

Noise monitoring report

JANUARY – JUNE

2019

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Executive summary

This noise monitoring report is drafted for the period January - June 2019. This report consists of three parts: introduction to this report, general statistics related to the operations at Dublin Airport, and noise monitoring statistics per noise terminal. This executive summary lists brief numbers related to the noise performance of Dublin Airport, these can be found in Table 1 and Table 2. In Table 1 the number of events at noise monitoring terminals (NMTs) which are directly overflowed are listed. These events are correlated aircraft noise events, they are coupled with a specific arriving or departing aircraft overflying the NMT. Table 2 shows in summary the average measured noise levels for the first half year period of 2019 for all operational NMTs. As one may expect, NMTs directly overflowed by aircraft using the main runway (NMTs 1, 2, and 20) have higher measured noise levels that can be identified as relating to aircraft noise. While at other NMTs other noise sources are more prevalent.

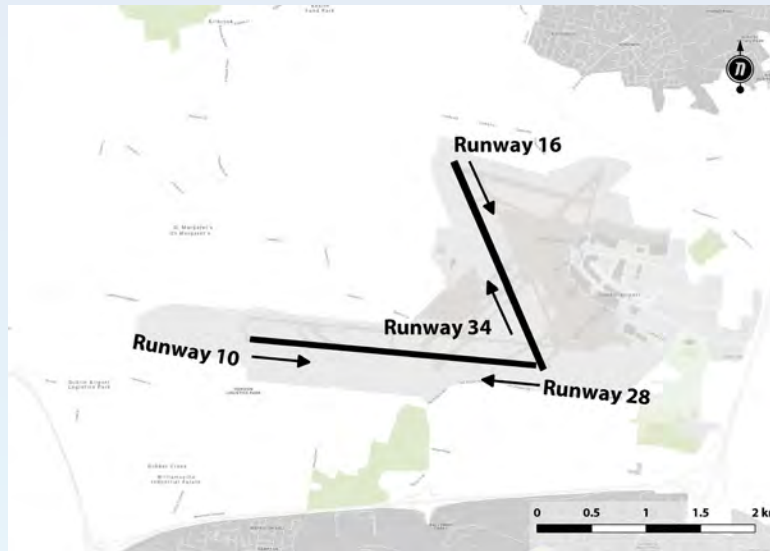


Figure 1: Runway layout Dublin Airport

Table 1: Correlated aircraft noise events

NMT	Number of correlated aircraft noise events			
	Description	Arrivals	Departures	Total
1	Arrivals Runway 10, Departures Runway 28	9 318	26 727	36 045
2	Arrivals Runway 28, Departures Runway 10	39 766	13 030	52 796
5	Arrivals Runway 16, Departures Runway 34	347	1 214	1 561
6	Arrivals Runway 34, Departures Runway 16	111	120	231
20	Arrivals Runway 28, Departures Runway 10	37 307	10 869	48 176

Table 2: Average measured noise levels

NMT	Daytime noise level, $L_{Aeq, 16h}$ [dB]		Nighttime noise level, $L_{Aeq, 8h}$ [dB]	
	Total	Aircraft	Total	Aircraft
1	73.9	64.2	63.6	56.9
2	61.6	60.5	56.5	55.2
4	56.3	44.4	53.2	38.2
5	56.0	48.8	55.7	51.6
6	62.2	45.8	60.2	47.5
20	63.5	58.7	59.5	53.2

Introduction

This half yearly report, commissioned by Dublin Airport, presents a summary of the noise performance near Dublin Airport, for the period from January 1st to June 30th 2019.

To monitor aircraft noise levels and flight tracks near Dublin Airport, a Noise and Flight Track Monitoring System (NFTMS) is in place. This system, produced by Brüel & Kjær, is composed of a series of Noise Monitoring Terminals (NMTs) which are installed in the area around the airport. In total, there are eight NMTs including one mobile unit:

- Bay Lane (NMT 1 : monitoring runway 28 departures and runway 10 arrivals);
- St. Doolaghs (NMT 2 : monitoring runway 10 departures and runway 28 arrivals);
- Bishopswood (NMT 3 : monitoring local area);
- Feltrim (NMT 4 : monitoring local area);
- Balcultry (NMT 5 : monitoring runway 34 departures and runway 16 arrivals);
- Artane (NMT 6 : monitoring runway 16 departures and runway 34 arrivals);
- Coast Road (NMT 20 : monitoring runway 10 departures and runway 28 arrivals);
- Mobile NMT (NMT 22: mobile monitoring terminal, its location varies around the airport).

This report presents the results of the measurements in the period from the start of January to the end of June 2019 for all NMT locations, with the exception of NMT 3, NMT 21 and NMT 22. The report does not include NMT 3 as at the time of writing, a review of this NMT location was ongoing. NMT21 was taken out of service as its function was to monitor high powered engine test runs at Engine Test Run Site 1. This site has now been decommissioned. NMT 22 is not within this report as its location varies. The other NMT locations are shown in Figure 2. General statistics of flight operations of Dublin Airport in the first half of 2019 are provided in the General Statistics section. Results specific to the measurements obtained at the various monitoring stations are presented in the Noise Monitoring Statistics section.



Figure 2: Noise Monitoring Terminal locations

General Statistics

Traffic

In the first half of 2019, Dublin Airport handled a total of 115,834 flights and 15.5 million passengers. This is an increase of 4% in traffic and an increase of 5.4% in passenger numbers compared to the same period in 2018. Note that the number of movements includes both departures and arrivals. Figure 3, gives an hourly distribution of the movements for the first six months of 2019, compared to the hourly distribution of the same period in 2018.

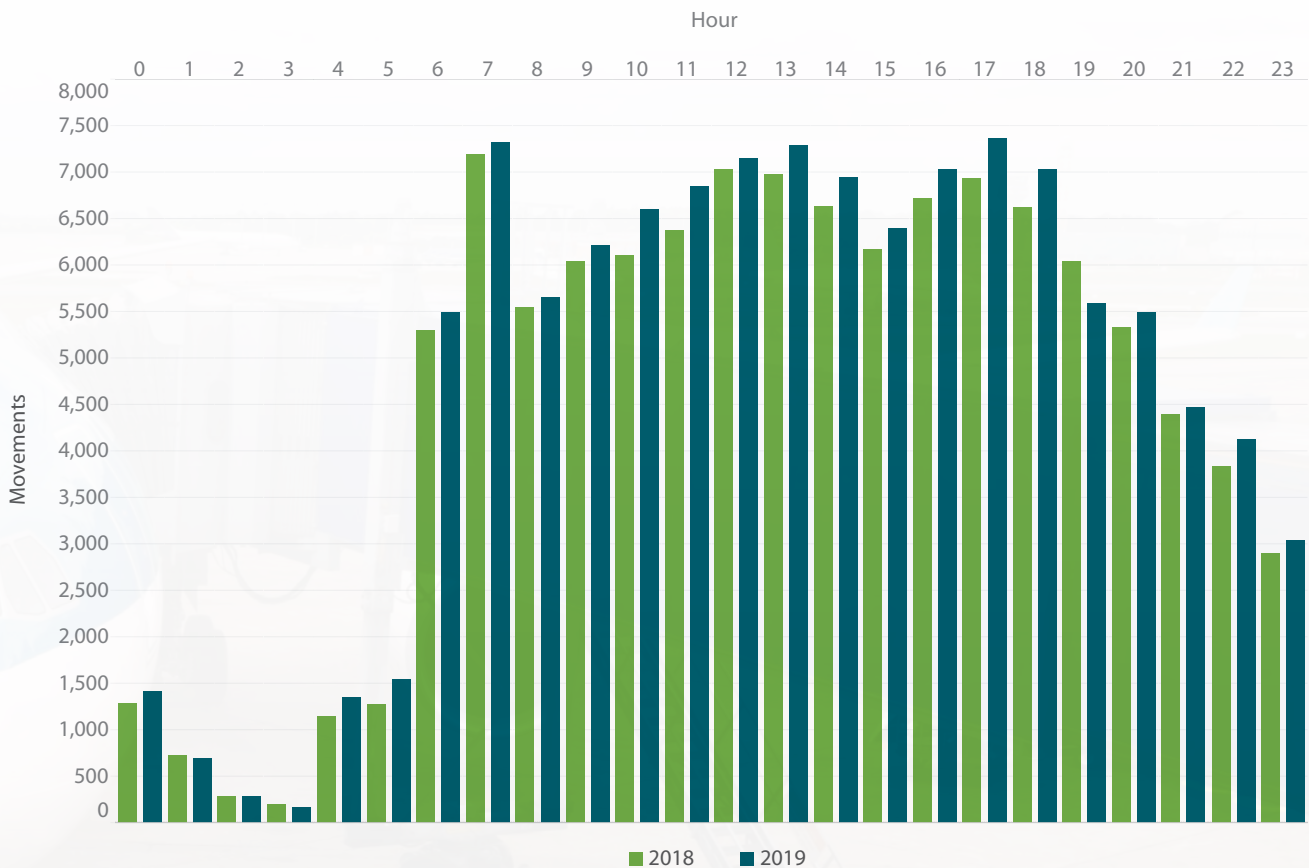


Figure 3: Hourly distribution of movements from January – June 2018 vs. 2019

Dublin Airport hosts a wide variety of aircraft, ranging from turboprop aircraft such as the ATR and Dash-8 to wide body jets like the Boeing 777. However, the majority of movements were performed using medium sized jets, with the Boeing 737 and Airbus A320 series aircraft accounting for more than 69% of the total. Figure 4 provides a more detailed overview of aircraft types. The aircraft types are divided into the categories: A/B and C/D. Table 3 on the next page list typical aircraft types belonging to these categories.

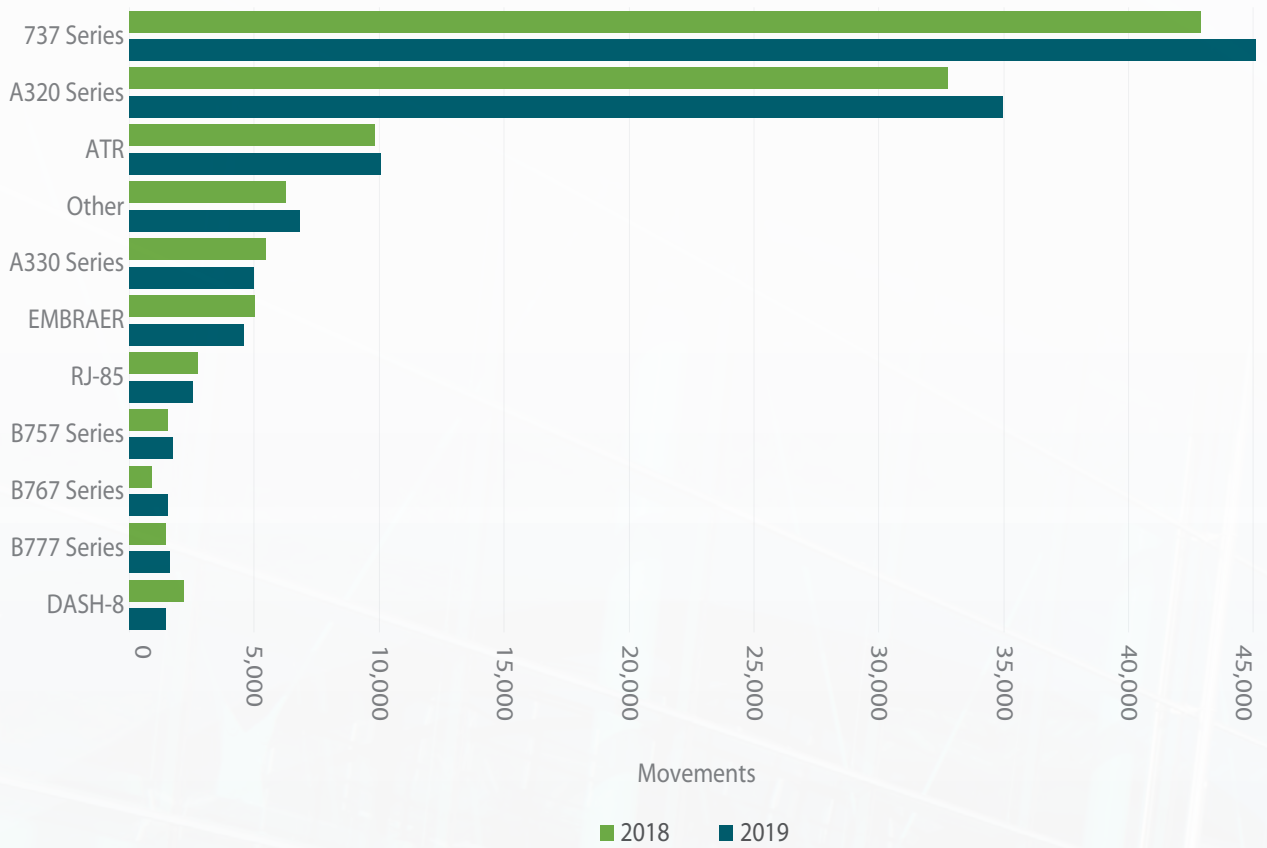


Figure 4: Aircraft type distribution January – June 2018 vs. 2019

Table 3: Aircraft type classification

Aircraft category	Aircraft type:
A/B	Propellor aircraft
	Turboprop aircraft
	Whisperjets (aircraft like BAe-146 and Avro-Jet)
	Mostly small general aviation aircraft powered by piston engines
C/D	Airbus
	Boeing
	Bombardier Canadair Regional Jet (CRJ) - Series
	Business jets
	Embraer

Track adherence

There are four environmental corridors at Dublin airport, one for every runway direction. For the first half of 2019, 99.3% of the aircraft stayed within these corridors. This is a 0.2% decrease in track adherence from the same period in 2018.

