Malahide is located near the coast, north east of the airport. The R106 was a dominant noise source in the area during the daytime. Position F was located next to the R106 approximately 7km away from Dublin airport with ambient and background noise levels of around 69 dB $L_{Aeq,T}$ and 54 dB L_{A90}. At night-time ambient and background noise levels at this position were around 55 dB and 40 dB respectively. Position E was located approximately 4km away from Dublin airport in a quieter residential area located away from busy main roads. The daytime ambient and background noise levels were 50 dB and 40 dB respectively. The night-time levels were 47 dB $L_{Aeq,T}$ and 32 dB L_{A90}. Aircraft noise at these locations was considered negligible.

East (Locations #9 & #10)

The area east of the Dublin airport, at a distance of approximately 2.5 km contains rural areas with smaller residential neighbourhoods located away from busy roads. The area is generally quieter than other locations around the airport with the daytime ambient and background noise levels, measured at Position H, of around 58 dB $L_{Aeq,T}$ and 43 dB L_{A90}. The night-time ambient and background noise levels were around 52 dB $L_{Aeq,T}$ and 37 dB L_{A90}. Aircraft noise was occasionally dominant. For Portmarnock School, approximately 6.5km away from Dublin airport, which was closed for the summer holidays during the survey, a similar result was evident with daytime ambient and background noise levels of around 51 dB $L_{Aeq,T}$ and 40 dB $L_{Aeq,T}$. At night, the ambient and background levels were around 44 dB $L_{Aeq,T}$ and 33 dB $L_{Aeq,T}$. Aircraft noise at this location was not considered dominant.

South east (Location #6)

Clonshaugh's business and technology park and Belcamp Park are located approximately 3 km to the south east of the airport. The M1, M50 and R139 are dominant noise sources in the area. The daytime ambient and background noise levels measured were 57 dB and 53 dB respectively. The night-time ambient and background noise levels measured were 52 dB and 46 dB respectively. Aircraft noise was occasionally dominant.

South (Location #5)

The M50 and the Hampton Wood residential area are located south of the airport. The measurement position was located approximately 500 metres from the M50 and 2km from Dublin airport. The daytime ambient and background noise levels were 59 dB and 56 dB respectively. The night-time ambient and background noise levels measured were 48 dB and 44 dB respectively.

West (Location #7)

The area west of the airport contains further rural areas with smaller residential neighbourhoods. Aircraft noise dominated St Margaret's with daytime ambient noise levels of 64 dB and background noise levels ranging from 45 dB – 47 dB. The night-time ambient noise levels ranged between 57 dB – 59 dB and background noise levels ranged between 39 dB – 42 dB. The surrounding road network consisting of N2 and R135 were also audible. Aircraft noise was measured under both easterly and westerly modes of operation at the airport.

North west (Location #1)

North west of the airport approximately 4km away contains further rural areas. The R135 and R121 roads are dominant noise sources. Ambient and background noise levels of 61 dB and 52 dB respectively were measured. The night-time ambient and background noise levels measured were 59 dB and 44 dB respectively. Aircraft noise was not considered dominant.

13.4.1.6 daa Permanent Noise Monitoring Terminal Results

This section describes the locations of the permanent noise monitors in place and operating in the vicinity of Dublin Airport. Results are presented for each noise monitor over the period commencing January 2016 to the end of December 2016, describing the noise environment with and without aircraft activity. The corresponding information for the period commencing January 2018 to the end of December 2018 is also presented to highlight any trends.

The location of each noise monitoring terminal (NMT) is shown in Figure 13-2. There are currently eight permanent NMTs in the vicinity of Dublin Airport. These are located as follows:

- Bay Lane (NMT1), monitoring Runway 28 Departures & Runway 10 Arrivals
- St. Doolaghs (NMT2), monitoring Runway 10 Departures & Runway 28 Arrivals
- Bishopswood (NMT3), monitoring the local area
- Feltrim (NMT4), monitoring the local area
- Balcultry (NMT5), monitoring Runway 34 Departures & Runway 16 Arrivals
- Artane (NMT6), monitoring Runway 16 Departures & Runway 34 Arrivals
- Coast Road (NMT20), monitoring Runway 10 Departures & Runway 28 Arrivals
- North-east of the airport off the Naul Road (NMT21), monitoring noise produced by aircraft on the ground at a location close to the airport.

NMT22 is a mobile NMT, currently located within the airport site, located close to the West Apron in the vicinity of the mid-western boundary of the airport. NMTs 3 and 4 have been installed for permitted operations. daa publish half yearly reports on the outputs of these NMTs, providing a summary of the aircraft noise measurements from the system. The most recent of these reports are available from the Dublin Airport website[17].

[17] https://www.dublinairport.com/corporate/community-and-sustainability/noise/airport-noise-noise-reports

Figure 13-2: Permanent Noise Monitoring Terminals at Dublin Airport

Table 13-7 presents the average measured noise level over the six month period from January to July 2016 inclusive at each monitor, split into daytime (07:00 to 23:00) and night time (23:00 to 07:00) periods. Also presented is the noise level produced by aircraft, i.e. the correlated aircraft noise events. Where the "total" noise level at a given monitor is close in value to the "aircraft" noise level, this indicates that the total noise is dominated by aircraft noise. Where there is a 3 dB or more difference, this indicates that some other noise source(s) dominates the noise environment at the NMT. It can be seen that only at NMTs 1 and 2 does aircraft noise dominate the total noise environment. This is to be expected given the locations of these two monitors within 4 km directly to the east and west respectively of the airport's existing main runway.

These averages are not directly comparable to noise contours produced by computer modelling as noise contours are typically based on an average summer or annual day, and also include all aircraft movements rather than just those which produce a correlated noise event. Noise contours also include no noise other than that produced by aircraft.

Table 13-7: Average Measured Noise Levels (2016)

	Daytime Noise Level, dB $L_{Aeq,16hr}$				*Night Time Noise Level, dB $L_{Aeq,8hr}$*			
NMT	*Jan-Jun 2016*		*Jul-Dec 2016*		*Jan-Jun 2016*		*Jul-Dec 2016*	
	Total	*Aircraft*	*Total*	*Aircraft*	*Total*	*Aircraft*	*Total*	*Aircraft*
1	63.8	62.5	63.7	62.4	58.4	57.1	58.1	57.0
2	62.4	60.7	61.8	60.3	56.8	55.4	56.8	55.6
3	62.9	49.6	-	-	54.9	47.0	-	-
4	56.6	41.5	56.8	41.2	52.1	38.3	49.7	39.4

5	54.9	49.2	55.3	48.6	57.3	48.1	51.3	49.7
6	61.6	46.7	58.1	44.2	56.5	45.5	51.6	43.4
20	63.7	57.2	62.4	54.9	57.6	52.2	56.3	50.2

Table 13-8: Average Measured Noise Levels (2018)

	Daytime Noise Level, dB $L_{Aeq,16hr}$				*Night Time Noise Level, dB $L_{Aeq,8hr}$*			
NMT	*Jan-Jun 2018*		*Jul-Dec 2018*		*Jan-Jun 2018*		*Jul-Dec 2018*	
	Total	*Aircraft*	*Total*	*Aircraft*	*Total*	*Aircraft*	*Total*	*Aircraft*
1	63.9	62.8	64.0	62.9	58.9	57.2	58.1	56.6
2	61.1	60.5	61.9	61.1	56.5	54.9	57.5	56.5
4	57.2	46.9	55.3	43.8	54.2	36.7	51.0	33.7
5	58.3	49.5	54.8	48.5	55.1	50.2	54.3	50.4
6	57.7	45.8	60.9	48.9	58.0	45.1	59.2	47.0
20	64.3	58.7	63.4	59.6	58.6	47.7	58.9	54.8

Taking the NMTs where the highest noise levels were measured, these are generally consistent between the two years, especially so for NMT1 where the differences are not more than 0.5 dB, At some of the other locations the variations are greater, for example at NMT6 where the aircraft activity is due to use of the cross runway, the amount of which is weather dependent. Despite this, the overall picture presented by the results is similar in regard to where the highest noise levels occur and where aircraft noise contributes the most.

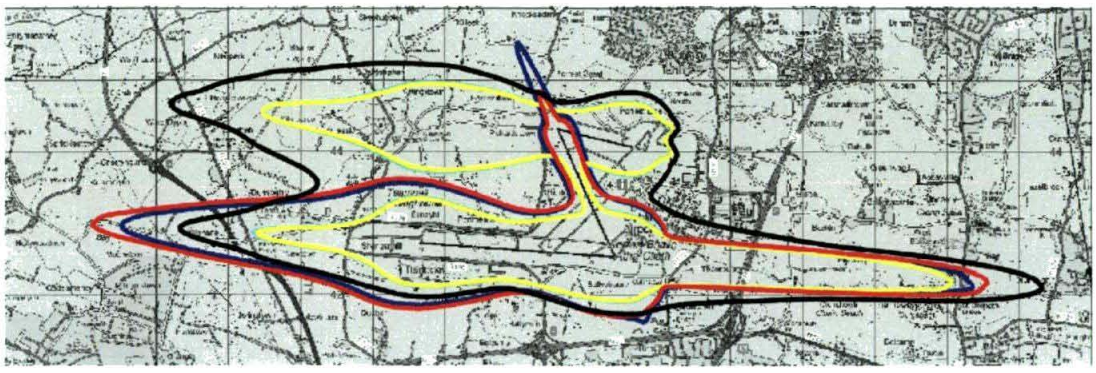
13.4.2 Noise Modelling L_{den} Metric

Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 0. For the 2018 Baseline and the 2019 Baseline these are based on the actual aircraft movements in 2018 and 2019 respectively. For the future years these are based on forecast aircraft movements.

The results for the years 2018, 2019, 2022 and 2025 are detailed below. 2022 represents the year that the North Runway is first expected to be operational, and 2025 the likely worst-case future year for the Relevant Action application. These results are also presented in Appendix 13C along with the results for the supplementary noise metrics.

Appendix 13C presents the resulting noise contours for each scenario. Figure 13-3 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2018, 2019, 2022, 2025 Baseline scenarios, as well as the 2025 Consented scenario.

Figure 13-3: 65 dB L_{den} Noise Contours, 2018 Baseline (blue), 2019 Baseline (red), 2022 Baseline (cyan), 2025 Baseline (yellow) and 2025 Consented (black)



The 2018 Baseline 65 dB L_{den} contour (blue) extends to the west from the South Runway to Mooretown and to the east to St Doolaghs. From the crosswind runway, the contour extends to Knocksedan to the north and does not reach the M50 to the south.

The 2019 Baseline 65 dB L_{den} contour (red) extends to the west from the South Runway to Mooretown and to the east to St Doolaghs. From the crosswind runway, the contour extends to Forrest Great to the north and does not reach the M50 to the south.

The 2022 Baseline 65 dB L_{den} contour (cyan) does not reach as far west as 2018 in line with the South Runway, extending to Killshane Bridge, and is slightly smaller to the east. In line with the North Runway, the contour extends to Kilmacree to the west and barely leaves the airport site to the east. The exposure from the crosswind runway does not leave the airport site.

The 2025 Baseline 65 dB L_{den} contour (yellow) is a very similar shape to that in 2022, albeit slightly smaller.

The 2025 Consented 65 dB L_{den} contour (black) does not reach as far west as 2018 in line with the South Runway, extending to Killshane, but extends further to the east, reaching Drumnigh. In line with the North Runway, the contour extends to Ward Upper to the west and barely leaves the airport site to the east. There is no contour in line with the crosswind runway as it is not used under this scenario.

To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the Baseline scenarios in terms of the Lden metric are given in Table 13-9.

Figure 13-4: Representative Location Points

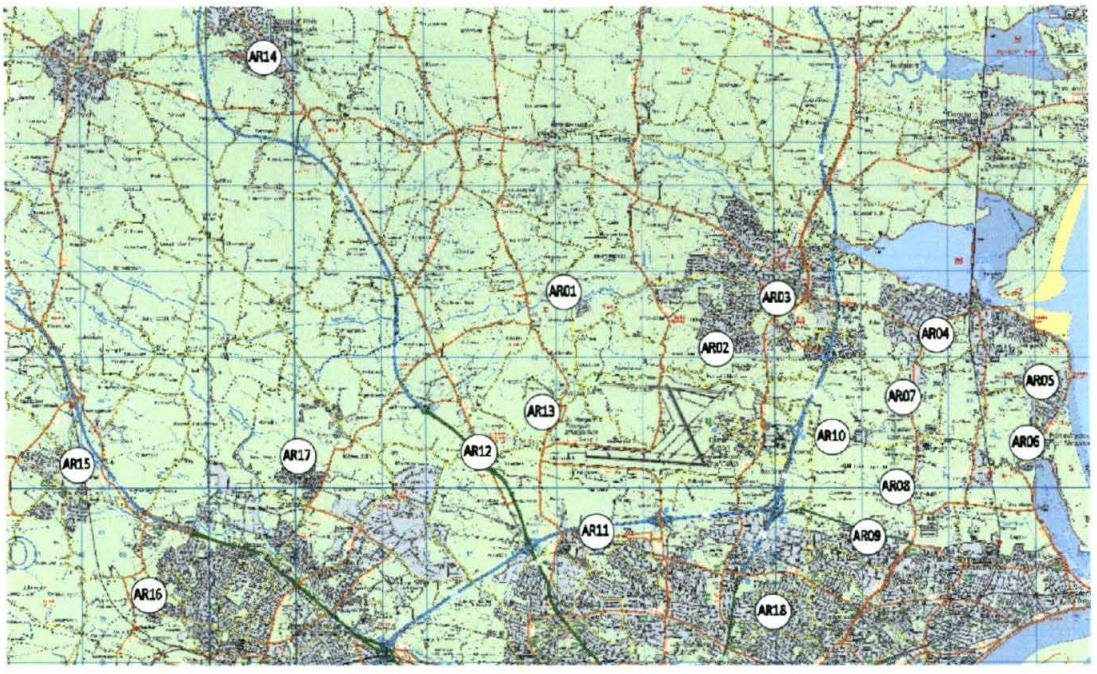


Table 13-9: Baseline Noise levels at Representative Locations (L_{den})

Representative Location	*Reference No.*	*Baseline Noise Level, dB (L_{den})*				
		2018	*2019*	*2022*	*2025*	*2025 Consented*
Tyrellstown, Toberburr	AR01	50	50	53	52	57
Ridgewood	AR02	53	53	57	57	60
Swords	AR03	47	47	48	48	52
Malahide Castle	AR04	45	45	46	46	49
Portmarnock N	AR05	48	48	49	49	51
Portmarnock S	AR06	56	56	56	56	58
Malahide S	AR07	50	50	51	51	55
St Doolaghs	AR08	65	65	64	64	66
Darndale Park	AR09	53	53	53	53	55
The Baskins	AR10	58	58	58	58	60
Mayeston Hall	AR11	57	57	54	54	56
Kilshane Cross	AR12	68	68	64	64	67
St Margret's	AR13	62	63	62	62	66
Ashbourne	AR14	48	48	47	47	49
Dunboyne	AR15	53	54	51	51	54
Ongar	AR16	51	52	49	48	50
Mount Garrett	AR17	61	61	57	57	59
Beaumont	AR18	54	51	49	49	51

Note – noise levels rounded to nearest whole number.