Runway use and weather

Figure 5 shows that Runway 28, the runway for aircraft landing and departing in the westerly direction, handled 72.1% of all movements in the period January to June 2019 versus 60.6% in same period in 2018. Runway 10, the runway for aircraft landing and departing in the easterly direction, was used for 25.9% of the movements in the period January to June 2019 versus 33.8% in 2018. The remaining percentage of the movements in 2019 and 2018 took place on the cross runway 16/34.

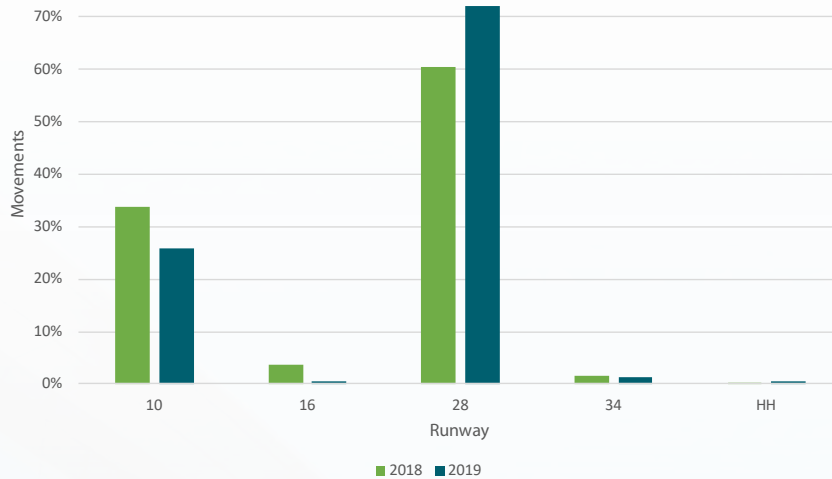


Figure 5: Runway usage, January - June 2018 vs. 2019

Overflying height analysis

The measured sound levels depends on the height at which the NMT is overflowed. Generally, higher overflying altitudes result in lower recorded sound levels. For NMT's, which are directly overflowed, the average overflying height is shown in Table 4 below for the first half of 2018 and 2019. In which A and D stands for arrivals and departures respectively.

Table 4: Average overflying height

	Height [ft]									
	NMT1		NMT2		NMT5		NMT6		NMT20	
	A	D	A	D	A	D	A	D	A	D
2018	900	2,600	1,000	2,600	1,100	2,800	1,100	3,100	1,500	3,400
2019	900	2,600	1,000	2,600	1,100	2,800	1,200	2,800	1,500	3,400

Noise Monitoring Statistics



Reading guide

The noise values presented in this report are values based on measurements, these values will differ from noise contours produced by computer modelling and are not directly comparable. Noise contours produced by computer modelling are typically based on an average summer or annual day and include all aircraft movements rather than just those which produce a correlated noise event.

The measured noise values are obtained from Noise Monitoring Terminals (NMTs). A new Noise and Flight Track Monitoring System (NFTMS) with all new NMTs, provided by Brüel & Kjær, has been commissioned by daa as of 2017 to monitor the noise performance of Dublin Airport.

These NMTs are set to record continuously and to trigger a noise event when two conditions are met. The first condition is the threshold level. The threshold level needs to be exceeded before recording is initiated. The threshold levels are continuously adjusted by Brüel & Kjær to ensure maximum correlation between noise and individual operations. The second condition is the length of the recorded noise event. The recorded noise event should last for at least 10 seconds. Due to its proximity to agricultural, roads, and/or urban areas, NMTs can be triggered not just by aviation noise. It is for this reason the system is designed to correlate a noise event with an aircraft departing or landing. Similarly, the system can detect when the noise originates from a weather event, such as thunder or other stormy conditions.

Noise measurements are classified in three categories: aircraft, community, and weather. The community category, or normal human activity, includes all noise events that are not categorised as aircraft or weather. Therefore, when total noise is mentioned, this includes all three noise categories.

Noise levels calculation methodology

For all correlated aircraft event the duration and measures the noise level of the event are logged by the noise monitoring system and converted to $L_{Aeq, 1 h}$. This is the sound level, in decibels, equivalent to the total A-weighted sound energy of one hour. Average noise levels, for a reference duration, are derived from $L_{Aeq, 1 h}$. The four noise levels are used in this report are:

- $L_{Aeq, 16 h}$ average daytime noise levels:
The $L_{Aeq, 16 h}$ is determined by averaging the aircraft noise levels per month between 07:00 and 23:00, hence 16 hour;
- $L_{Aeq, 8 h}$ average nighttime noise levels:
The $L_{Aeq, 8 h}$ is determined by averaging the aircraft noise levels per month between 23:00 and 07:00, hence 8 hour equivalent;
- L_{Aeq} average hourly noise levels:
Same methodology applies for L_{Aeq} compared to $L_{Aeq, 16 h}$ and $L_{Aeq, 8 h}$, instead an average is taken per hour over a half year period instead of per month;
- $L_{A,MAX}$:
 $L_{A,MAX}$ indicates the maximum recorded noise level per correlated aircraft-noise event, while the average noise levels indicates the average noise levels for a reference duration;
- $L_{A,MAX}$ distribution:
This distribution is calculated by determining the number of occurrences per 3 dB bracket, since every 3 dB increase is doubling in sound level.

NMT 1: Bay Lane

Noise Monitoring Terminal 1 ('Bay Lane') is located west of Dublin Airport, see Figure 6 below, under the extended runway centerline of runway 28. Its purpose is to monitor runway 28 departures and runway 10 arrivals. The resulting data for NMT 1 measurements in the period from January 1st up to and including June 30th 2019 are presented in this section.



Figure 6: Noise Monitoring Terminal Bay Lane Location

Noise Events

The results are presented in Figure 7. 37,433 registered noise events were attributable to aircraft noise (66.7%). These noise events include both correlated and uncorrelated aircraft noise events. Correlated aircraft noise events are coupled with a specific arriving or departing aircraft overflying the NMT, while uncorrelated aircraft noise events are not.

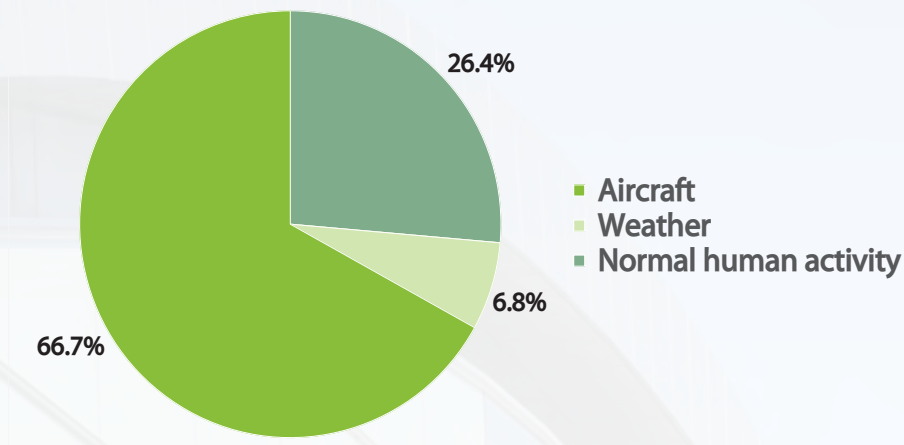


Figure 7: NMT 1 Noise Event Types

NMT Operational Status

To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this period, the NMTs are out of operation for short periods of time and do not record noise events. The operational status of NMT 1: Bay Lane is presented in Figure 8.

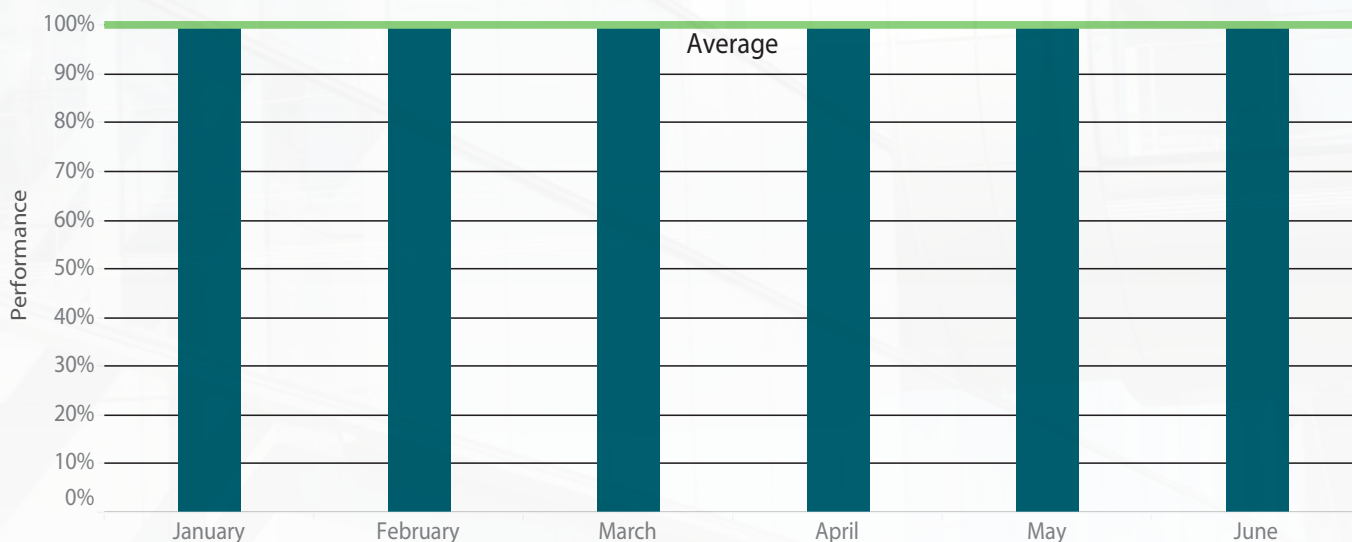


Figure 8: Operational status of NMT 1, January – June 2019

Noise Levels

Figure 9 presents the average noise levels measured at NMT 1 during daytime periods, which are defined to be from 07:00 in the morning to 22:59 in the evening. Recorded noise levels during these time segments are therefore averaged over a 16-hour window.

This procedure is followed both for all noise events, and for those events that were correlated to aircraft movements. The results shown are presented monthly.

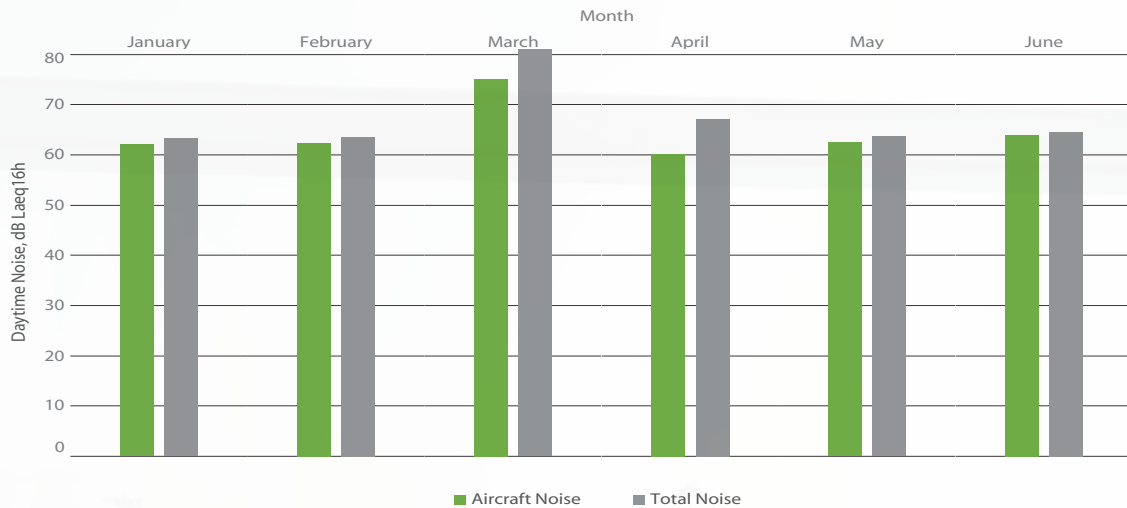


Figure 9: Averaged daytime noise levels for NMT 1, January – June 2019

Noise levels during the night are determined using a similar method. The night period is defined as a period between 23:00 in the evening to 06:59 in the morning. Noise levels are therefore averaged over an 8-hour window. Figure 10 presents these results monthly.

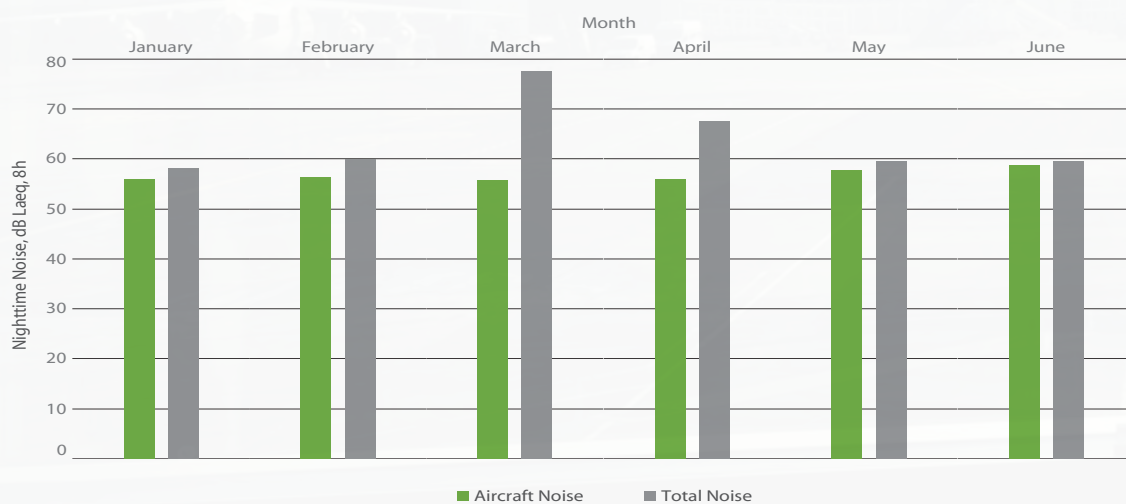


Figure 10: Averaged nighttime noise levels for NMT 1, January – June 2019

The hourly noise distribution at NMT 1 as shown in Figure 11.

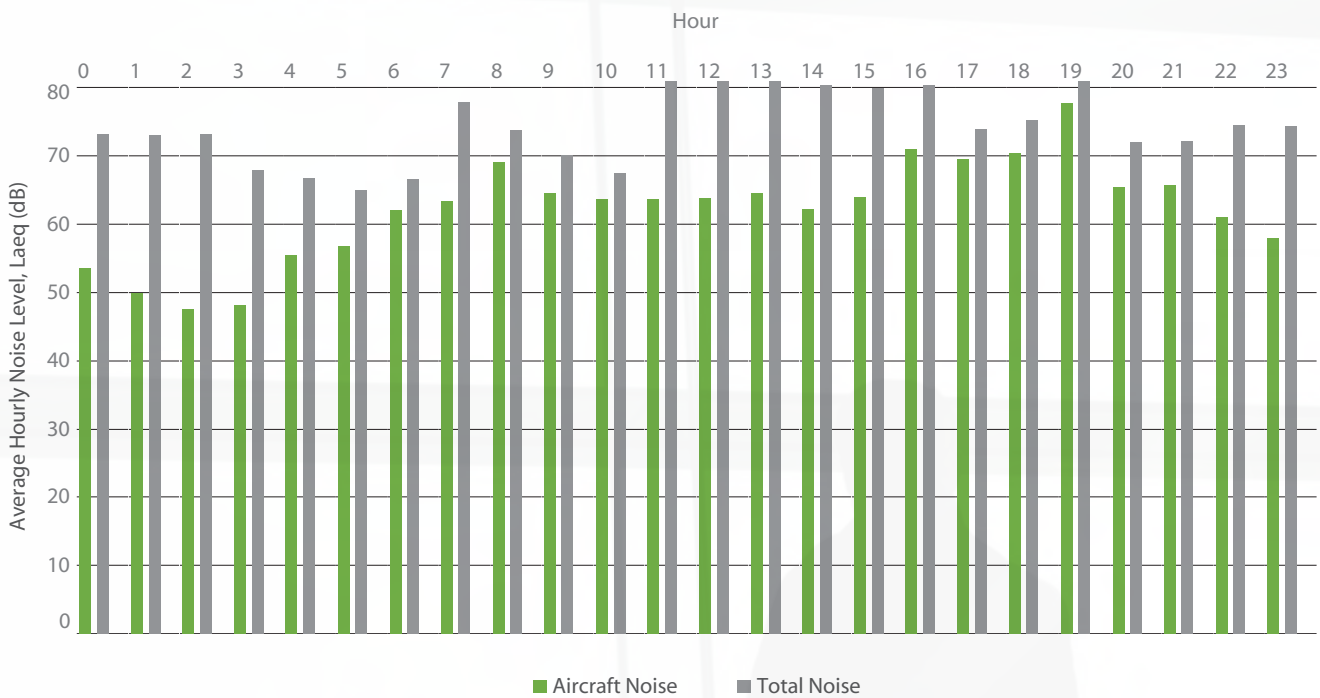


Figure 11: Averaged hourly noise levels for NMT 1, January – June 2019

Figure 12 shows the $L_{A,MAX}$ distribution, for aircraft noise, for the first half year of 2019 for NMT 1.

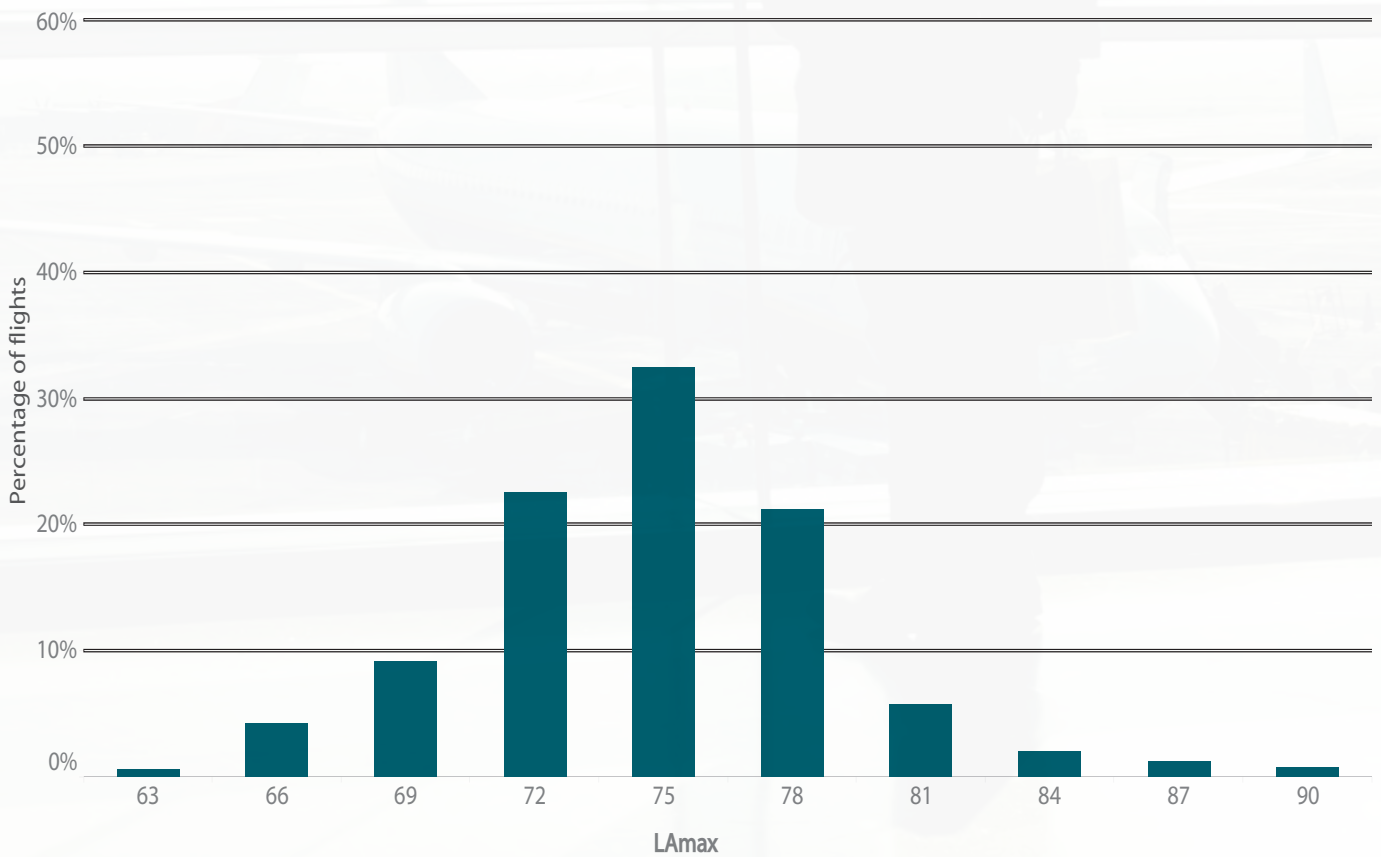


Figure 12: $L_{A,MAX}$ levels distribution for NMT 1, January – June 2019

NMT 2: St. Doolaghs

Noise Monitoring Terminal 2 ('St. Doolaghs') is located east of Dublin Airport, see Figure 13 below, under the extended runway centerline of runway 10. Its purpose is to monitor runway 10 departures and runway 28 arrivals. The resulting data for NMT 2 measurements in the period from January 1st up to and including June 30th 2019 are presented in this section.

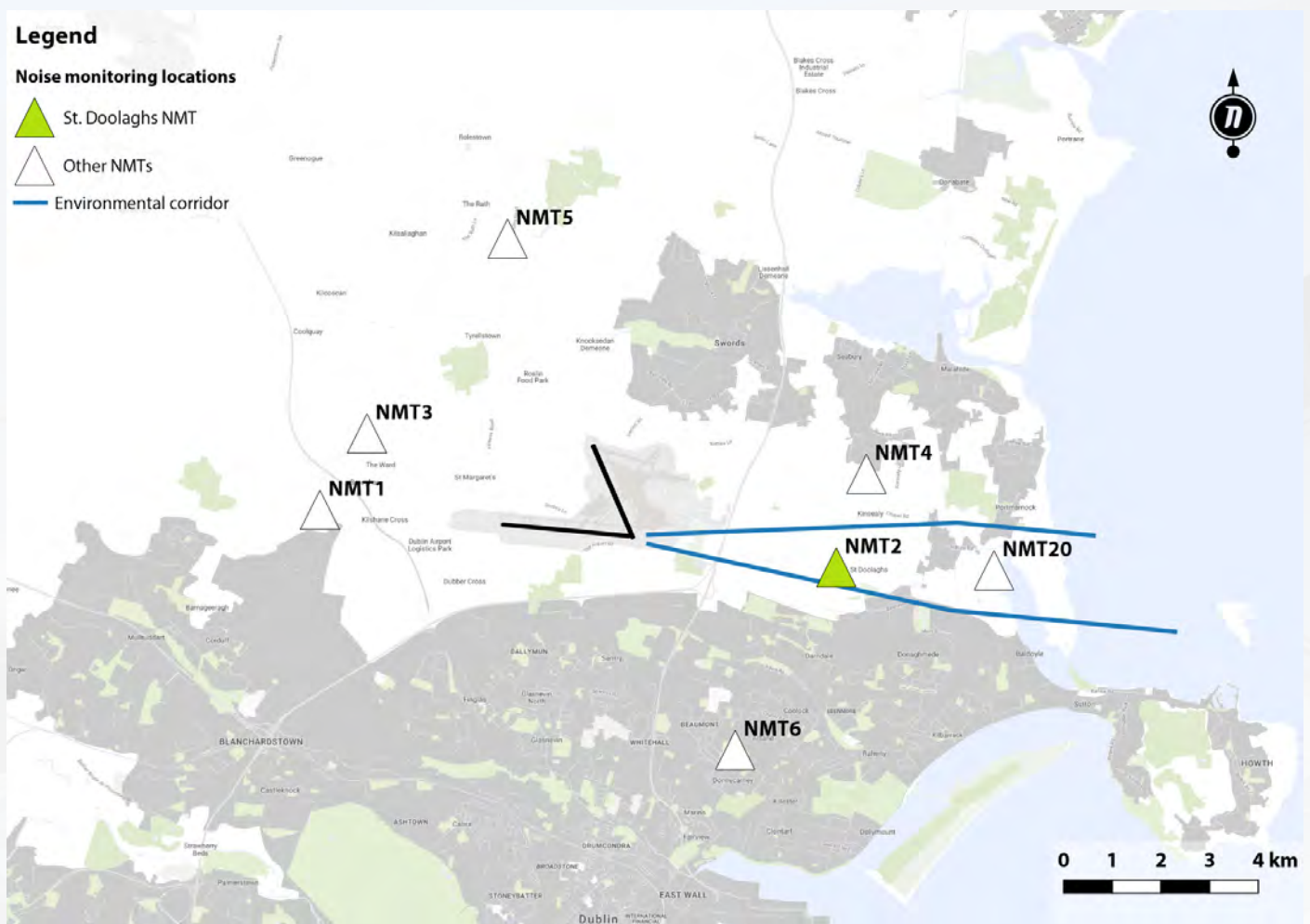


Figure 13: Noise Monitoring Terminal St. Doolaghs Location

Noise Events

The results are presented in Figure 14. 52,916 registered noise events were attributable to aircraft noise (90.1%). These noise events include both correlated and uncorrelated aircraft noise events. Correlated aircraft noise events are coupled with a specific arriving or departing aircraft overflying the NMT, while uncorrelated aircraft noise events are not.

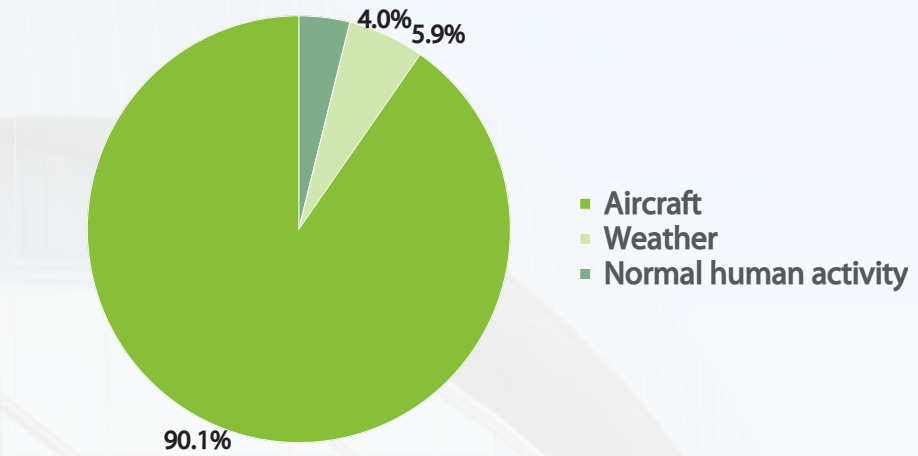


Figure 14: NMT 2 Noise Event Types

NMT Operational Status

To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this period, the NMTs are out of operation for short periods of time and do not record noise events. The operational status of NMT 2: St. Doolaghs is presented in Figure 15.