Noise levels remained largely similar between 2018 and 2019, with small increases of 0-1 dB at most locations reflecting the increase in total aircraft movements. There was however a reduction in the number of aircraft using

the crosswind runway, and a consequent reduction in noise level for receptors in line with the crosswind runway, for example, Beaumont (#18).

Noise levels at receptors close to flight paths from the existing South Runway or crosswind runway, for example St Doolaghs (#8), Killshane Cross (#12) or Beaumont (#18), are forecast to reduce between the 2018 Baseline and 2022 Baseline scenarios, whereas the opposite is true for receptors closer to flight paths from the North Runway, for example Swords (#3). Going from the 2022 Baseline to the 2025 Baseline, there are small decreases of 0-1 dB at all locations.

In the 2025 Consented scenario, noise levels are typically 2-4 dB louder than those which are now forecast for the 2025 Baseline scenario.

For each of the sets of baseline contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population including consented developments and land zoned for residential development. The results for the 2018 Baseline scenario are given by contour in Table 13-10 along with the areas of the contours.

Table 13-10: Areas, number of dwellings and population in 2018 Baseline Annual L_{den} contours

Scenario	*2018 Baseline*			
Contour L_{den} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
45	703.2	245,806	716,719	257,385	753,071
50	209.3	61,726	184,770	71,332	215,161
55	85.9	11,887	35,476	18,100	54,562
60	33.5	1,639	4,710	4,953	15,248
65	11.6	92	251	92	251
70	4.1	8	25	8	25

The dwelling and population results for the 2019 Baseline scenario are given by contour in Table 13-11 along with the areas of the contours.

Table 13-11: Areas, number of dwellings and population in 2019 Baseline Annual L_{den} contours

Scenario	*2019 Baseline*			
Contour L_{den} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
45	745.7	261,053	754,135	272,632	790,487
50	218.7	57,115	174,146	66,707	204,495
55	88.3	11,493	34,097	17,888	53,757
60	35.6	2,115	6,279	5,558	17,182
65	12.2	104	285	104	285

70	4.4	10	31	10	31

The dwelling and population results for the 2022 Baseline scenario are given by contour in Table 13-12 along with the areas of the contours.

Table 13-12: Areas, number of dwellings and population in 2022 Baseline Annual L_{den} contours

Scenario		*2022 Baseline*			
Contour L_{den} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
45	645.4	144,617	430,569	155,915	466,077
50	196.1	32,637	97,385	40,397	121,240
55	83.7	7,128	20,811	13,099	39,219
60	32.4	896	2,410	2,496	7,408
65	11.5	44	133	44	133
70	4.1	8	26	8	26

The dwelling and population results for the 2025 Baseline scenario are given by contour in Table 13-13 along with the areas of the contours.

Table 13-13: Areas, number of dwellings and population in 2025 Baseline Annual L_{den} contours

Scenario		*2025 Baseline*			
Contour L_{den} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
45	627.4	140,973	419,838	152,251	455,293
50	193.5	31,566	94,122	39,325	117,974
55	82.6	6,783	19,771	12,754	38,179
60	32.0	881	2,389	2,481	7,387
65	11.2	42	128	42	128
70	4.0	7	23	7	23

The dwelling and population results for the 2025 Consented scenario are given by contour in Table 13-14 along with the areas of the contours.

Table 13-14: Areas, number of dwellings and population in 2025 Consented Annual L_{den} contours

Scenario	2025 Consented			
Contour L_{den} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	1110.9	286,358	806,461	297,973	842,905
50	321.3	65,222	193,793	73,923	220,447
55	127.3	16,646	49,135	23,417	69,747
60	50.7	2,048	5,548	4,803	14,065
65	21.0	173	472	173	472
70	7.5	29	89	29	89

The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide a method for calculating the number of people highly annoyed by airborne aircraft noise. This aims to give an overall picture of the noise exposure by assessing a percentage of people as being highly annoyed at different noise levels. For example, around 10% are assessed as being highly annoyed at a noise level of 45 dB L_{den}, increasing to around 67% at a noise level of 75 dB L_{den}. The number of people assessed to be highly annoyed by this method in the Baseline scenarios is given in Table 13-15.

Table 13-15: Number of people highly annoyed – Baseline Scenarios

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2018 Baseline	110,234	120,201
2019 Baseline	115,740	125,923
2022 Baseline	65,227	74,321
2025 Baseline	63,316	72,337
2025 Consented	125,742	136,170

Considering past activity, the number of people exposed to aircraft noise increased from the 2018 Baseline to the 2019 Baseline, although there was a reduction in the number of people within the 50 and 55 dB L_{den} contours, due to lower usage of the crosswind runway in 2019. Consequently, the number of people assessed as highly annoyed by aircraft noise also increased, specifically by 5% from 110,234 to 115,740. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increased from 251 to 285.

The number of people exposed to aircraft noise is forecast to reduce from the 2018 Baseline to the 2022 Baseline, for all contour levels. Consequently, the number of people assessed as highly annoyed by aircraft noise also decreases, specifically by 41% from 110,234 to 65,227. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) decreases from 251 to 133.

Going forward to the 2025 Baseline scenario, there are further reductions to 63,316 people assessed as highly annoyed and 128 people exposed to at least a high noise level.

The 2025 Consented scenario results in a significantly greater number of people to be exposed to aircraft noise than what is now forecast in the 2025 Baseline, with 125,742 people assessed as highly annoyed and 472 people exposed to at least a high noise level.

In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-4 for the Baseline scenarios are given in Table 13-16.

Table 13-16: Schools, residential healthcare facilities and places of worship in Baseline L_{den} contours

Scenario	No. Receptors Above Threshold for Medium Absolute Effect		
	Schools	Residential Healthcare Facilities	Places of Worship
2018 Baseline	10	2	6
2019 Baseline	9	2	6
2022 Baseline	8	1	5
2025 Baseline	8	1	5
2025 Consented	11	2	6

The number of non-residential receptors exposed to the thresholds given in Table 13-4 reduced by one between 2018 and 2019, and is forecast to reduce further in the 2022 and 2025 Baseline scenarios. The 2025 Consented scenario exposes 5 additional non-residential receptors to noise levels above these thresholds compared to the 2025 Baseline.

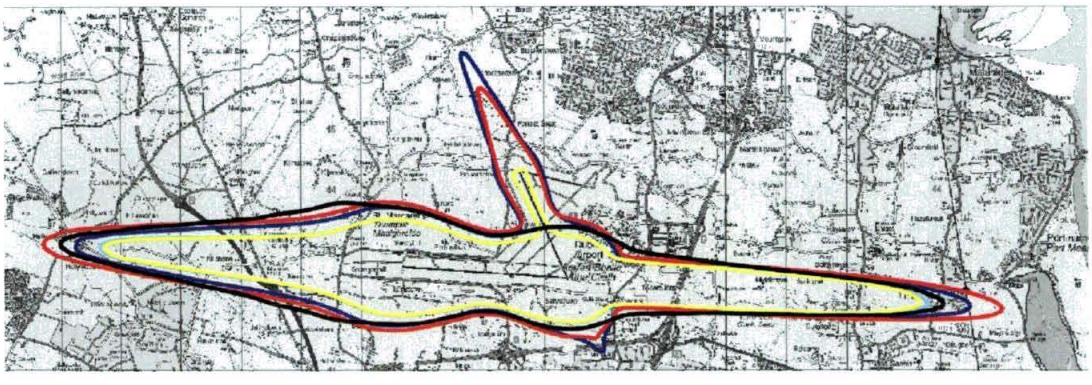
13.4.3 Noise Modelling L_{night} Metric

Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 0. For the 2018 Baseline and the 2019 Baseline these are based on the actual aircraft movements in 2018 and 2019 respectively. For the future years these are based on forecast movements.

The results for the years 2018, 2019, 2022 and 2025 are detailed below. 2022 represent the year of opening, and 2025 the worst-case year. These results are also presented in Appendix 13C along with the results for the supplementary noise metrics.

Figure 13-5 shows the noise contours representing a high impact, 55 dB L_{night}, for the 2018, 2019, 2022 and 2025 Baseline scenarios, as well as the 2025 Consented scenario.

Figure 13-5: 55 dB L_{night} Noise Contours, 2018 Baseline (blue), 2019 Baseline (red), 2022 Baseline (cyan), 2025 Baseline (yellow) and 2025 Consented (black)



The 2018 Baseline 55 dB L_{night} contour (blue) extends to the west from the South Runway to Hollystown and to the east to Drumnigh. From the crosswind runway, the contour extends to Killeek to the north and just crosses the M50 to the south.

The 2019 Baseline 55 dB L_{night} contour (red) extends to the west from the South Runway to Hollystown and to the east to just beyond Drumnigh. From the crosswind runway, the contour extends to Knocksedan to the north and does not reach the M50 to the south.

The 2022 Baseline 55 dB L_{night} contour (cyan) does not extend as far as the 2018 contour in line with the south runway, reaching to Bay to the west and not reaching Drumnigh to the east. The exposure from the crosswind runway does not leave the airport site. There is no contour in line with the North Runway as it is not used at night under this scenario.

The 2025 Baseline 55 dB L_{night} contour (yellow) is a very similar shape to that in 2022, albeit slightly smaller.

The 2025 Consented 55 dB L_{night} contour (black) extends to the west from the South Runway to Hollystown and to the east to Drumnigh. There is no contour in line with the crosswind runway as it is not used under this scenario.

To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the Baseline scenarios in terms of the L_{night} metric are given in Table 13-17.

Table 13-17: Baseline Noise levels at Representative Locations (L_{night})

Representative Location	*Reference No.*	*Baseline Noise Level, dB (L_{night})*				
		2018	*2019*	*2022*	*2025*	*2025 Consented*
Tyrellstown, Toberburr	AR01	43	43	38	38	44
Ridgewood	AR02	45	45	41	41	43
Swords	AR03	39	39	36	36	41
Malahide Castle	AR04	36	37	35	35	37
Portmarnock N	AR05	39	40	39	39	40
Portmarnock S	AR06	48	48	47	47	47
Malahide S	AR07	42	42	41	41	43
St Doolaghs	AR08	57	57	56	56	56
Darndale Park	AR09	44	44	44	44	45
The Baskins	AR10	49	49	48	48	50
Mayeston Hall	AR11	48	49	46	46	48
Kilshane Cross	AR12	59	60	59	59	61
St Margret's	AR13	54	54	52	52	55
Ashbourne	AR14	38	39	37	37	39
Dunboyne	AR15	45	46	44	44	47
Ongar	AR16	43	44	41	41	40
Mount Garrett	AR17	52	53	51	51	52
Beaumont	AR18	47	44	40	40	40

Note – noise levels rounded to nearest whole number.

Noise levels remained largely similar between 2018 and 2019, with small increases of 0-1 dB at most locations reflecting the increase in total aircraft movements. There was however a reduction in the number of aircraft using the crosswind runway, and a consequent reduction in noise level for receptors in line with the crosswind runway, for example, Beaumont (#18).

Noise levels are forecast to reduce between the 2018 Baseline and 2022 Baseline scenarios, in particular for receptors close to flight paths from the crosswind runway such as Beaumont (#18). For areas closer to flight paths from the existing South Runway such as St Doolaghs (#8) the forecast reduction is more modest. Going from the 2022 Baseline to the 2025 Baseline there are small decreases of 0-1 dB at all locations.

In the 2025 Consented scenario, noise levels are typically 1-2 dB louder than those which are now forecast for the 2025 Baseline scenario, although there are some locations with larger differences.

For each of the sets of baseline contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population, excluding consented developments, and allowing for consented developments and land zoned for residential development. The results for the 2018 Baseline scenario are given by contour in Table 13-18 along with the areas of the contours.

Table 13-18: Areas, number of dwellings and population in 2018 Baseline Annual L_{night} contours

Scenario		*2018 Baseline*			
Contour L_{night} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
40	304.4	102,538	307,457	112,422	338,671
45	118.2	18,815	55,492	25,998	77,477
50	48.4	4,131	12,316	7,808	23,926
55	16.8	276	753	328	950
60	5.8	19	56	19	56
65	2.3	3	10	3	10

The dwelling and population results for the 2019 Baseline scenario are given by contour in Table 13-19 along with the areas of the contours.

Table 13-19: Areas, number of dwellings and population in 2019 Baseline Annual L_{night} contours

Scenario		*2019 Baseline*			
Contour L_{night} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
40	328.4	113,699	344,912	123,802	376,760
45	122.2	19,717	59,307	26,939	81,439
50	52.3	4,522	13,838	8,518	26,369
55	18.6	558	1,533	1,376	4,158
60	6.4	41	110	41	110
65	2.5	4	13	4	13

The dwelling and population results for the 2022 Baseline scenario are given by contour in Table 13-20 along with the areas of the contours.

Table 13-20: Areas, number of dwellings and population in 2022 Baseline Annual L_{night} contours

Scenario	2022 Baseline			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	191.6	47,071	143,248	55,266	168,459
45	86.4	10,566	31,447	17,113	51,444
50	35.0	2,195	6,247	5,738	17,450
55	11.8	102	284	102	284
60	4.0	11	34	11	34
65	1.5	0	0	0	0

The dwelling and population results for the 2025 Baseline scenario are given by contour in Table 13-21 along with the areas of the contours.

Table 13-21: Areas, number of dwellings and population in 2025 Baseline Annual L_{night} contours

Scenario	2025 Baseline			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	189.3	46,552	141,767	54,809	167,200
45	85.3	10,370	30,882	16,917	50,879
50	34.3	2,132	6,032	5,675	17,235
55	11.5	101	281	101	281
60	3.9	10	31	10	31
65	1.5	0	0	0	0

The dwelling and population results for the 2025 Consented scenario are given by contour in Table 13-21 along with the areas of the contours.