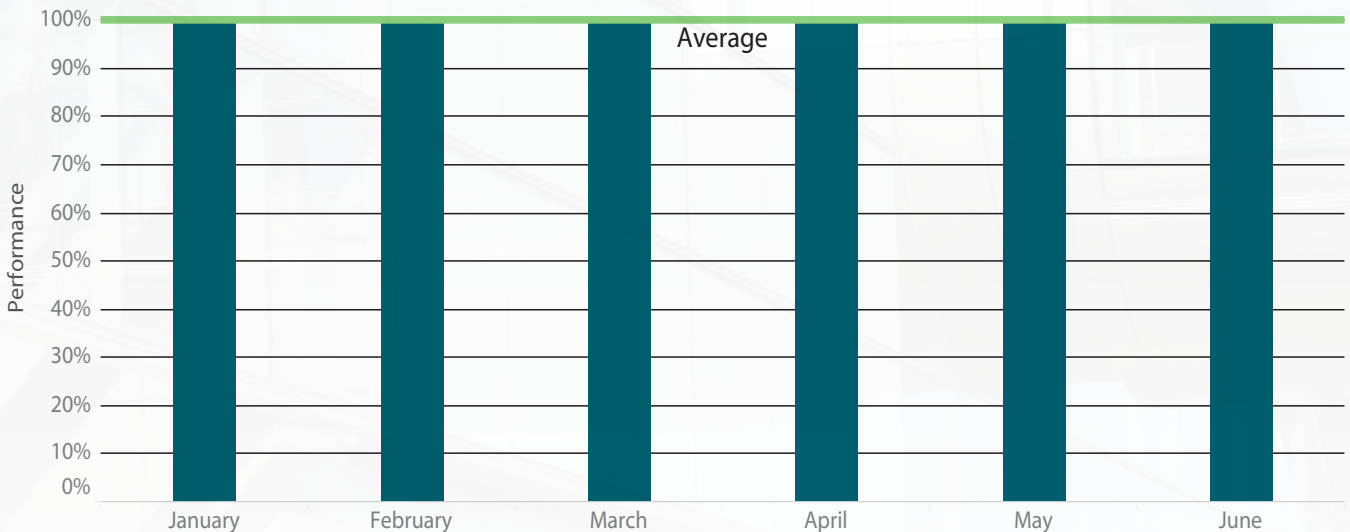


Figure 15: Operational status of NMT 2, January – June 2019

Noise Levels

Figure 16 presents the average noise levels measured at NMT 2 during daytime periods, which are defined to be from 07:00 in the morning to 22:59 in the evening. Recorded noise levels during these time segments are therefore averaged over a 16-hour window.

This procedure is followed both for all noise events, and for those events that were correlated to aircraft movements. The results shown are presented monthly.

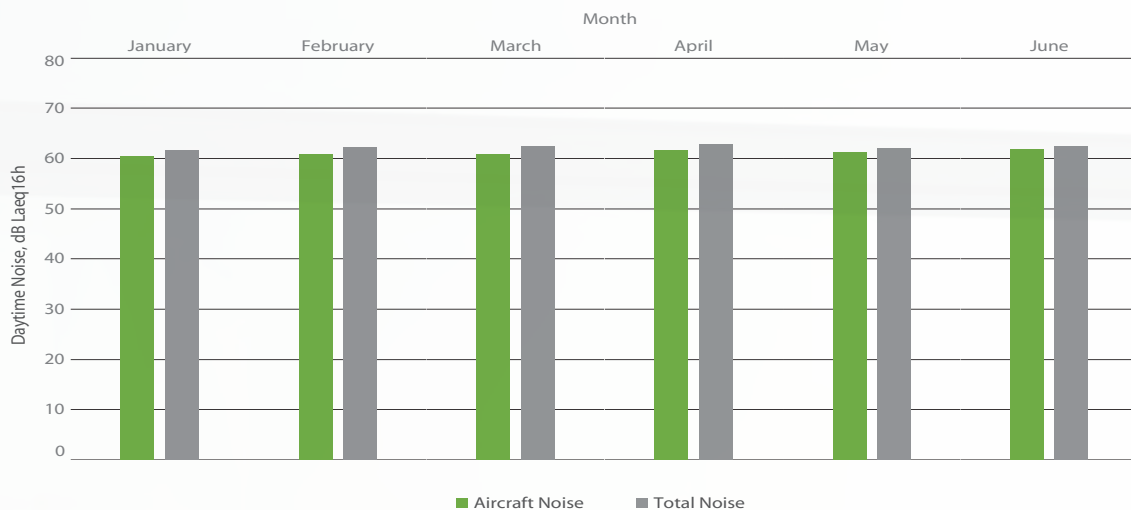


Figure 16: Averaged daytime noise levels for NMT 2, January – June 2019

Noise levels during the night are determined using a similar method. The night period is defined as a period between 23:00 in the evening to 06:59 in the morning. Noise levels are therefore averaged over an 8-hour window. Figure 17 presents these results monthly.

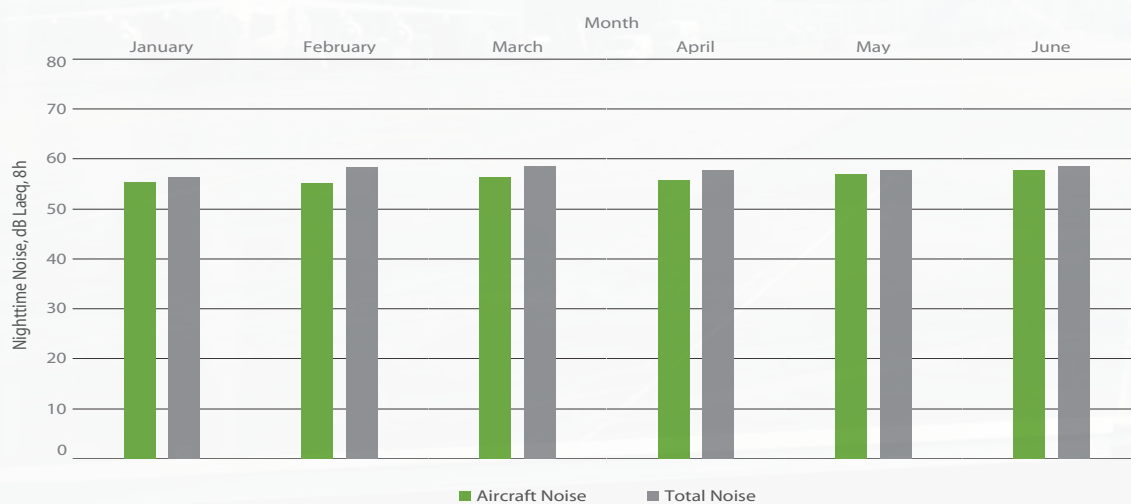


Figure 17: Averaged nighttime noise levels for NMT 2, January – June 2019

The hourly noise distribution at NMT 2 as shown in Figure 18.

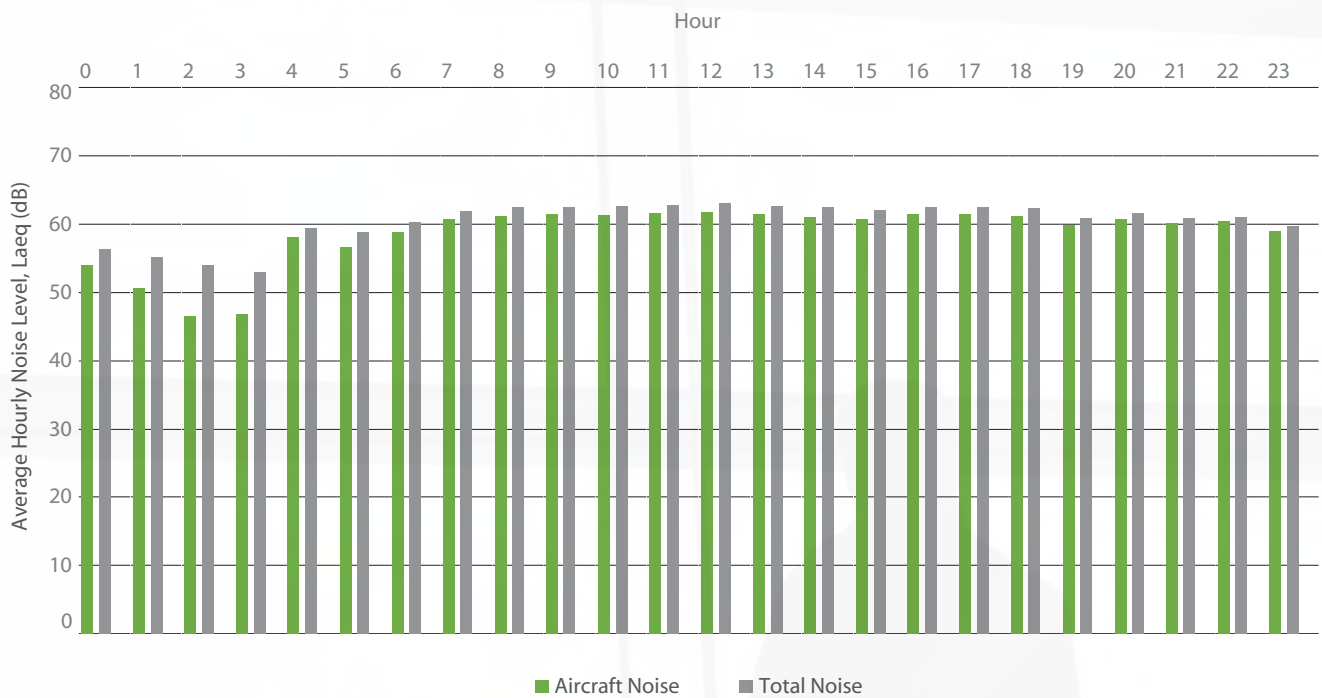


Figure 18: Averaged hourly noise levels for NMT 2, January – June 2019

Figure 19 shows the $L_{A,MAX}$ distribution, for aircraft noise, for the first half year of 2019 for NMT 2.

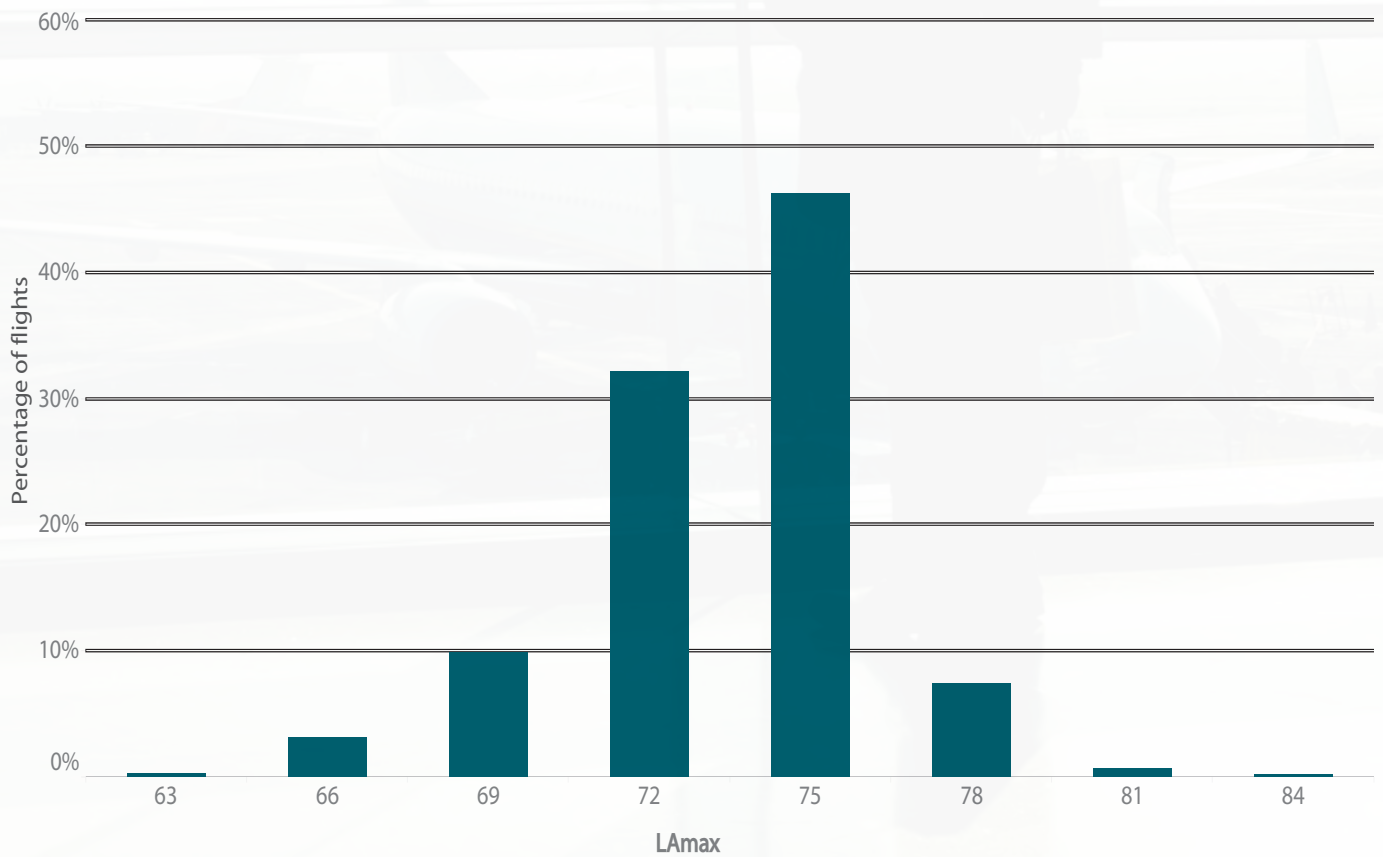


Figure 19: $L_{A,MAX}$ levels distribution for NMT 2, January – June 2019

NMT 4: Feltrim

Noise Monitoring Terminal 4 ('Feltrim') is located east of Dublin Airport and north of the flight path of runway 10/28, see Figure 20 below, and monitors the local area. The resulting data for NMT 4 measurements in the period from January 1st up to and including June 30th 2019 are presented in this section.



Figure 20: Noise Monitoring Terminal Feltrim Location

Noise Events

The results are presented in Figure 21. 7,306 registered noise events were attributable to aircraft noise (45.8%). These noise events include only uncorrelated aircraft noise events, since NMT 4 is not directly overflown.

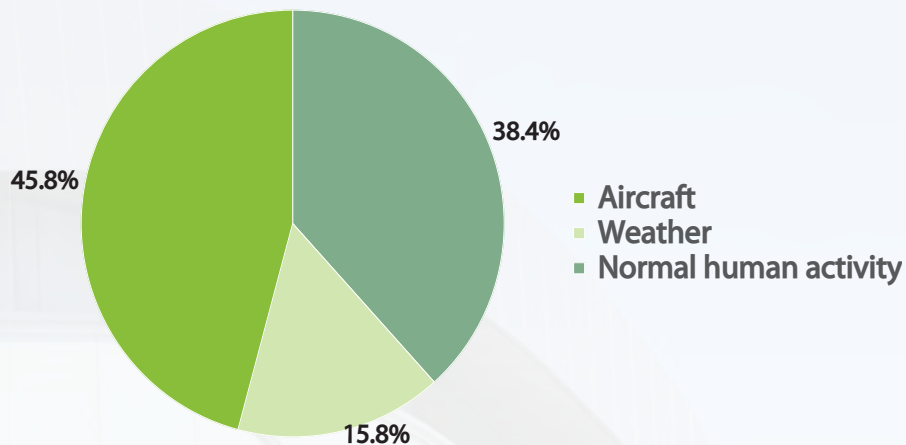


Figure 21: NMT 4 Noise Event Types

NMT Operational Status

To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this period, the NMTs are out of operation for short periods of time and do not record noise events. The operational status of NMT 4: Feltrim is presented in Figure 22.

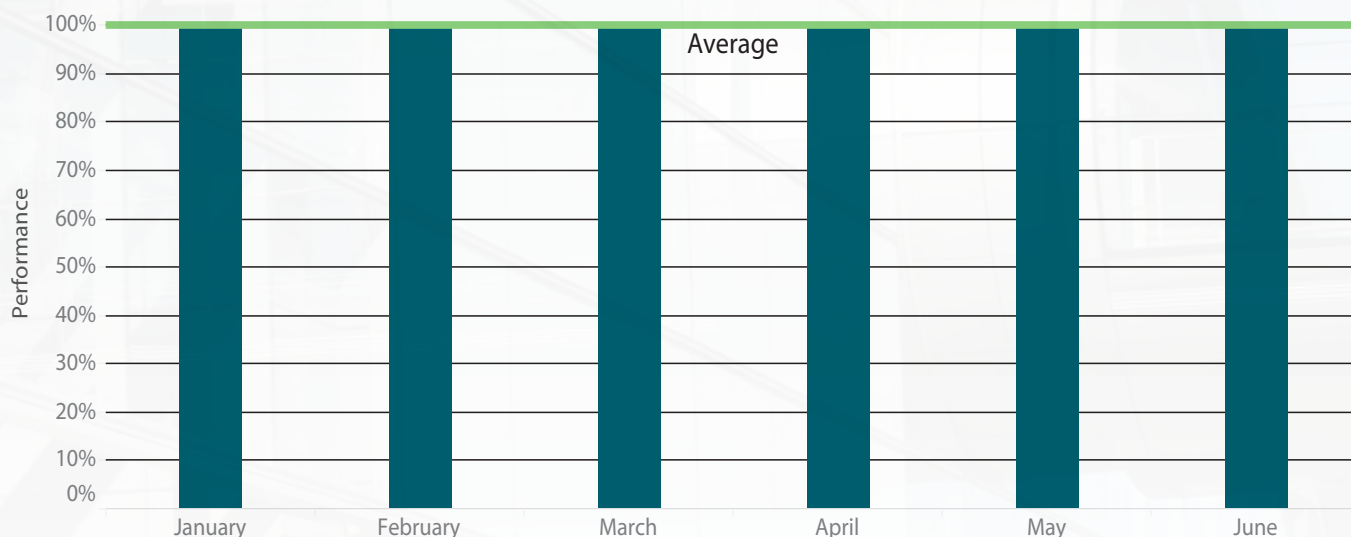


Figure 22: Operational status of NMT 4, January – June 2019

Noise Levels

Figure 23 presents the average noise levels measured at NMT 4 during daytime periods, which are defined to be from 07:00 in the morning to 22:59 in the evening. Recorded noise levels during these time segments are therefore averaged over a 16-hour window.

This procedure is followed both for all noise events, and for those events that were correlated to aircraft movements. The results shown are presented monthly.

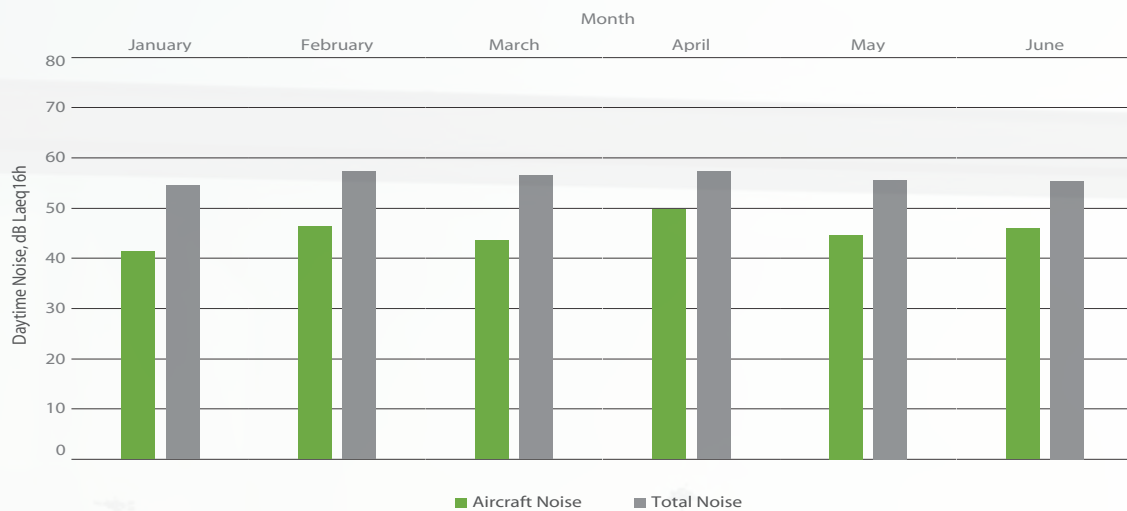


Figure 23: Averaged daytime noise levels for NMT 4, January – June 2019

Noise levels during the night are determined using a similar method. The night period is defined as a period between 23:00 in the evening to 06:59 in the morning. Noise levels are therefore averaged over an 8-hour window. Figure 24 presents these results monthly.

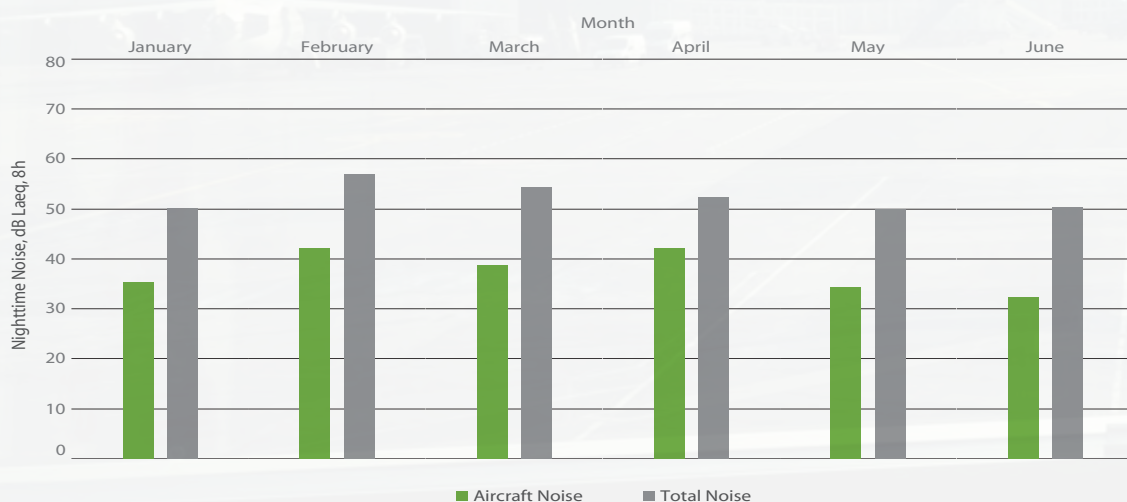


Figure 24: Averaged nighttime noise levels for NMT 4, January – June 2019

The hourly noise distribution at NMT 4 as shown in Figure 25.

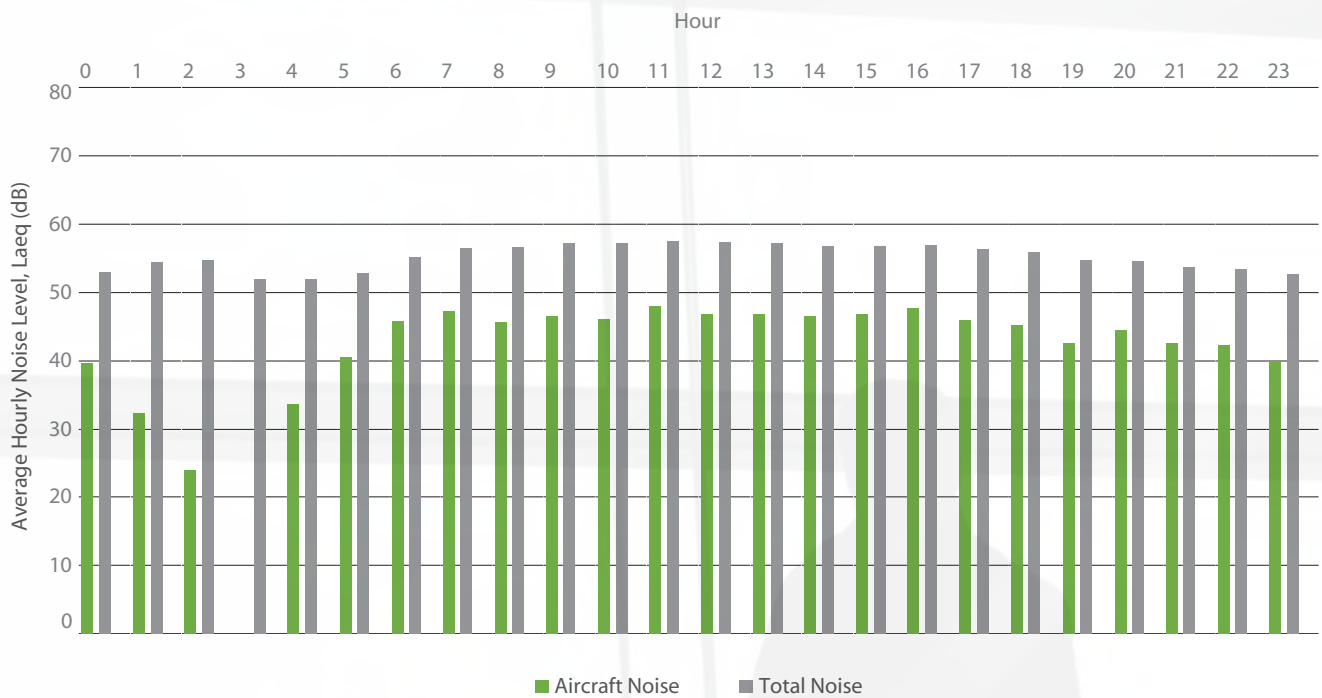


Figure 25: Averaged hourly noise levels for NMT 4, January – June 2019

Figure 26 shows the $L_{A,MAX}$ distribution, for aircraft noise, for the first half year of 2019 for NMT 4.