Table 13-22: Areas, number of dwellings and population in 2025 Consented Annual L_{night} contours

Scenario	2025 Consented			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	299.8	82,730	243,163	91,567	270,268
45	109.0	17,294	51,486	24,304	72,854
50	45.2	3,414	10,511	7,291	22,721
55	16.3	244	495	276	616
60	6.0	59	156	59	156
65	2.1	4	13	4	13

The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide a method for calculating the number of people highly sleep disturbed by airborne aircraft noise. This aims to give an overall picture of the noise exposure by assessing a percentage of people as being highly sleep disturbed at different noise levels. The number of people assessed to be highly sleep disturbed by this method in the Baseline scenarios is given in Table 13-23.

Table 13-23: Number of people highly sleep disturbed – Baseline Scenarios

Scenario	No. People Highly Sleep Disturbed	
	Excluding Consented Developments	Including Consented Developments
2018 Baseline	42,260	48,062
2019 Baseline	47,044	53,084
2022 Baseline	19,690	24,479
2025 Baseline	19,464	24,270
2025 Consented	33,207	38,415

Considering past activity, the number of people exposed to aircraft noise increased from the 2018 Baseline to the 2019 Baseline, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise also increases, specifically by 11% from 42,260 to 47,044. The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 753 to 1,533.

The number of people exposed to aircraft noise is forecast to reduce from the 2018 Baseline to the 2022 Baseline, for all contour levels. Consequently the number of people assessed as highly sleep disturbed by aircraft noise also decreases, specifically by 53% from 42,260 to 19,690. The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) decreases from 753 to 284.

Going forward to the 2025 Baseline Scenario, there are further reductions to 19,464 people assessed as highly sleep disturbed and 281 people exposed to at least a high noise level.

The 2025 Consented scenario would result in a significantly greater number of people being exposed to aircraft noise than what is now forecast in the 2025 Baseline, with 33,207 people assessed as highly sleep disturbed and 495 people exposed to at least a high noise level.

In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The numbers of these above the thresholds given in Table 13-4 for the Baseline scenarios are given in Table 13-24.

Table 13-24: Residential healthcare facilities in Baseline L_{night} contours

Scenario	*No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect*
2018 Baseline	4
2019 Baseline	2
2022 Baseline	2
2025 Baseline	2
2025 Consented	2

The number of residential healthcare facilities exposed to the threshold given in Table 13-4 reduced from 4 in 2018 to 2 in 2019, and is forecast to remain the same in the 2022 and 2025 Baseline scenarios. The 2025 Consented scenario shows no change from the 2025 Baseline.

13.4.4 Noise Modelling to Inform Vibration Effects

The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for the 2018, 2022 and 2025 Baseline scenarios. The results are given in Table 13-25.

Table 13-25: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft, Baseline scenarios

Scenario	*No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft*
2018 Baseline	4
2022 Baseline	0
2025 Baseline	0

In 2018, there were 4 dwellings which experienced noise levels in excess of 97 dB L_{Cmax} at least once per day. These are located to the south of Old Airport Road, near to the eastern end of the south runway. No dwellings exceed this threshold in either the 2022 or 2025 Baseline scenarios.

13.5 Environmental Design and Management

There are a number of measures already in place at Dublin Airport that reduce or mitigate the noise effects of aircraft operations. These are described in this section.

13.5.1 Reduction of Noise at Source

Over the past 20 years, the models and types of aircraft using Dublin Airport have evolved, and improvements in technology have meant that the typical aircraft using the airport are quieter than they used to be.

The ICAO Noise 'Chapter' defines specific noise performance criteria to which aircraft must be certificated. Since 2002, Chapter 2 aircraft have been banned from use in Europe and the vast majority of aircraft operating in the skies above the EU are now Chapter 4 compliant, with an increasing number of quieter Chapter 14 aircraft entering the fleet as airlines take delivery of newer aircraft.

This trend is expected to continue in the future as airlines renew their fleets, and begin to use new aircraft such as the Airbus A320neo and Boeing 737 MAX 8, which both meet the ICAO Chapter 14 requirements and are quieter than the equivalent types they will be replacing.

Specific fleet renewal plans for the two largest airlines at Dublin Airport, Aer Lingus and Ryanair, were considered when preparing the future forecast scenarios and details are presented in the Mott McDonald Impact of Restrictions Report.

daa plan to incentivise fleet renewal through the introduction of night time noise charges. This action is included in the approved Dublin Airport Noise Action Plan 2019-2023.

13.5.2 Land use Planning and Management

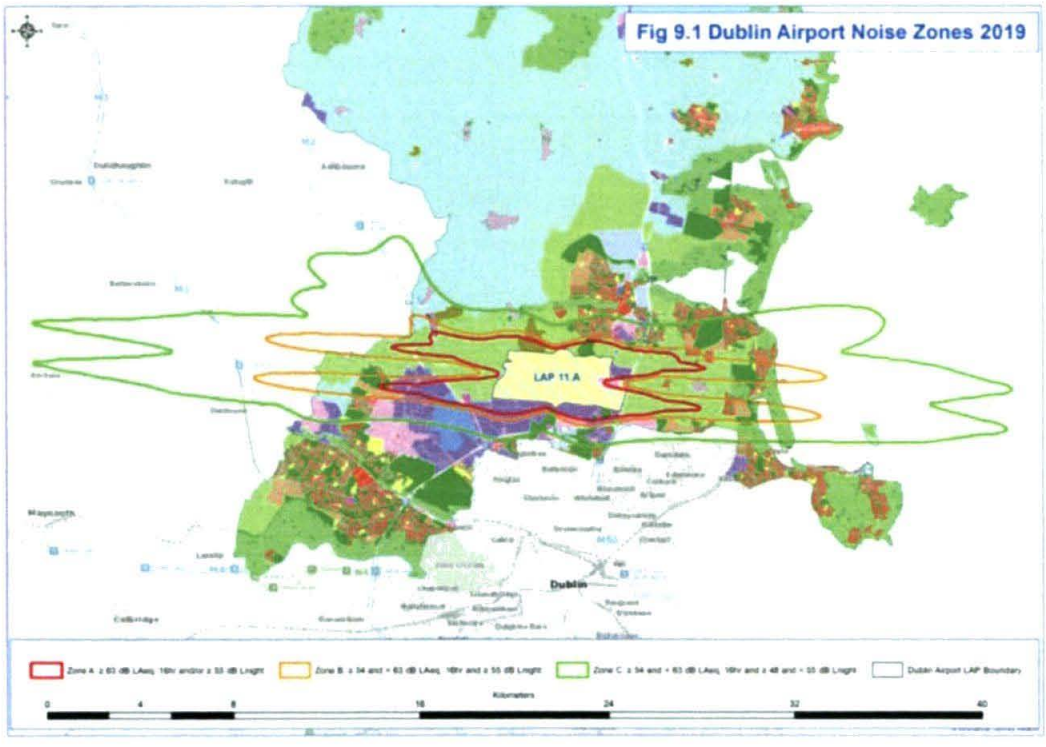
13.5.2.1 Noise Zones

The 2020 Local Area Plan (LAP) includes a dedicated section (section 9.1) to noise. In this section it notes the following. It also includes a figure of the latest Dublin Airport noise zones which is repeated below as Figure 13-6.

"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. Since the publication of previous noise 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. With the north runway set to become operational in 2022, updated information is available relating to aircraft noise performance and flight paths. For these reasons, it was considered appropriate to update the noise zones for Dublin Airport to allow for more effective land use planning for development within airport noise zones.

The updated noise zones are set out in Fig. 9.1. Dublin Airport Noise Zones and policies relating to development in Noise Zones are set out in Variation No. 1 to the Fingal Development Plan 2017 - 2023."

Figure 13-6: Extract from Local Area Plan – Noise Zones



The actions to restrict unsuitable development in the noise zones are described in the Fingal Development Plan 2017-2023 Variation No. 1, which states:

"Table 7.2 presents the four aircraft noise zones and the associated objective of each zone along with an indication of the potential noise exposure from operations at Dublin Airport. The zones are based on potential noise exposure levels due to the airport using either the new northern or existing southern runway for arrivals or departures."

Table 7.2 is reproduced below for reference as Table 13-26. The table consider two noise metrics, L_{night} which is one of primary metrics used in this chapter, and $L_{Aeq,16hr}$ which is one of the supplementary noise metrics. Due to the distribution of flights across the day, evening and night periods at larger airports the noise exposure expressed using the $L_{Aeq,16hr}$ metric is typically 2 dB lower than if it is expressed using the L_{den} metric, the primary metric used in this chapter.

Table 13-26: Extract from Fingal Development Plan 2017-2023 (Table 7.2)

Zone	*Indication of Potential Noise Exposure during Airport Operations*	*Objective*
D	≥ 50 and < 54 dB $L_{Aeq,16hr}$	To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment.
	and	All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non-residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed.
	≥ 40 and < 48 dB L_{night}	Applicants are advised to seek expert advice.
C	≥ 54 and < 63 dB $L_{Aeq,16hr}$	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development
		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.
	and	The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures.
	≥ 48 and < 55 dB L_{night}	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 levels.
		Applicants are strongly advised to seek expert advice.
B	≥ 54 and < 63 dB $L_{Aeq,16hr}$	To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.
		Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.
	and	Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines.
	≥ 55 dB L_{night}	An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the developments 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 levels.
		Applicants must seek expert advice.
A	≥ 63 dB $L_{Aeq,16hr}$	To resist new provision for residential development and other noise sensitive uses.

and/or ≥ 55 dB L_{night}	All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted

Notes:

- 'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: Planning & Noise – New Residential Development, May 2017;
- Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

13.5.2.2 Residential Sound Insulation Schemes

Dublin Airport operates an insulation scheme for dwellings exposed to 63 dB $L_{Aeq,16h}$ or greater. There are two separate schemes; a one-off voluntary scheme based on 2016 exposure, and a scheme required by the North Runway Permission based on the forecast traffic in 2022. The 63 dB $L_{Aeq,16h}$ contour eligibility as part of the North Runway scheme will be reviewed every two years following the opening of the North Runway as required by the planning conditions.

Dublin Airport takes responsibility for the full implementation of the insulation programmes, from initial survey through to quality assessment after installation works. The assessments have included noise measurements of the overall improvement from the works, and these have found improvements in internal noise levels of at least 5 dB.

Over 200 local residences are currently eligible for insulation under the two schemes.

13.5.2.3 Schools Sound Insulation Scheme

A voluntary insulation scheme is on offer for all schools and registered pre-schools which fall within the predicted 60 dB $L_{Aeq,16h}$ contour. The scheme is designed so maximum noise levels within classrooms and school buildings do not exceed 45 dB L_{Aeq} over 8 hours (a typical school day) after insulation measures are undertaken.

The following schools and pre-schools were specified in the North Runway planning permission and have all been contacted in relation to the insulation scheme:

- Mary Queen of Ireland, Rivermeade
- Little Moo Moo's Pre-School
- St. Margaret's National School
- Nzone Creche & Pre-School
- St Nicholas of Myra NS
- Portmarnock Community School

Following acoustic testing it was determined that 2 of these schools (Portmarnock Community School & Mary Queen of Ireland, Rivermeade) did not exceed the 45 dB threshold and thus no works were required at these schools.

13.5.2.4 Dwelling Purchase Scheme

Following extensive engagement with eligible dwelling owners, their representatives, and the Planning Authority and its advisors, several significant enhancements were made to the draft Voluntary Dwelling Purchase Scheme, and it received approval in 2016. Eligibility for the Scheme is based on the predicted 69 dB $L_{Aeq,16h}$ contour.

Although just five dwellings are located in this contour, daa has voluntarily extended participation in the Scheme to a further 33 dwellings, thus honouring earlier commitments and having regard to the contours used in the original planning application.

The Scheme is completely voluntary and places no obligation on any resident to participate. Offers to purchase will include a 30% premium on the current market value of the residence. Property valuations will be based on operations at Dublin Airport and prior to the North Runway being in place.

Eligible homeowners can have their property independently valued at daa's cost, and daa will also provide allowances in relation to conveyancing fees, stamp duty, tax advice and moving costs.

The Scheme will remain available for three years after the North Runway becomes operational, and homeowners are also eligible to participate in the Voluntary Residential Noise Insulation Scheme.

This Voluntary Dwelling Purchase Scheme compares very favourably to those at other airports such as Heathrow and Gatwick in the UK.

13.5.3 Operational Procedures

Along with airport stakeholders, Dublin Airport have implemented a range of operational procedures to minimise noise. These include:

- Noise Preferential Runway usage: aircraft must use the preferred runway under specific conditions and time of day/night. These are selected for noise abatement purposes, the intent being to utilise whenever possible the runways which enable aircraft to avoid noise-sensitive areas during the initial departure and final approach phases of flight.
- Environmental Noise Corridors: aircraft must stay within designated noise corridors on arrival and departure to minimise noise impact.
- Noise Abatement Procedures: these are specific rules on how aircraft should perform take-off climbs to ensure that noise is minimised.
- Continuous Descent Approach: this reduces the noise experienced on the ground by reducing the overall thrust required during the initial descent and keeping aircraft at higher altitudes for longer.
- Reverse thrust is not permitted at night, unless required for safety reasons.
- There are limitations on the use of the crosswind runway.
- Once the North Runway is operational, Dublin Airport will be operated using "Option 7b" during the daytime (07:00-23:00). This is a mode of operation which uses the concept of a preferred runway to lessen the impact of aircraft noise on local communities. In general this means that departures to the west will use the North Runway, and departures to the east will use the South Runway, with arrivals using the opposite runway to departures.

13.5.4 Operating Restrictions

The relevant operating restrictions are detailed in Conditions 3(d) and 5 relating to the North Runway Permission, as described in Section 12.1.

13.6 Assessment of Effects and Significance

13.6.1 Effects During Operation with Proposed Relevant Action

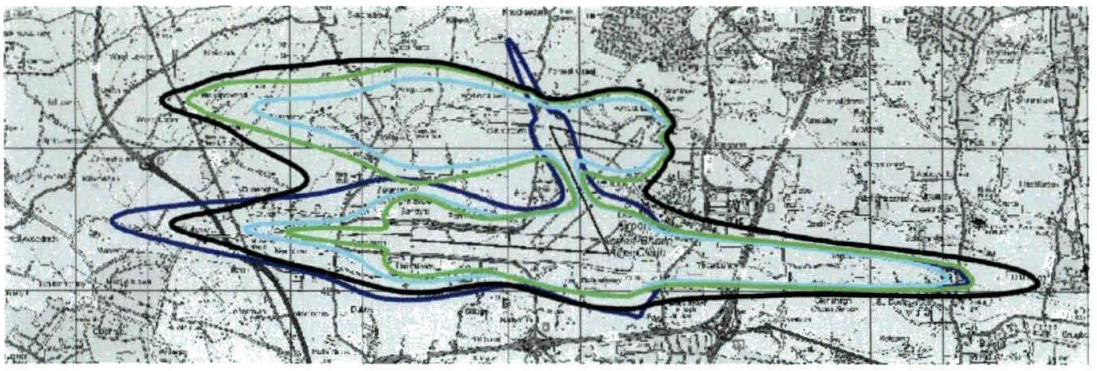
13.6.1.1 Opening Year 2022 L_{den} Metric

Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 0. For the 2022 Relevant Action scenario these are based on forecast aircraft movements without Conditions 3(d) and 5 of the North Runway Permission, and with the proposed replacement measures in place. Due to the profound impact on the aviation industry worldwide of the Covid-19 pandemic, activity is forecast to be less than 32 mppa by 2022, so the presence of Condition 3 of the Terminal 2 Permission (which limits Dublin Airport to 32 mppa) has no effect.