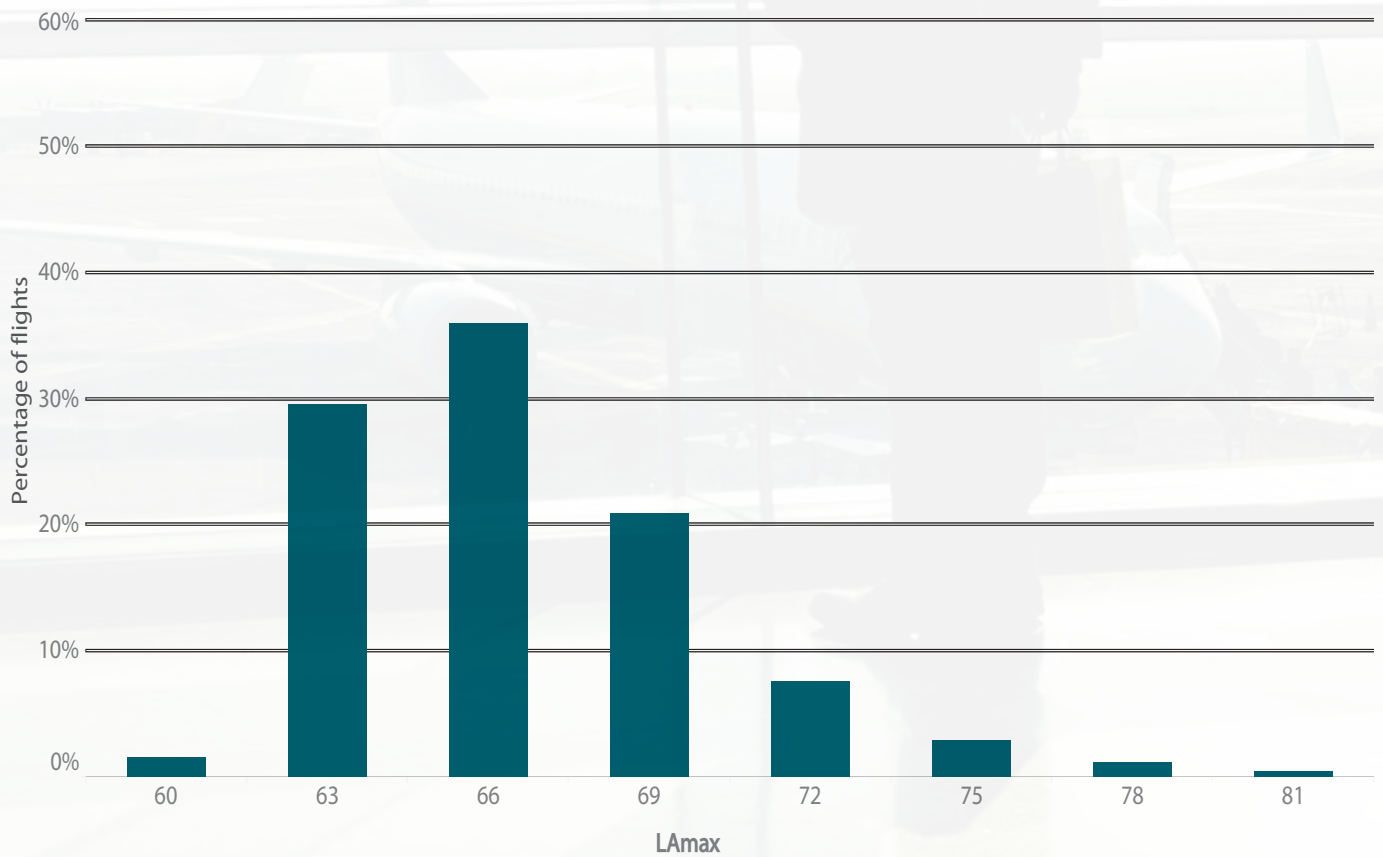


Figure 26: $L_{A,MAX}$ levels distribution for NMT 4, January – June 2019

NMT 5: Balcultry

Noise Monitoring Terminal 5 ('Balcultry') is located northwest of Dublin Airport, see Figure 27 below, under the extended runway centerline of runway 34. Its purpose is to monitor runway 34 departures and runway 16 arrivals. The resulting data for NMT 5 measurements in the period from January 1st up to and including June 30th 2019 are presented in this section.

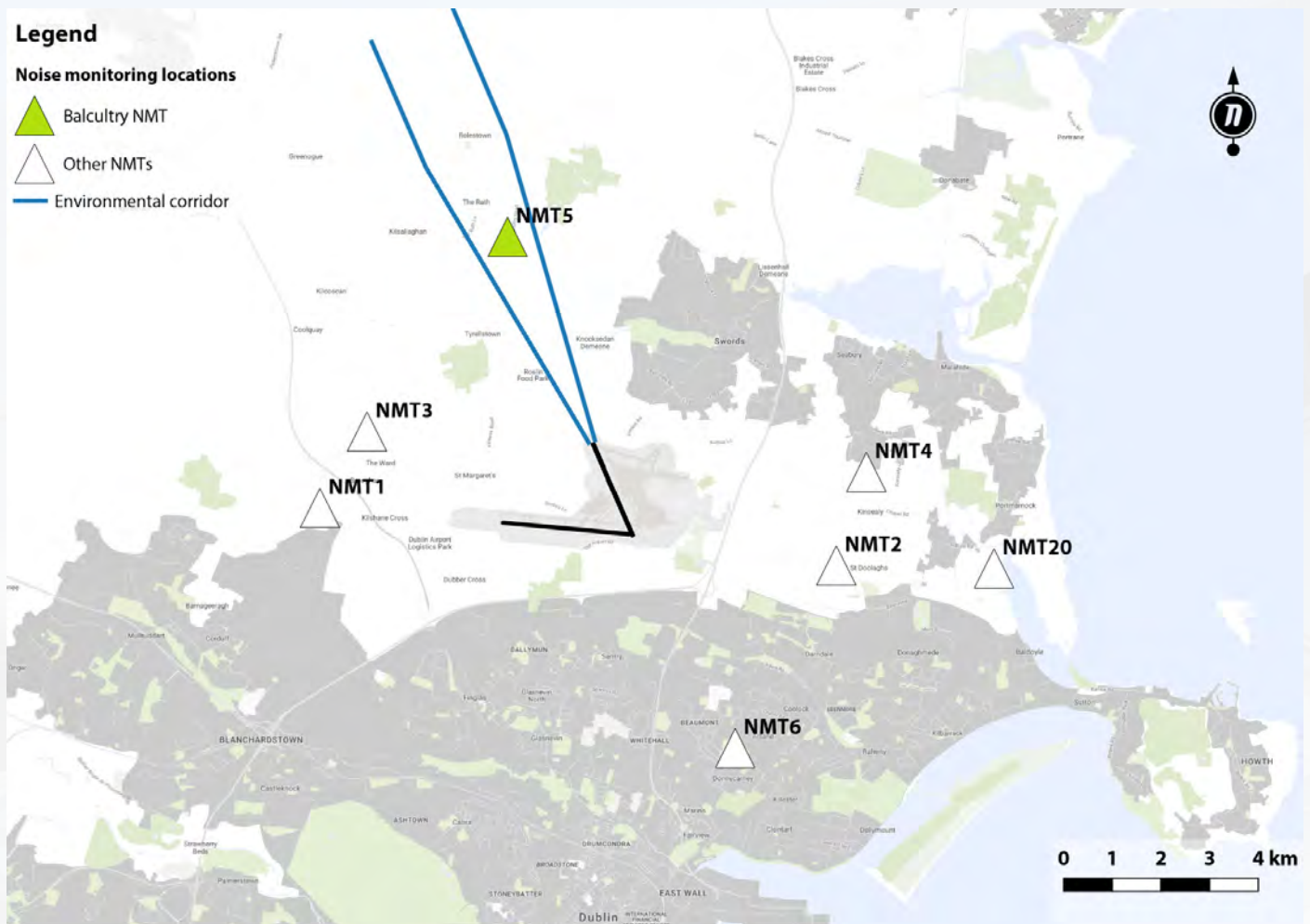


Figure 27: Noise Monitoring Terminal Balcultry Location

Noise Events

The results are presented in Figure 28. 2,100 registered noise events were attributable to aircraft noise (19.9%). These noise events include both correlated and uncorrelated aircraft noise events. Correlated aircraft noise events are coupled with a specific arriving or departing aircraft overflying the NMT, while uncorrelated aircraft noise events are not.

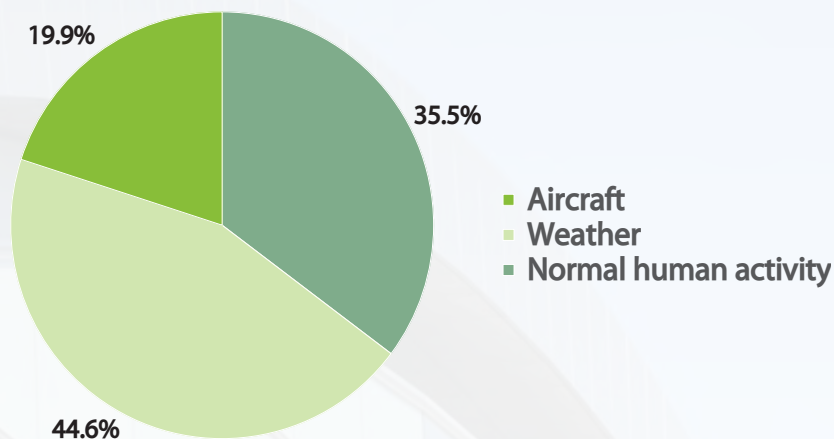


Figure 28: NMT 5 Noise Event Types

NMT Operational Status

To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this period, the NMTs are out of operation for short periods of time and do not record noise events. The operational status of NMT 5: Balcultry is presented in Figure 29.

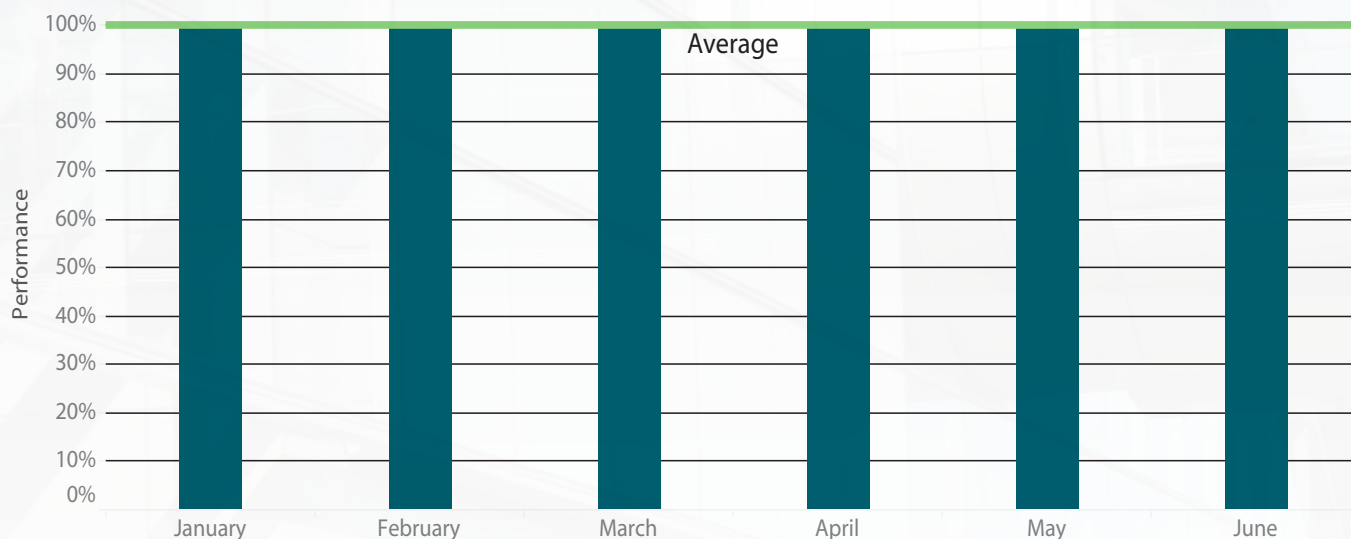


Figure 29: Operational status of NMT 5, January – June 2019

Noise Levels

Figure 30 presents the average noise levels measured at NMT 5 during daytime periods, which are defined to be from 07:00 in the morning to 22:59 in the evening. Recorded noise levels during these time segments are therefore averaged over a 16-hour window.

This procedure is followed both for all noise events, and for those events that were correlated to aircraft movements. The results shown are presented monthly.

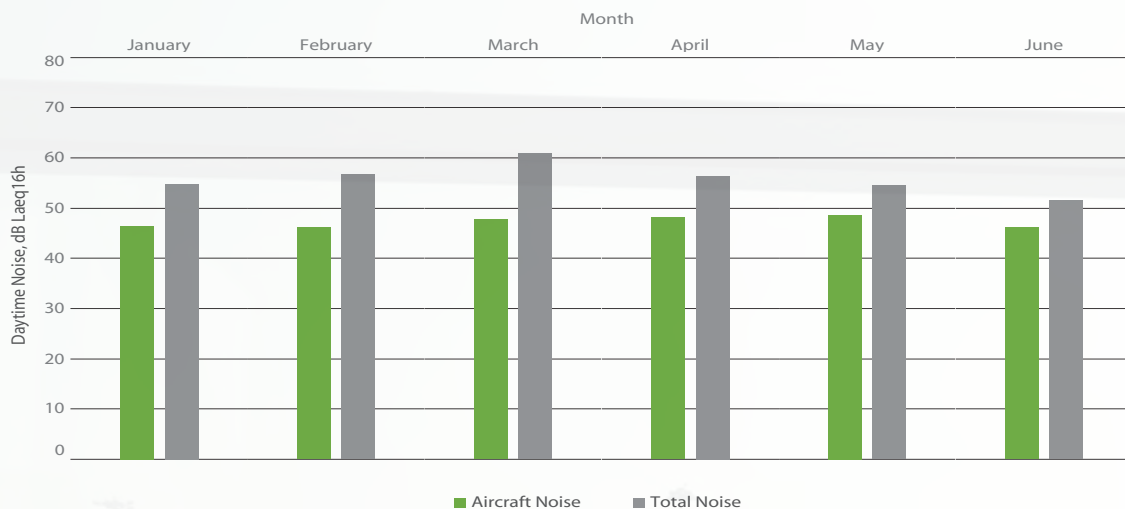


Figure 30: Averaged daytime noise levels for NMT 5, January – June 2019

Noise levels during the night are determined using a similar method. The night period is defined as a period between 23:00 in the evening to 06:59 in the morning. Noise levels are therefore averaged over an 8-hour window. Figure 31 presents these results monthly.



Figure 31: Averaged nighttime noise levels for NMT 5, January – June 2019

The hourly noise distribution at NMT 5 as shown in Figure 32.

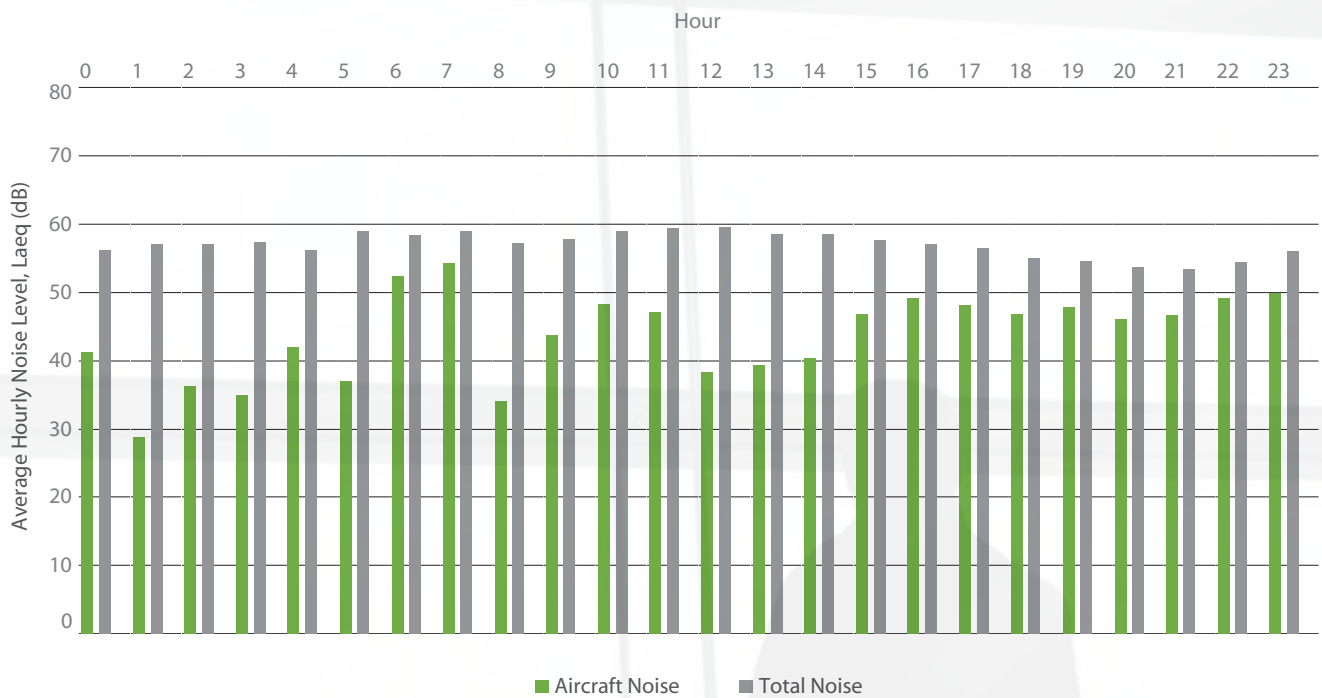


Figure 32: Averaged hourly noise levels for NMT 5, January – June 2019

Figure 33 shows the $L_{A,MAX}$ distribution, for aircraft noise, for the first half year of 2019 for NMT 5.

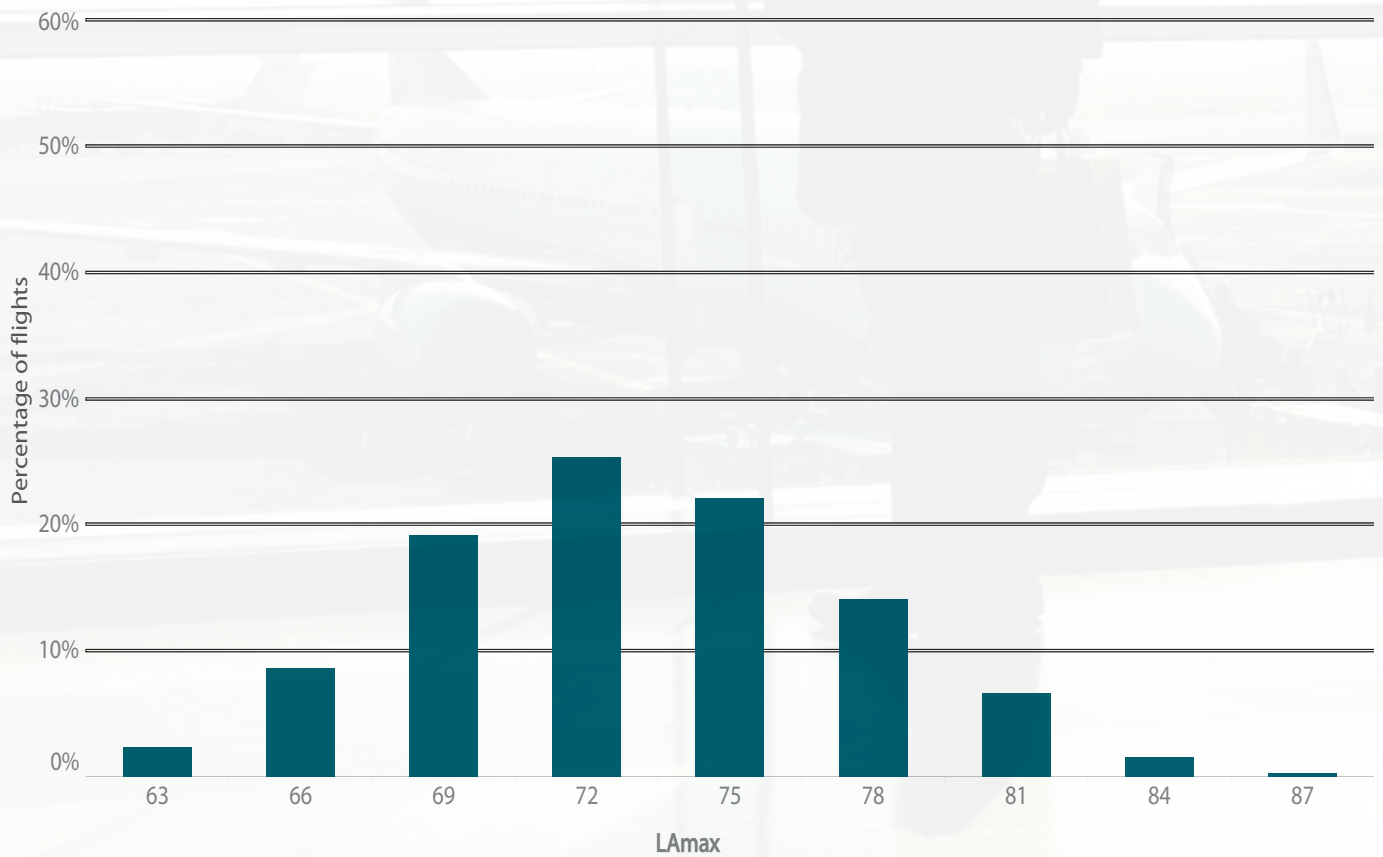


Figure 33: $L_{A,MAX}$ levels distribution for NMT 5, January – June 2019

NMT 6: Artane

Noise Monitoring Terminal 6 ('Artane') is located southeast of Dublin Airport on the roof of a school building, see Figure 34 below, under the extended runway centerline of runway 16. Its purpose is to monitor runway 16 departures and runway 34 arrivals. The resulting data for NMT 6 measurements in the period from January 1st up to and including June 30th 2019 are presented in this section.

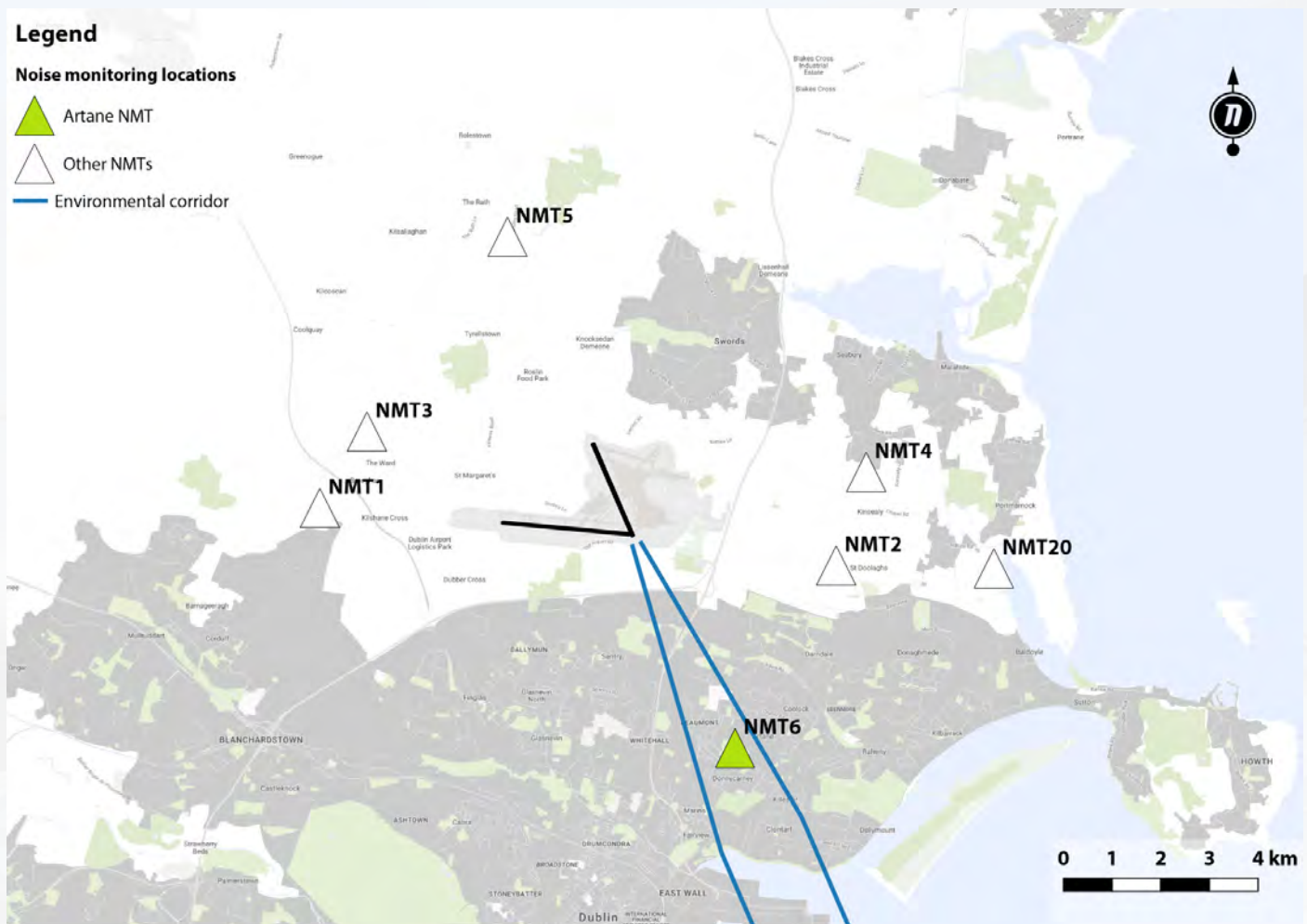


Figure 34: Noise Monitoring Terminal Artane Location

Noise Events

The results are presented in Figure 35. 602 registered noise events were attributable to aircraft noise (2.2%). These noise events include both correlated and uncorrelated aircraft noise events. Correlated aircraft noise events are coupled with a specific arriving or departing aircraft overflying the NMT, while uncorrelated aircraft noise events are not.

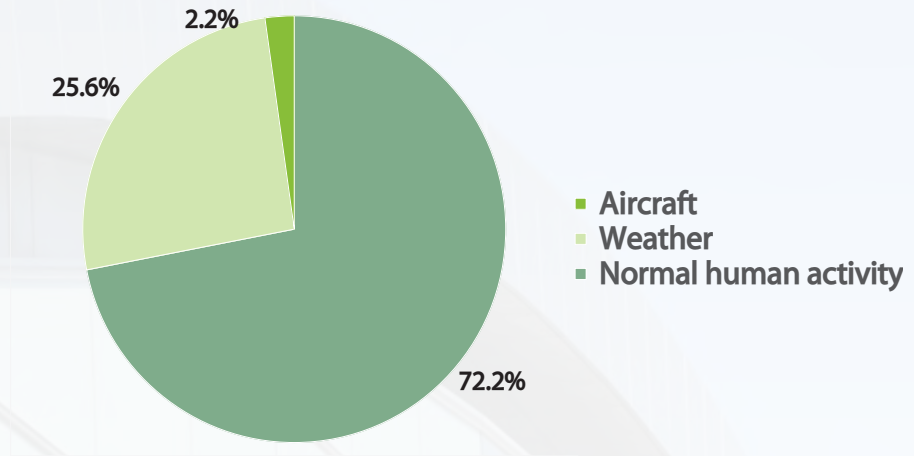


Figure 35: NMT 6 Noise Event Types

NMT Operational Status

To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this period, the NMTs are out of operation for short periods of time and do not record noise events. The operational status of NMT 6: Artane is presented in Figure 36.