Appendix 13C presents the resulting noise contours for each scenario. Figure 13-7 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2022 Relevant Action scenario.

Considering past activity the 2018 Baseline scenario is presented for comparison. Considering the future situation the 2022 Baseline scenario is presented for comparison, as well as the 2025 Consented scenario.

Figure 13-7: 65 dB L_{den} Noise Contours, 2022 Relevant Action (green), 2018 Baseline (blue), 2022 Baseline (cyan) and 2025 Consented (black)



The 2022 Relevant Action 65 dB Lden contour (green) does not reach as far west as the 2018 or 2022 Baseline contours in line with the south runway, not reaching Killshane Bridge, and is very similar to the 2018 Baseline contour to the east, reaching St Doolaghs. In line with the North Runway, the contour extends further than the 2022 Baseline to Ward Upper to the west and barely leaves the airport site to the east. The exposure from the crosswind runway does not leave the airport site.

The 2022 Relevant Action 65 dB L_{den} contour (green) lies within the corresponding 2025 Consented contour (black) at all locations.

To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2022 Relevant Action scenario in terms of the L_{den} metric are given in Table 13-27, where they are compared with the 2018, 2022 Baseline and 2025 Consented scenarios.

Table 13-27: 2022 Relevant Action Noise levels at Representative Locations (L_{den})

Representative Location	*Reference No.*	*Noise Level, dB (L_{den})*			
		2022 Relevant Action	*Difference to 2018 Baseline*	*Difference to 2022 Baseline*	*Difference to 2025 Consented*
Tyrellstown, Toberburr	AR01	55	+4	+2	-2
Ridgewood	AR02	59	+7	+2	-1
Swords	AR03	50	+3	+1	-2
Malahide Castle	AR04	45	0	-1	-4
Portmarnock N	AR05	49	+1	0	-3
Portmarnock S	AR06	56	+1	+1	-1
Malahide S	AR07	51	+1	0	-4
St Doolaghs	AR08	65	0	+1	-1
Darndale Park	AR09	54	+1	+1	-2
The Baskins	AR10	58	+1	+1	-2
Mayeston Hall	AR11	53	-4	-1	-3
Kilshane Cross	AR12	63	-5	-2	-4
St Margret's	AR13	63	+1	+1	-3
Ashbourne	AR14	48	+1	+1	-1
Dunboyne	AR15	51	-2	0	-3
Ongar	AR16	48	-3	0	-2
Mount Garrett	AR17	54	-6	-3	-4
Beaumont	AR18	49	-5	+1	-2

Note – values rounded to nearest whole number. Differences based on unrounded values.

Comparing the 2022 Relevant Action scenario to the 2018 Baseline, receptors close to flight paths to the west of the existing South Runway or close to flight paths from the crosswind runway, for example Kilshane Cross (#12) or Beaumont (#18), are forecast to see reductions in noise level, whereas the opposite is true for receptors closer to flight paths from the North Runway, for example Swords (#3). Receptors to the east of the airport, such as Malahide (#7) or St Doolaghs (#8), see no change or an increase of 1 dB(A).

Comparing the 2022 Relevant Action scenario to the 2022 Baseline, most receptors see an increase in noise level of around 1 dB(A) or no change, although receptors close to flight paths to the west of the existing South Runway, such as Kilshane Cross (#12) and Mount Garrett (#17), see reductions.

Comparing the 2022 Relevant Action scenario to the 2025 Consented, all receptors are forecast to be quieter in the 2022 Relevant Action scenario, by 1-4 dB.

For the 2022 Relevant Action L_{den} contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-28 along with the areas of the contours.

Table 13-28: Areas, number of dwellings and population in 2022 Relevant Action Lden contours

Scenario	*2022 Relevant Action*				
Contour L_{den}	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population*	*Dwellings*	*Population*
45	742.4	154,877	458,833	166,369	494,941
50	221.3	36,196	107,643	43,956	131,498
55	93.2	8,360	23,830	14,308	41,966
60	36.5	1,172	3,207	3,001	8,870
65	13.7	78	227	78	227
70	4.9	10	32	10	32

The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide a method for calculating the number of people highly annoyed by airborne aircraft noise. This aims to give an overall picture of the noise exposure by assessing a percentage of people as being highly annoyed at different noise levels. The number of people assessed to be highly annoyed by this method in the 2022 Relevant Action scenario is given in Table 13-29, where it is compared with the 2018, 2022 Baseline and 2025 Consented scenarios.

Table 13-29: Number of people highly annoyed – 2022 Relevant Action vs Baseline Scenarios

Scenario	*No. People Highly Annoyed*	
	Excluding Consented Developments	*Including Consented Developments*
2022 Relevant Action	69,428	78,534
2018 Baseline	110,234	120,201
2022 Baseline	65,227	74,321
2025 Consented	125,742	136,170

Comparing the 2022 Relevant Action scenario with the 2018 Baseline, the number of people exposed to aircraft noise is forecast to reduce, for all contour levels except 70 dB L_{den}, which increases from 25 to 32 people. Consequently the number of people assessed as highly annoyed by aircraft noise also decreases, specifically by

37% from 110,234 to 69,428. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) decreases from 251 to 227 excluding consented developments.

Comparing the 2022 Relevant Action scenario with the 2022 Baseline, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. The number of people assessed as highly annoyed by aircraft noise increases by 6% from 65,227 to 69,428. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 133 to 227 excluding consented developments.

Comparing the 2022 Relevant Action scenario with the 2025 Consented scenario, the number of people exposed to aircraft noise is forecast to be lower in the 2022 Relevant Action scenario, for all contour levels. The number of people assessed as highly annoyed by aircraft noise is lower by 45% with 125,742 in 2025 Consented compared to 69,428 in 2022 Relevant Action. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) is lower, with 472 in 2025 Consented compared to 227 in 2022 Relevant Action, excluding consented developments. The reason for the reduction in noise effects, despite an increase in aircraft movements, is that new aircraft now coming into service are quieter than previously forecast. Additionally, some of the louder historic aircraft types used in the 2025 Consented forecast, such as the Hawker Siddeley HS748, have now been largely phased out of service.

When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 0, and specifically Table 13-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Relevant Action scenario is compared with the 2018 Baseline in Table 13-30, with the 2022 Baseline in Table 13-31, and with the 2025 Consented in Table 13-30. These tables include all people in existing residential receptors who are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are not assessed as being subject to significant effects and so have not been included.

Table 13-30: Air Noise (L_{den}) People by Magnitude of effect – 2022 Relevant Action vs 2018 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	87,758	149,862
Not Significant	122,499	26,642
Slight	237,034	4,961
Moderate	75,120	7,354
Significant	24,112	7,738
Very Significant	123	633
Profound	0	75

Table 13-31: Air Noise (L_{den}) People by Magnitude of effect – 2022 Relevant Action vs 2022 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	121,209	290,474
Not Significant	10,675	26,822
Slight	950	7,480
Moderate	7,639	1,563
Significant	1,886	95

Very Significant	0	0
Profound	0	0

Table 13-32: Air Noise (L_{den}) People by Magnitude of effect – 2022 Relevant Action vs 2025 Consented

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	184,865	253
Not Significant	292,084	157
Slight	278,060	0
Moderate	37,097	0
Significant	13,860	0
Very Significant	84	0
Profound	0	0

Going from the 2018 Baseline to the 2022 Relevant Action scenario, 24,235 people are assessed as having at least a significant beneficial effect, and 8,446 people are assessed as having at least a significant adverse effect. However, at the highest effect levels, i.e. very significant and profound, more people have adverse than beneficial effects.

Going from the 2022 Baseline to the 2022 Relevant Action scenario, 1,886 people are assessed as having a significant beneficial effect, and 95 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

Going from the 2025 Consented to the 2022 Relevant Action scenario, 13,944 people are assessed as having a significant beneficial effect, and no people are assessed as having a significant adverse effect.

In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-4 for the 2022 Relevant Action scenario are given in Table 13-33, where they are compared with the 2018, 2022 Baseline and 2025 Consented scenarios.

Table 13-33: Schools, residential healthcare facilities and places of worship in 2022 Relevant Action L_{den} contours

Scenario	*No. Receptors Above Threshold for Medium Absolute Effect*		
	Schools	*Residential Healthcare Facilities*	*Places of Worship*
2022 Relevant Action	10	1	5
2018 Baseline	10	2	6
2022 Baseline	8	1	5
2025 Consented	11	2	6

The number of non-residential receptors exposed to the thresholds given in Table 13-4 is forecast to reduce between the 2018 Baseline and 2022 Relevant Action scenarios. While the number of receptors does increase

between the 2022 Baseline and 2022 Relevant Action scenarios the increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant. The number of receptors exposed in the 2022 Relevant Action scenario is lower than the 2025 Consented.

13.6.1.2 Opening Year 2022 L_{night} Metric

Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 0. For the 2022 Relevant Action scenario these are based on forecast aircraft movements without Conditions 3(d) and 5 of the North Runway Permission, and with the proposed replacement measures in place. Due to the profound impact on the aviation industry worldwide of the Covid-19 pandemic, activity is forecast to be less than 32 mppa by 2022, so the presence of Condition 3 of the Terminal 2 Permission (which limits Dublin Airport to 32 mppa) has no effect.

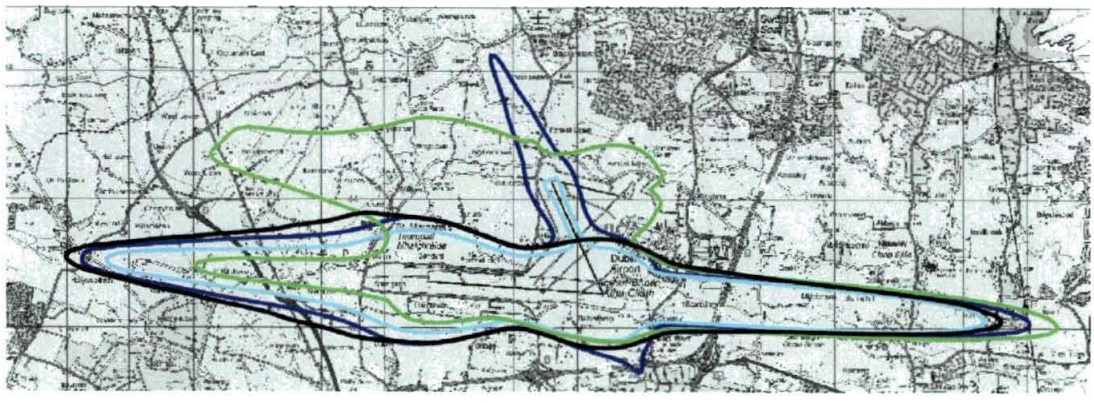
Appendix 13C presents the resulting noise contours for each scenario. Appendix 14C presents the resulting noise contours for each scenario. The noise contours representing a high impact, 55 dB Lnight, do not extend much further than the airport site in the 2022 Relevant Action scenario or any of the Baseline scenarios.

The 2022 Relevant Action noise contours representing a low impact, 45 dB Lnight, are a similar shape to the 2018 Baseline but are larger and shifted slightly to the north. They extend to the west nearly to the R122, to the north into Ridgewood, to the east to just past the M1 and to the south to Santry Demesne.

shows the noise contours representing a high impact, 55 dB L_{night}, for the 2022 Relevant Action scenario.

Considering past activity the 2018 Baseline scenario is presented for comparison. Considering the future situation the 2022 Baseline scenario is presented for comparison, as well as the 2025 Consented scenario.

Figure 13-8: 55 dB L_{night} Noise Contours, 2022 Relevant Action (green), 2018 Baseline (blue), 2022 Baseline (cyan) and 2025 Consented (black)



The 2022 Relevant Action 55 dB L_{night} contour (green) does not extend as far as the 2018, 2022 Baseline or 2025 Consented contours in line with the south runway to the west, reaching Killshane, but extends further to the east, reaching just beyond Drumnigh. In line with the North Runway, the contour extends just beyond Bishopswood to the west and barely leaves the airport site to the east. The exposure from the crosswind runway does not leave the airport site.

To provide further information on changes in the noise environment for specific communities, predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2022 Relevant Action scenario in terms of the L_{night} metric are given in Table 13-34, where they are compared with the 2018, 2022 Baseline and 2025 Consented scenarios.

Table 13-34: 2022 Relevant Action Noise levels at Representative Locations (L_{night})

Representative Location	*Reference No.*	*Baseline Noise Level, dB (L_{night})*			
		2022 Relevant Action	*Difference to 2018 Baseline*	*Difference to 2022 Baseline*	*Difference to 2025 Consented*
Tyrellstown, Toberburr	AR01	46	+3	+7	+1
Ridgewood	AR02	50	+5	+10	+7

Swords	AR03	41	+2	+4	0
Malahide Castle	AR04	37	+1	+2	-1
Portmarnock N	AR05	40	+1	+2	+1
Portmarnock S	AR06	49	+1	+1	+1
Malahide S	AR07	43	+1	+2	0
St Doolaghs	AR08	57	0	+1	+1
Darndale Park	AR09	45	+1	+2	0
The Baskins	AR10	50	+1	+2	0
Mayeston Hall	AR11	45	-3	-1	-3
Kilshane Cross	AR12	57	-2	-2	-4
St Margret's	AR13	55	+1	+3	-1
Ashbourne	AR14	39	+1	+2	0
Dunboyne	AR15	44	-1	0	-3
Ongar	AR16	41	-3	0	0
Mount Garrett	AR17	49	-4	-3	-4
Beaumont	AR18	41	-6	+1	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

Comparing the 2022 Relevant Action scenario to the 2018 Baseline, receptors close to flight paths to the west of the existing South Runway or close to flight paths from the crosswind runway, for example Kilshane Cross (#12) or Beaumont (#18), are forecast to see reductions in noise level, whereas the opposite is true for receptors close to flight paths from the North Runway, for example Swords (#3).

Comparing the 2022 Relevant Action scenario to the 2022 Baseline, receptors close to flight paths to the west of the existing South Runway, for example Kilshane Cross (#12) or Mount Garrett (#17), see reductions. However receptors closer to flight paths from the North Runway, for example Swords (#3) or Malahide (#7), see increases.

Comparing the 2022 Relevant Action scenario to the 2025 Consented, receptors close to flight paths to the west of the existing South Runway, for example Kilshane Cross (#12) or Mount Garrett (#17), see reductions. However receptors closer to flight paths from the North Runway, for example North Portmarnock (#5), see increases.

For the 2022 Relevant Action L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-35 along with the areas of the contours.

Table 13-35: Areas, number of dwellings and population in 2022 Relevant Action L_{night} contours

Scenario		*2022 Relevant Action*			
Contour L_{night} (dB)	*Area (km^2)*	*Excluding Consented Developments*		*Including Consented Developments*	
		Dwellings	*Population.*	*Dwellings*	*Population*
40	300.9	58,236	173,582	67,810	203,350
45	135.3	15,204	44,013	22,128	65,105
50	52.8	2,441	6,761	6,341	18,722
55	20.3	359	1,152	815	2,643
60	7.0	20	62	20	62

65	2.6	0	0	0	0

The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide a method for calculating the number of people highly sleep disturbed by airborne aircraft noise. This aims to give an overall picture of the noise exposure by assessing a percentage of people as being highly sleep disturbed at different noise levels. The number of people assessed to be highly sleep disturbed by this method in the 2022 Relevant Action scenario is given in Table 13-36, where it is compared with the 2018, 2022 Baseline and 2025 Consented scenarios.

Table 13-36: Number of people highly sleep disturbed – 2022 Relevant Action vs Baseline Scenarios

Scenario	*No. People Highly Sleep Disturbed*	
	Excluding Consented Developments	*Including Consented Developments*
2022 Relevant Action	24,355	29,812
2018 Baseline	42,260	48,062
2022 Baseline	19,690	24,479
2025 Consented	33,207	38,415

Comparing the 2022 Relevant Action scenario with the 2018 Baseline, the number of people exposed to aircraft noise is forecast to reduce at most contour levels but increase at the contour levels of 55 and 60 dB L_{night}. Overall the number of people assessed as highly sleep disturbed by aircraft noise decreases by 42% from 42,260 to 24,355. However, the number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 753 to 1,152 excluding consented developments.

Comparing the 2022 Relevant Action scenario with the 2022 Baseline, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise also increases, specifically by 24% from 19,690 to 24,355. The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 284 to 1,152 excluding consented developments.

Comparing the 2022 Relevant Action scenario with the 2025 Consented scenario, the number of people exposed to aircraft noise is forecast to be lower in the 2022 Relevant Action scenario at most contour levels but higher at the contour level of 55 dB L_{night}. The number of people assessed as highly sleep disturbed by aircraft noise is lower by 27% with 33,207 in 2025 Consented compared to 24,355 in 2022 Relevant Action. The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) is higher, with 495 in 2025 Consented compared to 1,152 in 2022 Relevant Action, excluding consented developments.

When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 0, and specifically Table 13-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2022 Relevant Action scenario is compared with the 2018 Baseline in Table 13-37, with the 2022 Baseline in Table 13-38, and with the 2025 Consented in Table 13-39. These tables include all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-37: Air Noise (L_{night}) People by Magnitude of effect – 2022 Relevant Action vs 2018 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	20,186	55,542
Not Significant	52,660	23,431
Slight	124,277	5,441

Moderate	29,722	7,366
Significant	9,657	1,184
Very Significant	18	273
Profound	0	85

Table 13-38: Air Noise (L_{night}) People by Magnitude of effect – 2022 Relevant Action vs 2022 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	39,288	77,827
Not Significant	11,244	20,048
Slight	3,006	16,950
Moderate	8,851	5,338
Significant	337	11,124
Very Significant	0	505
Profound	0	106

Table 13-39: Air Noise (L_{night}) People by Magnitude of effect – 2022 Relevant Action vs 2025 Consented

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	57,534	72,206
Not Significant	32,119	8,101
Slight	46,400	7,880
Moderate	20,085	9,046
Significant	6,570	2,841
Very Significant	82	276
Profound	67	50

Going from the 2018 Baseline to the 2022 Relevant Action scenario, 9,675 people are assessed as having at least a significant beneficial effect, and 1,542 people are assessed as having a significant adverse effect. However, at the highest effect levels, i.e. very significant and profound, more people have adverse than beneficial effects.

Going from the 2022 Baseline to the 2022 Relevant Action scenario, 337 people are assessed as having at least a significant beneficial effect, and 11,735 people are assessed as having at least a significant adverse effect.

Going from the 2022 Baseline to the 2025 Consented scenario, 6,719 people are assessed as having at least a significant beneficial effect, and 3,167 people are assessed as having at least a significant adverse effect. However, at the highest effect levels, i.e. very significant and profound, more people have adverse than beneficial effects.

In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The numbers of these above the thresholds given in Table 13-4 for the 2022 Relevant Action scenario are given in Table 13-40, where they are compared with the 2018, 2022 Baseline and 2025 Consented scenarios.

Table 13-40: Residential healthcare facilities in 2022 Relevant Action L_{night} contours

Scenario	*No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect*
2022 Relevant Action	2
2018 Baseline	4
2022 Baseline	2
2025 Consented	2

The number of residential healthcare facilities exposed to the threshold given in Table 13-4 in the 2022 Relevant Action scenario is lower than in the 2018 Baseline scenario, and the same as in the 2022 Baseline and 2025 Consented scenarios. Any increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

13.6.1.3 Worst-case Year 2025 L_{den} Metric

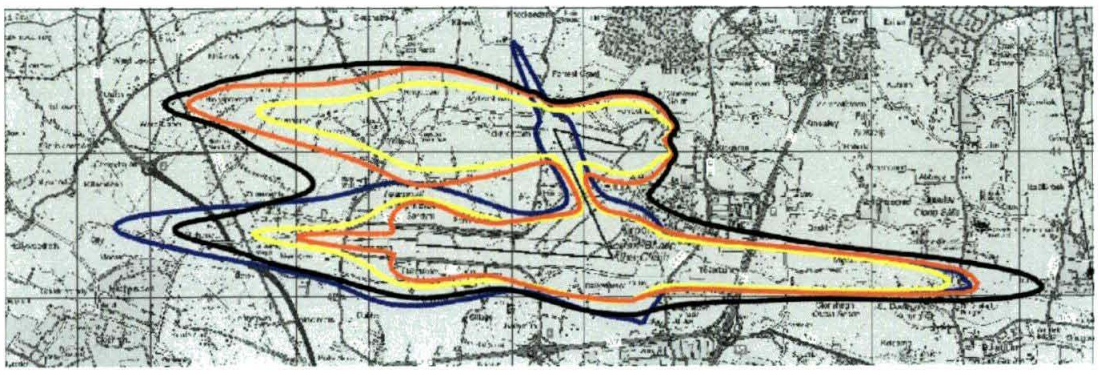
Noise contours have been produced for the primary assessment metric of L_{den} using the methodology described in Section 0. For the 2025 Relevant Action scenario these are based on forecast aircraft movements without Conditions 3(d) and 5 of the North Runway Permission, and with the proposed replacement measures in place. They also assume, based on the available forecasts and hourly runway capacity, that during the peak early morning period of 06:00-08:00, one runway is used for arrivals and the other for departures. As noted earlier depending on the precise timing of flights there may be the need to use both runways during the peak departures period as determined by Air Traffic Control. For westerly operations this is in accordance with mode of operation Option 7b, as Runway 28L would remain the preferred for arriving aircraft.

The proposed Relevant Action relates to operating restrictions arising under Conditions 3(d) and 5 of the planning permission granted for the North Runway. To provide context of the intended effects of these conditions, a comparison is included in this section with the noise impact that was forecast for 2025 when the North Runway permission was given (2025 Consented scenario).

Appendix 13C presents the resulting noise contours for the 2025 Relevant Action scenario. Figure 13-9 shows the noise contours representing a high impact, 65 dB L_{den}, for the 2025 Relevant Action scenario.

Considering past activity the 2018 Baseline scenario is presented for comparison. Considering the future situation the 2025 Baseline scenario is presented for comparison, as well as the 2025 Consented scenario.

Figure 13-9: 65 dB L_{den} Noise Contours, 2025 Relevant Action (orange), 2018 Baseline (blue), 2025 Baseline (yellow) and 2025 Consented (black)



The 2025 Relevant Action 65 dB L_{den} contour (orange) does not reach as far west as the 2018 or 2025 Baseline contours in line with the south runway, not quite reaching Killshane Bridge, and is very similar to the 2018 Baseline contour to the east, reaching St Doolaghs. In line with the North Runway, the contour extends further than the 2025 Baseline to Ward Upper to the west and barely leaves the airport site to the east. The exposure from the crosswind runway does not leave the airport site.

The 2025 Relevant Action 65 dB L_{den} contour (orange) lies within the corresponding 2025 Consented contour (black) at all locations.

To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2025 Relevant Action situation in terms of the L_{den} metric are given in Table 13-41, where they are compared with the 2018, 2025 Baseline and 2025 Consented scenarios.

Table 13-41: 2025 Relevant Action Noise levels at Representative Locations (L_{den})

Representative Location	*Reference No.*	*Noise Level, dB (L_{den})*			
		2025 Relevant Action	*Difference to 2018 Baseline*	*Difference to 2025 Baseline*	*Difference to 2025 Consented*
Tyrellstown, Toberburr	AR01	54	+4	+2	-2
Ridgewood	AR02	59	+6	+2	-1
Swords	AR03	49	+3	+1	-2
Malahide Castle	AR04	45	0	0	-4
Portmarnock N	AR05	49	+1	0	-3
Portmarnock S	AR06	56	+1	+1	-1
Malahide S	AR07	51	+1	0	-4
St Doolaghs	AR08	65	0	+1	-1
Darndale Park	AR09	54	+1	+1	-2
The Baskins	AR10	58	+1	+1	-2
Mayeston Hall	AR11	53	-4	-1	-3
Kilshane Cross	AR12	62	-5	-2	-4
St Margret's	AR13	63	+1	+1	-3
Ashbourne	AR14	48	+1	+1	-1
Dunboyne	AR15	51	-2	0	-3
Ongar	AR16	48	-3	0	-2
Mount Garrett	AR17	54	-7	-3	-4
Beaumont	AR18	49	-5	+1	-2

Note – values rounded to nearest whole number. Differences based on unrounded values.

Comparing the 2025 Relevant Action scenario to the 2018 Baseline, receptors close to flight paths to the west of the existing South Runway or close to flight paths from the crosswind runway, for example Kilshane Cross (#12) or Beaumont (#18), are forecast to see reductions in noise level, whereas the opposite is true for receptors closer to flight paths from the North Runway, for example Swords (#3). Receptors to the east of the airport, such as Malahide (#7) or St Doolaghs (#8), see an increase of 0-1 dB(A).

Comparing the 2025 Relevant Action scenario to the 2025 Baseline, most receptors see an increase in noise level of around 1 dB(A), although receptors close to flight paths to the west of the existing South Runway, such as Kilshane Cross (#12) and Mount Garrett (#17), see reductions.

Comparing the 2025 Relevant Action scenario to the 2025 Consented, all receptors are forecast to be quieter in the 2025 Relevant Action scenario, by 1-4 dB.

For the 2025 Relevant Action L_{den} contours, the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-42 along with the areas of the contours.

Table 13-42: Areas, number of dwellings and population in 2025 Relevant Action Lden contours

Scenario	2025 Relevant Action				
Contour L_{den}	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
45	737.5	151,229	448,076	162,701	484,131
50	220.3	35,276	104,907	43,127	129,029
55	92.8	8,125	23,171	14,027	41,133
60	36.3	1,193	3,247	3,022	8,910
65	13.5	75	218	75	218
70	4.9	10	32	10	32

The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide a method for calculating the number of people highly annoyed by airborne aircraft noise. This aims to give an overall picture of the noise exposure by assessing a percentage of people as being highly annoyed at different noise levels. The number of people assessed to be highly annoyed by this method in the 2025 Relevant Action scenario is given in Table 13-43, where it is compared with the 2018, 2025 Baseline and 2025 Consented scenarios.

Table 13-43: Number of people highly annoyed – 2025 Relevant Action vs Baseline Scenarios

Scenario	No. People Highly Annoyed	
	Excluding Consented Developments	Including Consented Developments
2025 Relevant Action	67,760	76,809
2018 Baseline	110,234	120,201
2025 Baseline	63,316	72,337
2025 Consented	125,742	136,170

Comparing the 2025 Relevant Action scenario with the 2018 Baseline, the number of people exposed to aircraft noise is forecast to reduce at lower contour levels but increase at higher contour levels. Overall the number of people assessed as highly annoyed by aircraft noise decreases by 39% from 110,234 to 67,760. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) decreases from 251 to 218 excluding consented developments.

Comparing the 2025 Relevant Action scenario with the 2025 Baseline, the number of people exposed to aircraft noise is forecast to increase for all contour levels. The number of people assessed as highly annoyed by aircraft noise increases by 7% from 63,316 to 67,760. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) increases from 128 to 218, excluding consented developments.

Comparing the 2025 Relevant Action scenario with the 2025 Consented scenario, the number of people exposed to aircraft noise is forecast to be lower in the 2025 Relevant Action scenario, for all contour levels. The number of people assessed as highly annoyed by aircraft noise is lower by 46% with 125,742 in 2025 Consented compared to 67,760 in 2025 Relevant Action. The number of people exposed to at least a high level of noise (i.e. 65 dB L_{den} or above) is lower, with 472 in 2025 Consented compared to 218 in 2025 Relevant Action, excluding consented developments.

When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 0, and specifically Table 13-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Relevant Action scenario is compared with the 2018 Baseline in Table 13-44, with the 2025 Baseline in Table 13-45, and with the 2025 Consented in Table 13-46. These tables include all people in existing residential receptors who are exposed to at least 45 dB L_{den} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-44: Air Noise (L_{den}) People by Magnitude of effect – 2025 Relevant Action vs 2018 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	83,073	149,194
Not Significant	113,033	22,193
Slight	252,199	4,699
Moderate	77,652	7,098
Significant	24,571	7,267
Very Significant	134	626
Profound	0	72

Table 13-45: Air Noise (L_{den}) People by Magnitude of effect – 2025 Relevant Action vs 2025 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	114,758	287,948
Not Significant	10,375	26,710
Slight	1,096	5,271
Moderate	7,427	3,466
Significant	2,110	95

Very Significant	0	0
Profound	0	0

Table 13-46: Air Noise (L_{den}) People by Magnitude of effect – 2025 Relevant Action vs 2025 Consented

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	151,951	198
Not Significant	297,340	54
Slight	303,762	0
Moderate	39,201	0
Significant	13,861	0
Very Significant	94	0
Profound	0	0

Going from the 2018 Baseline to the 2025 Relevant Action scenario, 24,705 people are assessed as having at least a significant beneficial effect, and 7,965 people are assessed as having at least a significant adverse effect. However, at the highest effect levels, i.e. very significant and profound, more people have adverse than beneficial effects.

Going from the 2025 Baseline to the 2025 Relevant Action scenario, 2,110 people are assessed as having a significant beneficial effect, and 95 people are assessed as having a significant adverse effect. No people are assessed as having the highest effect levels, i.e. very significant and profound.

Going from the 2025 Consented to the 2025 Relevant Action scenario, 13,955 people are assessed as having a significant beneficial effect, and no people are assessed as having a significant adverse effect.

In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. The numbers of each of these above the thresholds given in Table 13-4 for the 2025 Relevant Action scenario are given in Table 13-47, where they are compared with the 2018, 2025 Baseline and 2025 Consented scenarios.

Table 13-47: Schools, residential healthcare facilities and places of worship in 2025 Relevant Action L_{den} contours

Scenario	*No. Receptors Above Threshold for Medium Absolute Effect*		
	Schools	*Residential Healthcare Facilities*	*Places of Worship*
2025 Relevant Action	10	1	5
2018 Baseline	10	2	6
2025 Baseline	8	1	5
2025 Consented	11	2	6

The number of non-residential receptors exposed to the thresholds given in Table 13-4 is forecast to reduce between the 2018 Baseline and 2025 Relevant Action scenarios. While the number of receptors does increase between the 2025 Baseline and 2025 Relevant Action scenarios the increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant. The number of receptors exposed in the 2025 Relevant Action scenario is lower than the 2025 Consented.

13.6.1.4 Worst-case Year 2025 L_{night} Metric

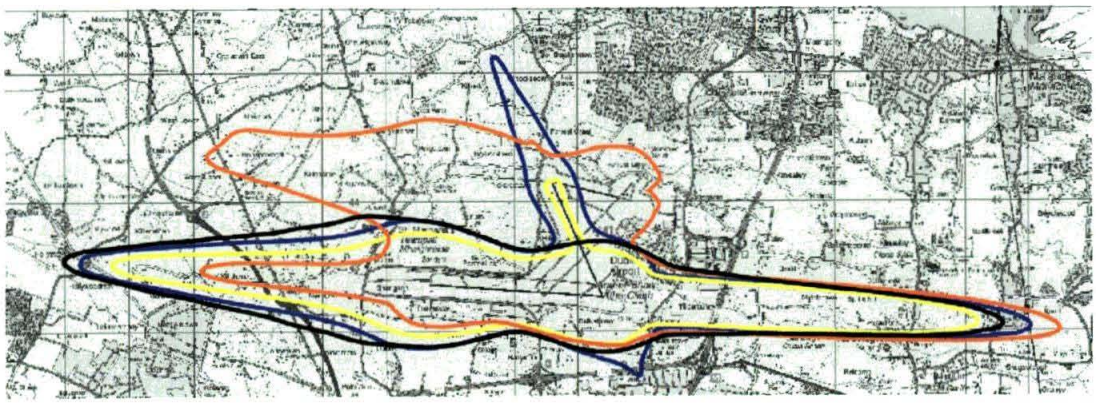
Noise contours have been produced for the primary assessment metric of L_{night} using the methodology described in Section 0. For the 2025 Relevant Action scenario these are based on forecast aircraft movements without Conditions 3(d) and 5 of the North Runway Permission, and with the proposed replacement measures in place. They also assume, based on hourly runway capacity, that during the early morning period 06:00-08:00 one runway is used for arrivals and the other for departures. As noted earlier depending on the precise timing of flights there may be the need to use both runways during the peak departures period as determined by Air Traffic Control. For westerly operations this is in accordance with mode of operation Option 7b, as Runway 28L would remain the preferred for arriving aircraft.

The Relevant Action relates to operating restrictions arising under Conditions 3(d) and 5 of the planning permission granted for the North Runway. To provide context of the intended effects of these conditions, a comparison is included in this section with the noise impact that was forecast for 2025 when the North Runway permission was given (2025 Consented scenario).

Appendix 13C presents the resulting noise contours for the 2025 Relevant Action scenario. Figure 13-10 shows the noise contours representing a high impact, 55 dB L_{night}, for the 2025 Relevant Action scenario.

Considering past activity the 2018 Baseline scenario is presented for comparison. Considering the future situation the 2025 Baseline scenario is presented for comparison, as well as the 2025 Consented scenario.

Figure 13-10: 55 dB L_{night} Noise Contours, 2025 Relevant Action (orange), 2018 Baseline (blue), 2025 Baseline (yellow) and 2025 Consented (black)



The 2025 Relevant Action 55 dB L_{night} contour (orange) does not extend as far as the 2018, 2025 Baseline or 2025 Consented contours in line with the south runway to the west, reaching just past Killshane, but extends further to the east, reaching just beyond Drumnigh. In line with the North Runway, the contour extends to Ward Upper to the west and barely leaves the airport site to the east. The exposure from the crosswind runway does not leave the airport site.

To provide further information on changes in the noise environment for specific communities predictions have also been undertaken of the noise levels at a number of representative locations which are shown on Figure 13-4. The results of these predictions for the 2025 Relevant Action situation in terms of the L_{night} metric are given in Table 13-48, where they are compared with the 2018, 2025 Baseline and 2025 Consented scenarios.

Table 13-48: 2025 Relevant Action Noise levels at Representative Locations (L_{night})

Representative Location	*Reference No.*	*Noise Level, dB (L_{night})*

		2025 Relevant Action	Difference to 2018 Baseline	Difference to 2025 Baseline	Difference to 2025 Consented
Tyrellstown, Toberburr	AR01	46	+3	+7	+1
Ridgewood	AR02	50	+5	+10	+7
Swords	AR03	41	+2	+5	0
Malahide Castle	AR04	37	+1	+2	-1
Portmarnock N	AR05	40	+1	+2	+1
Portmarnock S	AR06	49	+1	+2	+1
Malahide S	AR07	43	+1	+2	0
St Doolaghs	AR08	57	0	+1	+1
Darndale Park	AR09	45	+1	+2	0
The Baskins	AR10	50	+1	+2	0
Mayeston Hall	AR11	45	-3	-1	-3
Kilshane Cross	AR12	57	-2	-2	-4
St Margret's	AR13	55	+1	+3	-1
Ashbourne	AR14	39	+1	+2	0
Dunboyne	AR15	44	-1	0	-3
Ongar	AR16	41	-3	0	0
Mount Garrett	AR17	48	-4	-3	-4
Beaumont	AR18	41	-6	+1	+1

Note – values rounded to nearest whole number. Differences based on unrounded values.

Comparing the 2025 Relevant Action scenario to the 2018 Baseline, receptors close to flight paths to the west of the existing South Runway or close to flight paths from the crosswind runway, for example Kilshane Cross (#12) or Beaumont (#18), are forecast to see reductions in noise level, whereas the opposite is true for receptors closer to flight paths from the North Runway, for example Swords (#3).

Comparing the 2025 Relevant Action scenario to the 2025 Baseline, receptors close to flight paths to the west of the existing South Runway, for example Kilshane Cross (#12) or Mount Garrett (#17), see reductions. However receptors closer to flight paths from the North Runway, for example Swords (#3) or Malahide (#7), see increases.

Comparing the 2025 Relevant Action scenario to the 2025 Consented, receptors close to flight paths to the west of the existing South Runway, for example Kilshane Cross (#12) or Mount Garrett (#17), see reductions. However receptors closer to flight paths from the North Runway, for example North Portmarnock (#5), see increases.

For the 2025 Relevant Action L_{night} contours the number of dwellings and the estimated population that they contain have been determined. This has been done based on the existing dwellings and population excluding consented developments, and also based on the existing dwellings and population allowing for consented developments and land zoned for residential development. The results are given by contour in Table 13-49 along with the areas of the contours.

Table 13-49: Areas, number of dwellings and population in 2025 Relevant Action L_{night} contours

Scenario		2025 Relevant Action			
Contour L_{night} (dB)	Area (km^2)	Excluding Consented Developments		Including Consented Developments	
		Dwellings	Population.	Dwellings	Population
40	302.0	58,554	174,473	68,050	203,977
45	135.6	15,161	43,855	22,085	64,947

50	52.7	2,433	6,729	6,245	18,358
55	20.3	360	1,157	916	2,948
60	7.0	20	62	20	62
65	2.6	0	0	0	0

The World Health Organisation's Environmental Noise Guidelines 2018, as endorsed by the European Commission through Directive 2020/367, provide a method for calculating the number of people highly sleep disturbed by airborne aircraft noise. This aims to give an overall picture of the noise exposure by assessing a percentage of people as being highly sleep disturbed at different noise levels. The number of people assessed to be highly sleep disturbed by this method in the 2025 Relevant Action scenario is given in Table 13-50, where it is compared with the 2018, 2025 Baseline and 2025 Consented scenarios.

Table 13-50: Number of people highly sleep disturbed – 2025 Relevant Action vs Baseline Scenarios

Scenario	*No. People Highly Sleep Disturbed*	
	Excluding Consented Developments	*Including Consented Developments*
2025 Relevant Action	24,456	29,869
2018 Baseline	42,260	48,062
2025 Baseline	19,464	24,270
2025 Consented	33,207	38,415

Comparing the 2025 Relevant Action scenario with the 2018 Baseline, the number of people exposed to aircraft noise is forecast to reduce at most contour levels but increase at the contour levels of 55 and 60 dB L_{night}. Overall, the number of people assessed as highly sleep disturbed by aircraft noise decreases by 42% from 42,260 to 24,456. However, the number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 753 to 1,157 excluding consented developments.

Comparing the 2025 Relevant Action scenario with the 2025 Baseline, the number of people exposed to aircraft noise is forecast to increase, for all contour levels. Consequently, the number of people assessed as highly sleep disturbed by aircraft noise increases by 26% from 19,464 to 24,456. The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) increases from 281 to 1,157 excluding consented developments.

Comparing the 2025 Relevant Action scenario with the 2025 Consented scenario, the number of people exposed to aircraft noise is now forecast to be lower in the 2025 Relevant Action scenario at most contour levels but be higher at the contour level of 55 dB L_{night}. The number of people assessed as highly sleep disturbed by aircraft noise is lower by 26% with 33,207 in 2025 Consented compared to 24,456 in 2025 Relevant Action. The number of people exposed to at least a high level of noise (i.e. 55 dB L_{night} or above) is higher, with 495 in 2025 Consented compared to 1,157 in 2025 Relevant Action, excluding consented developments.

When comparing scenarios, it is also important to consider the change in noise level in order to determine significant changes between the scenarios. Section 0, and specifically Table 13-3, set out the method for interpreting the absolute noise level and change in noise level into a magnitude of effect. The 2025 Relevant Action scenario is compared with the 2018 Baseline in Table 13-51, with the 2025 Baseline in Table 13-52, and with the 2025 Consented in Table 13-53. These tables include all people in existing residential receptors who are exposed to at least 40 dB L_{night} in at least one of the scenarios. People who are exposed to negligible absolute noise levels in both scenarios are assessed as not being subject to significant effects and so have not been included.

Table 13-51: Air Noise (L_{night}) People by Magnitude of effect – 2025 Relevant Action vs 2018 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	20,474	55,853

Not Significant	52,945	23,412
Slight	124,243	5,422
Moderate	29,321	7,514
Significant	9,691	1,187
Very Significant	18	278
Profound	0	85

Table 13-52: Air Noise (L_{night}) People by Magnitude of effect – 2025 Relevant Action vs 2025 Baseline

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	38,939	78,412
Not Significant	10,804	20,128
Slight	2,485	17,632
Moderate	9,030	5,694
Significant	425	11,166
Very Significant	0	505
Profound	0	112

Table 13-53: Air Noise (L_{night}) People by Magnitude of effect – 2025 Relevant Action vs 2025 Consented

Magnitude of effect	*No. people with Beneficial Effect*	*No. people with Adverse Effect*
Imperceptible	59,358	72,942
Not Significant	29,961	8,015
Slight	46,485	7,983
Moderate	19,711	9,163
Significant	6,713	2,855
Very Significant	80	279
Profound	72	53

Going from the 2018 Baseline to the 2025 Relevant Action scenario, 9,709 people are assessed as having at least a significant beneficial effect, and 1,551 people are assessed as having a significant adverse effect. However, at the highest effect levels, i.e. very significant and profound, more people have adverse than beneficial effects.

Going from the 2025 Baseline to the 2025 Relevant Action scenario, 425 people are assessed as having a significant beneficial effect, and 11,783 people are assessed as having a significant adverse effect.

Going from the 2025 Consented to the 2025 Relevant Action scenario, 6,865 people are assessed as having a significant beneficial effect, and 3,187 people are assessed as having a significant adverse effect. However, at the highest effect levels, i.e. very significant and profound, more people have adverse than beneficial effects.

In addition to the consideration of residential properties, other potential receptors of high sensitivity have been included in this assessment, specifically schools, residential healthcare facilities and places of worship. Of these, only residential healthcare facilities are highly sensitive to noise at night. The numbers of these above the thresholds given in Table 13-4 for the 2025 Relevant Action scenario are given in Table 13-54, where they are compared with the 2018, 2025 Baseline and 2025 Consented scenarios.

Table 13-54: Residential healthcare facilities in 2025 Relevant Action L_{night} contours

Scenario	*No. Residential Healthcare Facilities Above Threshold for Medium Absolute Effect*
2025 Relevant Action	2
2018 Baseline	4
2025 Baseline	2
2025 Consented	2

The number of residential healthcare facilities exposed to the threshold given in Table 13-4 in the 2025 Relevant Action scenario is lower than in the 2018 Baseline scenario, and the same as in the 2025 Baseline and 2025 Consented scenarios. Any increases for the individual receptors are all less than 3 dB(A) and so are not rated as significant.

13.6.2 Cumulative Noise Effects

A potential consideration would be to assess the cumulative noise effect of the different noise sources, such as air noise assessed in this chapter and ground noise assessed in Chapter 14. By convention, this type of cumulative assessment is not typically carried out, and was not for the Heathrow Cranford Agreement planning application (determined in February 2017) and the Stansted 43 million passengers application (determined in January 2020).

Instead each of the main sources associated with operations at the airport was assessed according to its own character, with specific methodologies applied. Air noise at a given receptor is characterised by a series of relatively loud individual noise events, between which there are periods of relative quiet. It can therefore be audible at large distances from the airport. Conversely ground noise at a given receptor is characterised by lower noise levels which have a longer duration and will vary less over time as it is often due to multiple activities occurring at the same time. It is typically only audible to those closer to the airport boundary.

For these reasons each of the noise sources are dealt with separately and it is not feasible to derive a cumulative noise impact for airport operations. Additionally, combining air and ground noise into a single assessment would have the potential to overlook potential significant effects that may arise for the quieter of the two sources.

13.6.3 Noise Modelling to Inform Vibration Effects

The number of dwellings exceeding the threshold for potential vibration effects due to airborne aircraft, based on experiencing noise levels of at least 97 dB L_{Cmax} at least once per 24 hour day, has been predicted for the 2022 and 2025 Relevant Action scenarios. The results are given in Table 13-55 where they are compared with the results for the Baseline scenarios.

Table 13-55: Number of dwellings exceeding threshold for potential vibration effects due to airborne aircraft, Baseline scenarios

Scenario	*No. dwellings exceeding threshold for potential vibration effects due to airborne aircraft*
2018 Baseline	4
2022 Baseline	0
2025 Baseline	0
2022 Relevant Action	0
2025 Relevant Action	0

In 2018, there were 4 dwellings which experienced noise levels in excess of 97 dB L_{Cmax} at least once per day. These are located to the south of Old Airport Road, near to the eastern end of the south runway. No dwellings exceed this threshold in any of the future scenarios. Therefore there are no significant vibration effects predicted.

13.7 Additional Mitigation Measures

13.7.1 Mitigation During Operation of Proposed Relevant Action

In addition to the mitigation measures already in place at Dublin Airport, as part of this application daa are proposing the following:

- An Annual Noise Quota (ANQ) system to replace the limit of 65 flights per night, as described in Chapter 2.
- A preferential runway use system (there is no proposed change to Condition 3a-c of North Runway Permission):
  - The parallel runways (10R-28L and 10L-28R) shall be used in preference to the cross runway, 16-34;
  - 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;
  - 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; and
  - Runway 10L-28R shall not be used for take-off or landing between 0000 hours and 0559 hours (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 or where Runway 10R-28L length is required for a specific aircraft type).
- A night noise insulation scheme.
- A detailed framework for monitoring the noise performance of Dublin Airport.

13.7.1.1 Night Noise Insulation Scheme

The proposed scheme will provide a grant of €20,000 to fund sound insulation improvement works, for dwellings meeting either of the following criteria:

- Forecast to be exposed to night-time noise levels of at least 55 dB L_{night} in the 2025 Relevant Action scenario, or
- Forecast to be exposed to noise levels greater than 50 dB L_{night} in the 2022 Relevant Action scenario, accompanied by an increase of at least 9 dB when compared to 2018.

Eligibility within the 55 dB L_{night} contour will be reviewed every 2 years with revised forecasts.

The proposed night insulation scheme is considered additional to the existing daytime noise insulation scheme currently provided in accordance with Condition 7 of North Runway planning permission.

13.7.1.2 Noise Monitoring Framework

It is proposed to implement a framework for monitoring the noise performance with respect to any Noise Abatement Objective (NAO) set by the Aircraft Noise Competent Authority (ANCA) in due course. Performance will be reported annually to ANCA, in compliance with the relevant sections of the Aircraft Noise (Dublin Airport) Regulation Act 2019.

Performance will be reported for the previous calendar year and for other forecast years depending on the measure (and outlined below), will include, but not be limited to, the following items:

- Effects of aircraft noise:
  - The number of people highly annoyed and highly sleep disturbed by aircraft noise to be calculated using the method set out in EU Directive 2020/367 and reported for the previous calendar year and forecast for 2025.
- Exposure to aircraft noise:
  - Aircraft noise contours and associated area, population and dwelling (and other noise sensitive properties) totals to be produced in 5 dB bands, from 45 dB to 75 dB Lden and 40dB to 70 dB Lnight. For the previous calendar year and forecast for 2025.
- Aircraft Source Noise Measures:
  - As part of the reporting for performance of the proposed Night Quota System, the number of movements and QC will be reported for the previous year and the next year. Annual totals of Air Transport Movements (ATMs) and Quota Count (QC) will be reported, with a breakdown for each of the QC bands (QC0, 0.125, 0.25, 0.5, 1, 2, 4, 8, 16). Data will be provided for the Night Quota Period (NQP, 23:30-06:00) and the Night Period (23:00-07:00).
- Operational Measures:
  - For the previous year calendar year, the number of arriving and departing aircraft and their associated QC totals using each runway during the periods 23:00-00:00, 00:00-06:00 and 06:00-06:59. This will be averaged to indicate "per night" equivalent values. This will also be provided for a monthly breakdown.
- Noise Insulation Scheme Reporting:
  - The number of dwellings eligible and the total grants administered under the proposed night noise insulation scheme to be reported each year.
- Community Noise Reporting:
  - In addition to the requirements for noise reporting specified in Condition 10 of the parent permission. Noise reports will be developed working with ANCA and the local communities to present an overall picture of the airport's operation and its effects which could include the information above.
  - In consultation with ANCA and local communities, daa will develop a community noise monitoring programme to report specific noise related outcomes from the airport operation.
  - daa will make available noise and flight track information to the local community.
  - The number and nature of noise complaints will be reported monthly and annually.

The historic data for the following metrics are proposed to be reported, for comparison with a baseline year of 2018 that was chosen by daa as part of the candidate NAO.

- The overall number of people exposed to noise >= 55dB L_{den}
- The overall number of people considered highly annoyed.
- The overall number of people exposed to noise >=40dB L_{night}
- The overall number of people considered highly sleep disturbed
- The Area of the contour outlining those exposed to significant levels of noise at night (>55dB L_{night}).

Throughout the reporting described above, where there is a comparison of population or effects with the equivalent for a baseline (e.g. 2018), the population dataset used for deriving the baseline figures will be used consistently for all calculation years.

13.8 Residual Effects

The commonly accepted metrics for assessing air noise all relate to external noise levels. Therefore the assessment of effects presented in Section 13.6 do not allow for any benefit of the residential sound insulation schemes, as this reduces the internal noise level. However, the internal noise level is more representative of the effects, in particular for night noise which is the main focus of this application as most people would be expected to be indoors.

Therefore in order to assess the residual effects, the benefit of the residential sound insulation schemes has been allowed for by considering a residual effective noise level for properties with sound insulation, being 5 dB(A) lower than the modelled noise level.

Dwellings eligible for the existing schemes in a given scenario have been considered here as having a reduction of 5 dB for both their L_{den} and the L_{night} exposure, on the basis that the existing schemes offer to insulate the whole property.

Dwellings not eligible for the existing schemes, but eligible for the new scheme proposed as part of this application, have been considered here as having a reduction of 5 dB for their L_{night} exposure, and a reduction of 5 dB for the night component of their L_{den} exposure, on the basis that the new scheme is intended to cover insulation of bedrooms.

The assumed 5 dB(A) reduction is based on testing carried out in a sample of the properties treated under the existing scheme which found that a reduction of at least 5 dB(A) in the internal noise level has been achieved.

This residual effective noise level has then been used to determine residual effects, following the same methodology as the assessment of effects in Section 13.6.

Allowing for the benefit of the residential sound insulation schemes in general reduces the number of people assessed with residual significant adverse effects and in some cases increases the number of people assessed with residual significant beneficial effects. This analysis does result in a couple of apparent anomalies:

- For some people who have benefitted from the existing insulation scheme, allowing for the insulation scheme reduces an assessed significant beneficial effect to a residual not significant beneficial effect. This is because at lower noise levels a larger change is required to be considered significant, although in practice the people still experience the same reduction in noise but from a lower initial level.
- For some people who would become eligible for the existing insulation scheme based on the noise levels forecast in the 2025 Consented scenario, allowing for the insulation scheme results in a residual significant adverse effect when comparing to the 2022 or 2025 Relevant Action scenarios, despite the external noise level being lower in the Relevant Action scenarios. as due to lower noise levels they are no longer forecast to be eligible for the insulation scheme.

13.8.1 Likely Significant Environmental Effects

The residual effects, after the benefit of the residential sound insulation schemes has been allowed for, are summarised in Table 13-56 and Table 13-57. These tables include all people in existing residential receptors who are exposed to at least 45 dB L_{den} or 40 dB L_{night} in at least one of the scenarios.

Table 13-56: Summary of Residual Air Noise Effects, 2022 Relevant Action

Baseline Scenario	*L_{den} Residual Effects*			*L_{night} Residual Effects*		
	Significant Beneficial	Significant Adverse	Not Significant	Significant Beneficial	Significant Adverse	Not Significant
2018 Baseline	24,223	8,432	711,257	10,436	1,474	317,933
2022 Baseline	1,886	10	467,564	1,039	11,709	181,876
2025 Consented	14,155	116	792,858	7,028	3,152	253,077

Table 13-57: Summary of Residual Air Noise Effects, 2025 Relevant Action

Baseline Scenario	L_{den} Residual Effects			L_{night} Residual Effects		
	Significant Beneficial	Significant Adverse	Not Significant	Significant Beneficial	Significant Adverse	Not Significant
2018 Baseline	24,699	7,949	709,163	10,485	1,483	318,476
2025 Baseline	2,110	10	457,802	1,125	11,756	182,451
2025 Consented	14,154	119	792,856	7,180	3,172	253,316

Considering the year of opening of the North Runway, 2022, the residual effects of the Relevant Action scenario when compared to the 2018 Baseline are that some people experience significant beneficial effects, and others experience significant adverse effects. The overall result is a net significant beneficial effect for 15,791 people in terms of the L_{den} metric, and a net significant beneficial effect for 8,962 people in terms of the L_{night} metric. If instead comparing with the 2022 Baseline, there is a net significant beneficial effect for 1,876 people in terms of the L_{den} metric and a net significant adverse effect for 10,670 people in terms of the L_{night} metric. Finally, if comparing to the 2025 Consented scenario, there is a net significant beneficial effect for 14,039 people in terms of the L_{den} metric, and a net significant beneficial effect for 3,876 people in terms of the L_{night} metric.

Considering the likely worst-case future year, 2025, the residual effects when compared to the 2018 Baseline are that some people experience significant beneficial effects, and others experience significant adverse effects. The overall result is a net significant beneficial effect for 16,750 people in terms of the L_{den} metric and a net significant beneficial effect for 9,002 people in terms of the L_{night} metric. If instead comparing with the 2025 Baseline, there is a net significant beneficial effect for 2,100 people in terms of the L_{den} metric and a net significant adverse effect for 10,631 people in terms of the L_{night} metric. Finally, if comparing to the 2025 Consented scenario, there is a net significant beneficial effect for 14,035 people in terms of the L_{den} metric, and a net significant beneficial effect for 4,008 people in terms of the L_{night} metric.

While the 2022 Baseline scenario represents the current forecast for the future operation of a Dublin Airport with the North Runway operational and the current conditions in place, this has significantly lower impacts than what was forecast when the North Runway Permission was granted, i.e. the 2025 Consented scenario. The 2018 Baseline is expected to be broadly representative of the expected conditions immediately prior to the opening of the North Runway, i.e. what is permitted without the North Runway. It is currently forecast that by 2022, passenger throughput will have recovered to around 94% of the 2018 level, and aircraft movements to around 98% of the 2018 level, if the restrictions attached to the North Runway Permission have not come into force.

Using a similar method to calculate the residual effects, the residual noise levels assessed as high or very high can be calculated. These are presented in Table 13-58.

Table 13-58: Summary of People Exposed to High Residual Noise Levels

Scenario	No. People Exposed to High or Very High Residual L_{den} Noise Level	No. People Exposed to High or Very High Residual L_{night} Noise Level
2018 Baseline	44	548
2022 Baseline	26	82
2025 Baseline	23	76
2025 Consented	89	203

2022 Relevant Action	32	62
2025 Relevant Action	32	62

Considering the L_{den} results, the number of people exposed to a high residual noise level is under 100 in all scenarios. The number of people so exposed in the Relevant Action scenarios is lower than in the 2018 Baseline or 2025 Consented scenarios, but higher than in the 2022 or 2025 Baseline scenarios.

Considering the L_{night} results, the number of people exposed to a high residual noise level is under 100 in most scenarios, with the exceptions being the 2018 Baseline and 2025 Consented scenarios. The number of people so exposed in the Relevant Action scenarios is lower than in any of the other scenarios, due to the proposed new sound insulation scheme.

13.9 Summary

The assessment in this chapter presents the likely significant effects from air noise and vibration from aircraft as a result of the proposed Relevant Action.

Taking first the vibration assessment, no significant effects were found as a result of the Relevant Action.

Considering the air noise, this chapter has considered future forecast scenarios for the selected years of 2022 and 2025, and has compared the situation with the Relevant Action with three situations, that in 2018 (2018 Baseline), that in the corresponding future year with the North Runway operational and the current conditions in place (2022 or 2025 Baseline), and the consented situation that was forecast for 2025 as part of the North Runway planning process in 2004-2007 (2025 Consented). The latter situation is included to provide as illustration of the how aircraft technology and noise levels have improved over the years at a greater rate than forecast in 2004-2007.

Two primary assessment metrics have been considered, one relating to the overall situation (L_{den}) and the other just to the situation at night (L_{night}). For each of these metrics the number of people exposed to various noise levels have been determined for each assessment scenario. From these the number of people predicted to be highly annoyed and the number predicted to be highly sleep disturbed have been computed.

An assessment of significant effects has also been carried out for the comparison with each of the three situations described above. This takes into account the change in noise level for individual receptors and their resulting noise exposure.

Looking at the predicted number of people highly annoyed, in 2022 with the Relevant Action this is 6% higher than the 2022 Baseline scenario, but 37% lower than the 2018 Baseline and 45% lower than the 2025 Consented scenario. In 2025 with the Relevant Action it is predicted to be 7% higher than the 2025 Baseline scenario, but 39% lower than the 2018 Baseline and 46% lower than the 2025 Consented scenario.

Looking at the predicted number of people highly sleep disturbed, in 2022 with the Relevant Action this is 24% higher than the 2022 Baseline scenario, but 42% lower than the 2018 Baseline and 27% lower than the 2025 Consented scenario. In 2025 with the Relevant Action it is predicted to be 26% higher than the 2025 Baseline scenario, but 42% lower than the 2018 Baseline and 26% lower than the 2025 Consented scenario.

Looking at the number of people with significant residual effects after the proposed mitigation measures, firstly considering the overall situation (L_{den} metric), in 2022 or 2025 with the Relevant Action there is a forecast net beneficial effect when compared with the corresponding 2022 or 2025 Baseline scenarios. Comparison with the 2018 Baseline or 2025 Consented scenarios leads to a larger assessed net beneficial effect. Considering the night situation (L_{night} metric), in 2022 or 2025 with the Relevant Action there is a forecast net adverse effect when compared with the corresponding 2022 or 2025 Baseline scenarios. However comparison with the 2018 Baseline or 2025 Consented scenarios leads to an assessed net beneficial effect.

Finally looking at non-residential receptors, no significant effects were found as a result of the Relevant Action.

Chapter 14: Ground Noise and Vibration

14

14. Ground Noise and Vibration

14.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) reports the findings of an assessment of the likely significant effects from ground noise as a result of the proposed Relevant Action, which is described in Chapter 2.

This assessment and EIAR chapter have been produced by Bickerdike Allen Partners LLP.

Ground noise specifically encompasses noise associated with aircraft on the ground at Dublin Airport. This excludes any start of roll or reverse thrust activities, which are considered to be part of the air noise and covered in Chapter 13. In particular the key aircraft ground operations are aircraft taxiing and aircraft using Auxiliary Power Units (APUs) when on stands.

Aircraft ground activities do not typically produce any significant vibration effects at sensitive receptors outside of the airport site, and therefore the assessment of vibration due to aircraft ground operations has been scoped out of the EIA.

Road traffic noise effects have not been assessed for this application, as the Relevant Action is not forecast to cause any significant changes to the road traffic flows in the vicinity of the airport, either when considering the 24-hour period or the night period (23:00 to 07:00). The changes to road traffic flows are discussed in more detail in Chapter 9.

This chapter has considered future forecast scenarios for the selected years of 2022, when the North Runway is scheduled to open, and 2025, the first subsequent year when 32 mppa is expected to be reached; 2025 is therefore expected to constitute a worst case scenario for this Relevant Action application.

For each of the two selected years, this chapter has compared the scenario with the Relevant Action, referred to as the "2022 Relevant Action" and "2025 Relevant Action" scenarios, with two situations:

- The actual situation in 2018, referred to in this chapter as "2018 Baseline".
- The forecast situation in the corresponding future year, with the North Runway operational and the current conditions in place, referred to in this chapter as the "2022 Baseline" and "2025 Baseline" scenarios.

Consideration has also been given to the cumulative effects of a separate planning application which has been submitted to the planning authority that seeks to develop an area in the north east of the airport site, known as Apron 5H, which will result in 10 aircraft stands being located there. The future "Relevant Action" scenarios have been assessed separately with this change also in place. These are referred to in this chapter as the "2022 Apron 5H" and "2025 Apron 5H" scenarios.

14.1.1 Summary of the Proposed Relevant Action

The relevant noise related operating restrictions which currently apply to the North Runway Permission are as follows:

- No use of the North Runway at night (23:00 to 07:00). This is provided for in Condition 3d of the North Runway Permission.
- The Crosswind Runway can be only used for essential purposes. This is provided for in Condition 4 of the North Runway Permission.
- A limit on the number of aircraft movements at the airport at night (23:00 to 07:00) to 65/night. This is provided for in Condition 5 of the North Runway Permission.

The proposed Relevant Action is to remove Condition 5 of the North Runway Permission and to replace it with an annual night-time noise quota between 23:30 and 06:00, and also to amend Condition 3d to allow flights to take off from and/or land on the North Runway for an additional 2 hours i.e. 23:00 to 00:00 and 06:00 to 07:00, with the permitted operation in these 2 additional hours being the same as during the daytime hours when the North Runway is already permitted to be used. Overall, this would allow for an increase in the number of flights taking off and/or landing at Dublin Airport between 23:00 and 07:00.

No change is proposed to the overall permitted passenger capacity of the terminals at Dublin Airport, which is limited to 32 million passengers per annum (mppa), nor is there any proposed change to the permitted operation of the runway system during daytime hours (Option 7b).

14.1.1.1 Option 7b – Conditions 3(a) to 3(c) of the North Runway Permission

The Relevant Action does not alter Conditions 3(a) to (c) of North Runway Permission which which together describe the preferred runway concept put forward in the original North Runway planning process of 2004-2007, known as Option 7b:

> *On completion of construction of the runway hereby permitted, the runways at the airport shall be operated in accordance with 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 and shall provide 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*

In summary Option 7b provides that the arrivals from the east and departures to the east shall prefer to use the South Runway. Arrivals from the west and departures to the west can use the North Runway or South Runway as determined by air traffic control.

In practice it is expected that air traffic control will prefer to use one runway for arrivals and the other for departures, subject to capacity constraints, and therefore most of the time the North Runway will be preferred for departures to the west and the South Runway will be preferred for arrivals from the west. This is however sensitive to the precise timing of flights, particularly in the busy early morning period of 06:00-08:00, so there is potential for departures off both runways in this period.

14.2 Legislation and Planning Policy Context

The Environmental Impact Assessment (EIA) process is described in Chapter 1 of this EIAR. This notes that the EIA requirements derive from Council Directive 85/337/EEC and sets out the EIA regulations and EPA guidelines that were considered by AECOM in preparing this EIAR.

Chapter 6 of this EIAR sets out the legislative and planning policy context for the proposed Relevant Action. It includes reference to relevant national and local planning policies, including those that have been considered when determining the EIAR scope, method and mitigation. Those considered relevant to this chapter are summarised below with additional material also considered relevant. More detail on this additional material, and selected policies included in Chapter 6, are given in Appendix 14A.

14.2.1 Strategic Planning Context

daa has a number of obligations to fulfil with regard to the management of Dublin Airport. These and the overall framework the airport operates under are set out in the following:

- Section 23(1) of the Air Navigation and Transport (Amendment) Act 1998
- S.I. No 549/2018 – Environmental Noise Regulations 2018 (Government of Ireland (2018)
- Aircraft Noise (Dublin Airport) Regulations Act, 2019 (Government of Ireland, 2019)

The last of these implements EU Regulation 598/2014 (EC, 2014) on the establishment of rules and procedures with regard to the introduction of noise related operating restrictions at European Union Airports within the ICAO Balanced Approach (ICAO, 2010). Further details of this regulation, and the two listed above are contained in Appendix 14A.

14.2.2 National Planning Policy

The following national planning policy is considered relevant to this assessment.

- A National Aviation Policy for Ireland (2015) (DTTS, 2015)
- Project Ireland 2040 – National Planning Framework (2018) (Government of Ireland, 2018)

14.2.3 Local Planning Policy

The following local planning policy is considered relevant to this assessment.

- Fingal Development Plan 2017-2023 (FCC, 2017)
- Dublin Airport Local Area Plan (2020) (FCC, 2020)
- Noise Action Plan for Dublin Airport (2019-2023) (FCC, 2019)

14.2.4 Relevant UK Policy, Standards and Guidance

The following UK policies, standards and guidance documents are considered relevant to this assessment. More detail is given in Appendix 14A.

- National Planning Policy Framework (NPPF, 2020)
- Noise Policy Statement for England (2010) (DEFRA, 2010)
- National Planning Practice Guidance (DEFRA, 2019)
- UK Aviation Policy Framework (2013) (DfT, 2013)
- BS 8233:2014 Sound insulation and noise reduction in buildings – code of practice (BS, 2014)
- Department of Education - Acoustic design of schools: performance standards BB93 (2015)
- Department of Health - Specialist Services, Health Technical Memorandum 08-01: Acoustics (2013)
- CAP1616a Airspace Change: Environmental requirements technical annex (Civil Aviation Authority, 2020)
- BS7445 Description and measurement of environmental noise (BS, 2003)

14.2.5 Other International Policy, Standards and Guidance

The following other international policies, standards and guidance documents are considered relevant to this assessment. More detail is given in Appendix 14A.

- ICAO Convention on International Civil Aviation, Annex 16, Volume 1 (ICAO, 2014)
- Environmental Noise Directive 2002/49/EC (EC, 2002)
- WHO Guidelines for community noise (1999) (Berglund, B. *et al,* 1999)
- WHO Night Noise Guidelines for Europe (2009) (WHO, 2009)
- WHO Environmental Noise Guidelines for the European Region (2018) (WHO, 2018)
- ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (IOS, 1996)

14.3 Assessment Methodology

This section of this EIAR chapter describes the approach to the assessment of the ground noise effects, covering the following:

- Information sources that have been consulted throughout the preparation of this chapter;
- The methodology behind the assessment of ground noise effects, including the criteria for the determination of sensitivity of receptor and magnitude of change from the existing of 'baseline' condition;

- An explanation as to how the identification and assessment of potential ground noise effects has been reached; and
- The significance criteria and terminology for the assessment of ground noise residual effects.

Key sources of information that have been utilised for this assessment are as follows:

- The physical location of the airport, in particular the runways, taxiways and stands;
- The number of flights in each relevant assessment period, including their aircraft type, operation, and destination. This has been supplied by daa for both actual (e.g. 2018) and forecast scenarios (forecasts were prepared by Mott Macdonald).

14.3.1 Ground Noise Modelling Methodology

The assessment of ground noise relies heavily on the modelling of noise levels. This has been carried out using the CadnaA noise modelling software produced by Datakustik. This industry standard software model uses the methodology set out in ISO 9613-2:1996 (ISO, 1996). This software is used to produce noise contours and to predict noise levels at specific locations. Details of the modelling methodology are given in Appendix 14B.

The aircraft movements assessed as part of the ground noise assessment include the ground operations associated with all aircraft taking off from or landing at Dublin Airport, with the exception of helicopter and military aircraft. Operations by helicopter and military aircraft make up a very small proportion of the total and are not able to be assessed to the same level of accuracy. For example, in 2018 there were 820 operations by helicopters and 2 operations by military aircraft, making up 0.4% of the annual total of aircraft movements. As a result, their inclusion would have a negligible effect on the findings of this assessment.

14.3.2 Primary Assessment Metrics

There are various noise metrics available for the assessment of the impacts of ground noise. These are described in detail in Appendix 14A.

The noise produced by aircraft when on the ground at airports has historically been assessed using different metrics and criteria depending on the application. It is however common for ground noise at busy airports such as Dublin Airport to be assessed using a metric based on L_{Aeq}, i.e. one that averages the noise energy over a defined time period, which accounts for both the number, duration and noise level of the aircraft ground activities over a typical day. Adopted ground noise thresholds are typically not dissimilar from those used for air noise, and therefore the metrics used here mirror those that have been used for the air noise assessment:

- L_{den}, which takes into account the annual activity throughout the 24-hour period, with a 5 dB penalty applied to noise in the evening (19:00-23:00) period and a 10 dB penalty applied to noise in the night (23:00-07:00) period. The key effect linked with this metric is annoyance.
- L_{night}, which takes into account the annual activity during the night (23:00-07:00) period. The key effect linked with this metric is sleep disturbance.

14.3.3 Supplementary Noise Metrics

Particularly in other jurisdictions such as the UK, ground noise is often assessed in terms of the $L_{Aeq,16h}$ metric for the daytime (07:00-23:00) period and the $L_{Aeq,8h}$ metric for the night-time (23:00-07:00) period. These periods relate to an average summer day. Summer in this instance is defined as the 92-day period between 16 June and 15 September inclusive. Noise contours and population assessments have also been carried out using these metrics.

Compared to noise produced by airborne aircraft, ground noise is typically characterised by steady noise levels at a lower level, but with a longer duration. As a result, for air noise it is common to utilise a number of supplementary metrics in order to fully describe the nature of air noise and its effects on the community. For ground noise, the metrics based on L_{Aeq} are considered sufficient as single events are not typically a concern.

The exception to this is when high power engine testing is carried out. 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, only during daytime hours and is only permitted at a designated location, away from populated neighbouring areas. The noise from engine testing is considered negligible in the context of the overall airport ground noise.

14.3.4 Methodology for Determining Baseline Conditions and Sensitive Receptors

The extents of the study area are contained within a rectangle that extends approximately 3.5 km to the west, 5 km to the east, 4.5 km to the north and 3 km to the south of the centre of the existing main runway at Dublin Airport. The study area contains all receptors exposed to ground noise levels of at least 50 dB L_{den} or 45 dB L_{night}. This includes all of the receptors that experience potential significant effects. Although significant effects can in theory be found down to 45 dB L_{den} and 40 dB L_{night}, the change in noise level required for this finding was not experienced at any of the assessed receptors.

The baseline considers the situation prior to the Relevant Action, for which information for the actual situation in 2018 has been provided. It also considers the forecast situation in the future years of 2022 and 2025, with the North Runway operational and the current conditions in place.

The following have been considered as potential receptors of high sensitivity for this assessment:

- Dwellings;
- Schools;
- Residential healthcare facilities and
- Places of worship.

Receptors with a lower sensitivity to noise, such as offices and hotels, have not been considered as part of this assessment.

The assessment of dwellings includes an allowance for those which are consented but not yet constructed. These have been presented separately to the totals for existing dwellings.

14.3.5 Methodology for Determining Construction Effects

As the proposed Relevant Action will result in no changes to the design or construction of the North Runway, the proposed Relevant Action will not cause any construction noise impacts related to the proposed Relevant Action.

14.3.6 Methodology for Determining Operational Effects

The Regulation 598 assessment considered a number of different options for the use of the runway system at night. The resulting chosen option, presented in this chapter as the "Relevant Action" scenario, involves the preferred runway concept used in the daytime (07:00 to 23:00), known as Option 7b, being used in the night periods of 23:00 to 00:00 and 06:00 to 07:00. The limit of 65 flights per night (23:00 to 07:00) is also removed.

The effects of the Relevant Action are determined by comparing this scenario with the baseline for 2018 and the future baseline for the relevant year with the current conditions in place. Based on the number of flights in the forecast, the expectation is that in the "Relevant Action" scenarios which are based on Option 7b, all departures in the periods of 23:00 to 00:00 and 06:00 to 07:00 will use the North Runway for westerly operations, and the South Runway for Easterly operations, with arrivals using the opposite runway.

Consideration has also been given to the cumulative effects of a separate planning application which has been submitted to the planning authority that seeks to develop an area in the north east of the airport site, known as Apron 5H, which will result in 10 aircraft stands being located there. That application, if successful, would not result in any change to the number of aircraft operations, but would re-distribute some of them to the Apron 5H stands. In general this would result in a small increase in noise levels for receptors to the north of the airport and a small decrease for receptors to the south. The future "Relevant Action" scenarios have been assessed separately with this change also in place. These are known as the "Apron 5H" scenarios.

The following future years have been assessed:

- 2022 – the year the North Runway is expected to open; and
- 2025 – the first year following the opening of the North Runway when a throughput of 32 mppa is expected to be reached.

The assessment in this chapter considers 2022 and 2025. These represent the year of opening, and the likely worst-case future year. After 2025, the noise impacts are expected to remain similar, but reduce slightly if the