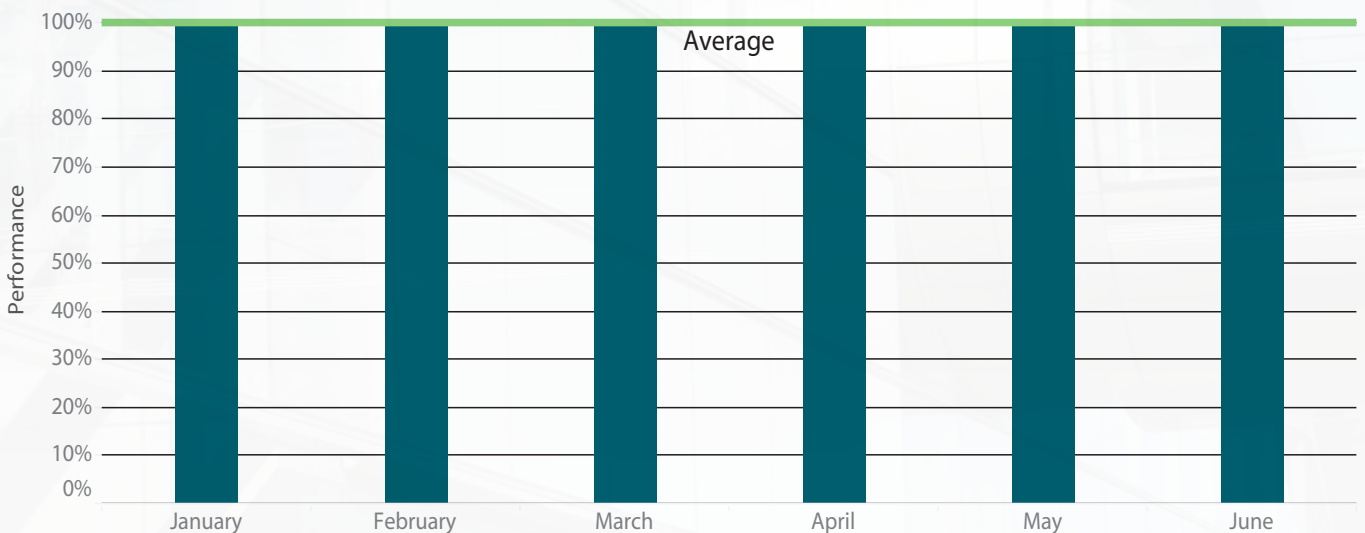


Figure 36: Operational status of NMT 6, January – June 2019

Noise Levels

Figure 37 presents the average noise levels measured at NMT 6 during daytime periods, which are defined to be from 07:00 in the morning to 22:59 in the evening. Recorded noise levels during these time segments are therefore averaged over a 16-hour window.

This procedure is followed both for all noise events, and for those events that were correlated to aircraft movements. The results shown are presented monthly.

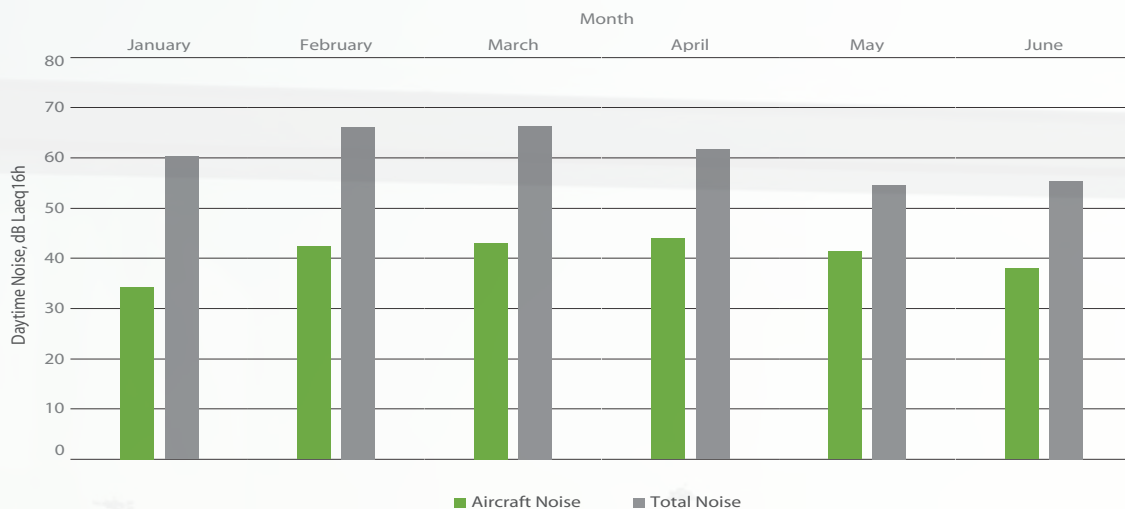


Figure 37: Averaged daytime noise levels for NMT 6, January – June 2019

Noise levels during the night are determined using a similar method. The night period is defined as a period between 23:00 in the evening to 06:59 in the morning. Noise levels are therefore averaged over an 8-hour window. Figure 38 presents these results monthly.

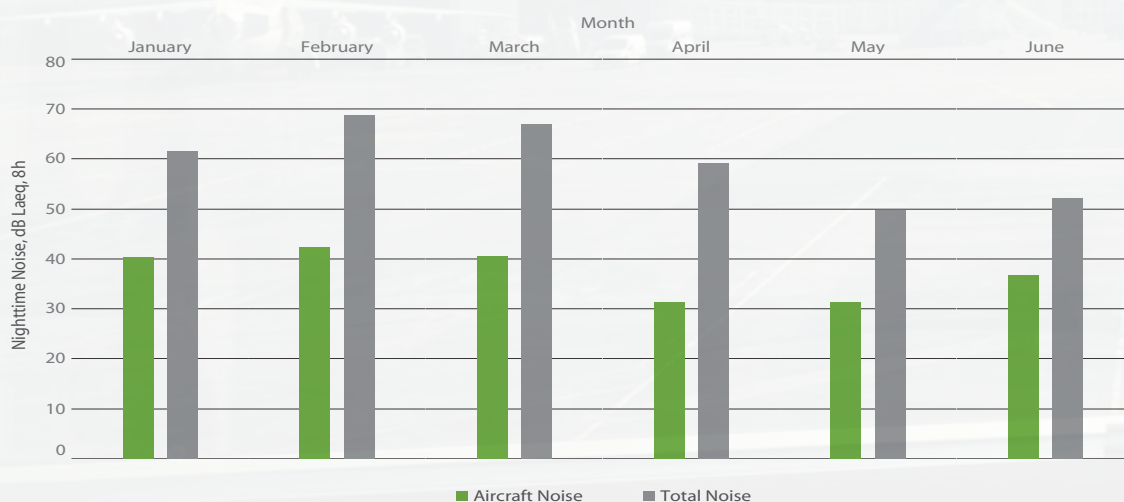


Figure 38: Averaged nighttime noise levels for NMT 6, January – June 2019

The hourly noise distribution at NMT 6 as shown in Figure 39.

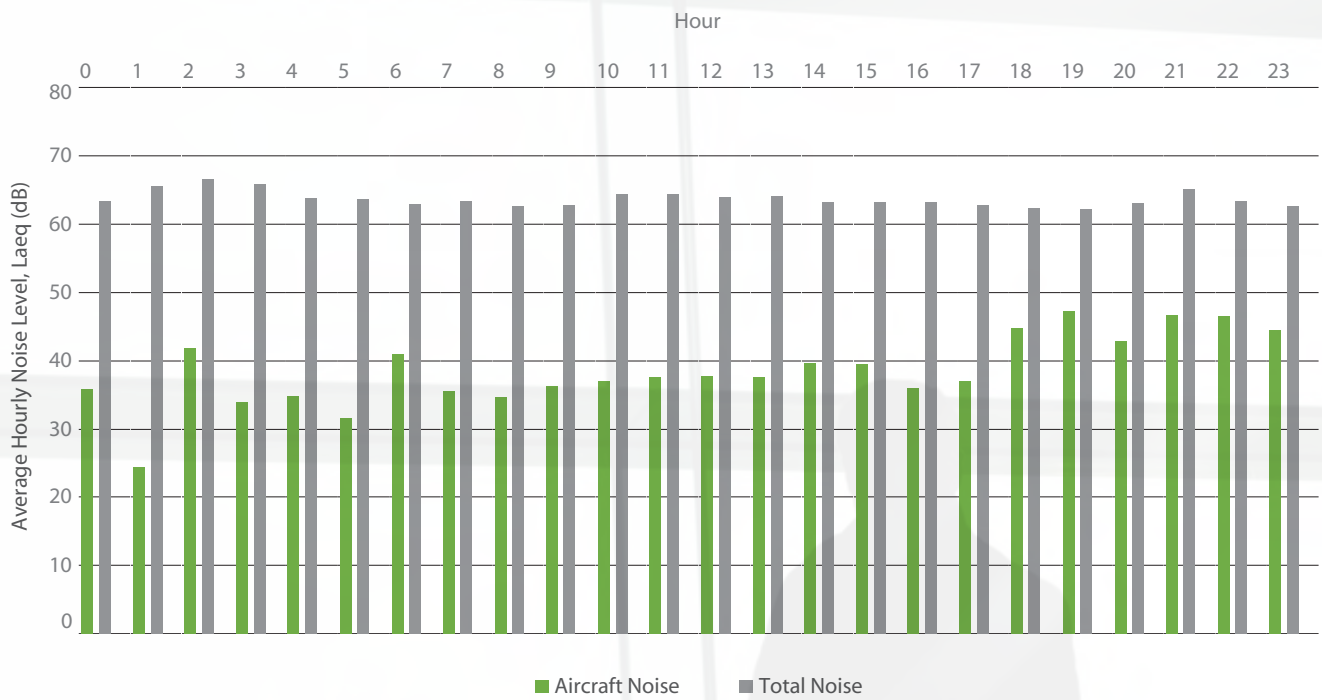


Figure 39: Averaged hourly noise levels for NMT 6, January – June 2019

Figure 40 shows the $L_{A,MAX}$ distribution, for aircraft noise, for the first half year of 2019 for NMT 6.

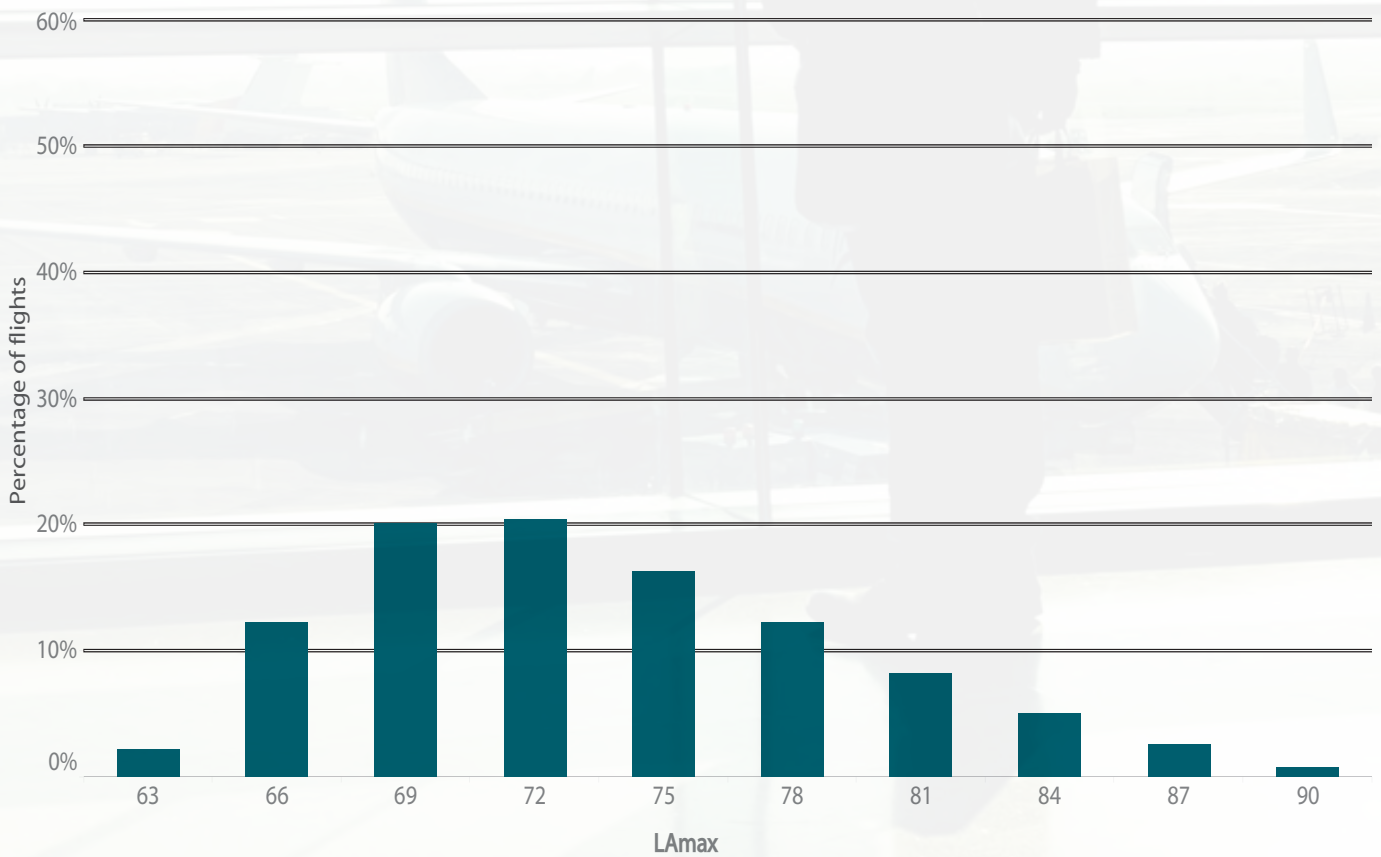


Figure 40: $L_{A,MAX}$ levels distribution for NMT 6, January – June 2019

NMT 20: Coast Road

Noise Monitoring Terminal 20 ('Coast Road') is located east of Dublin Airport, see Figure 41 below, under the extended runway centerline of runway 10. Its purpose is to monitor runway 10 departures and runway 28 arrivals. The resulting data for NMT 20 measurements in the period from January 1st up to and including June 30th 2019 are presented in this section.

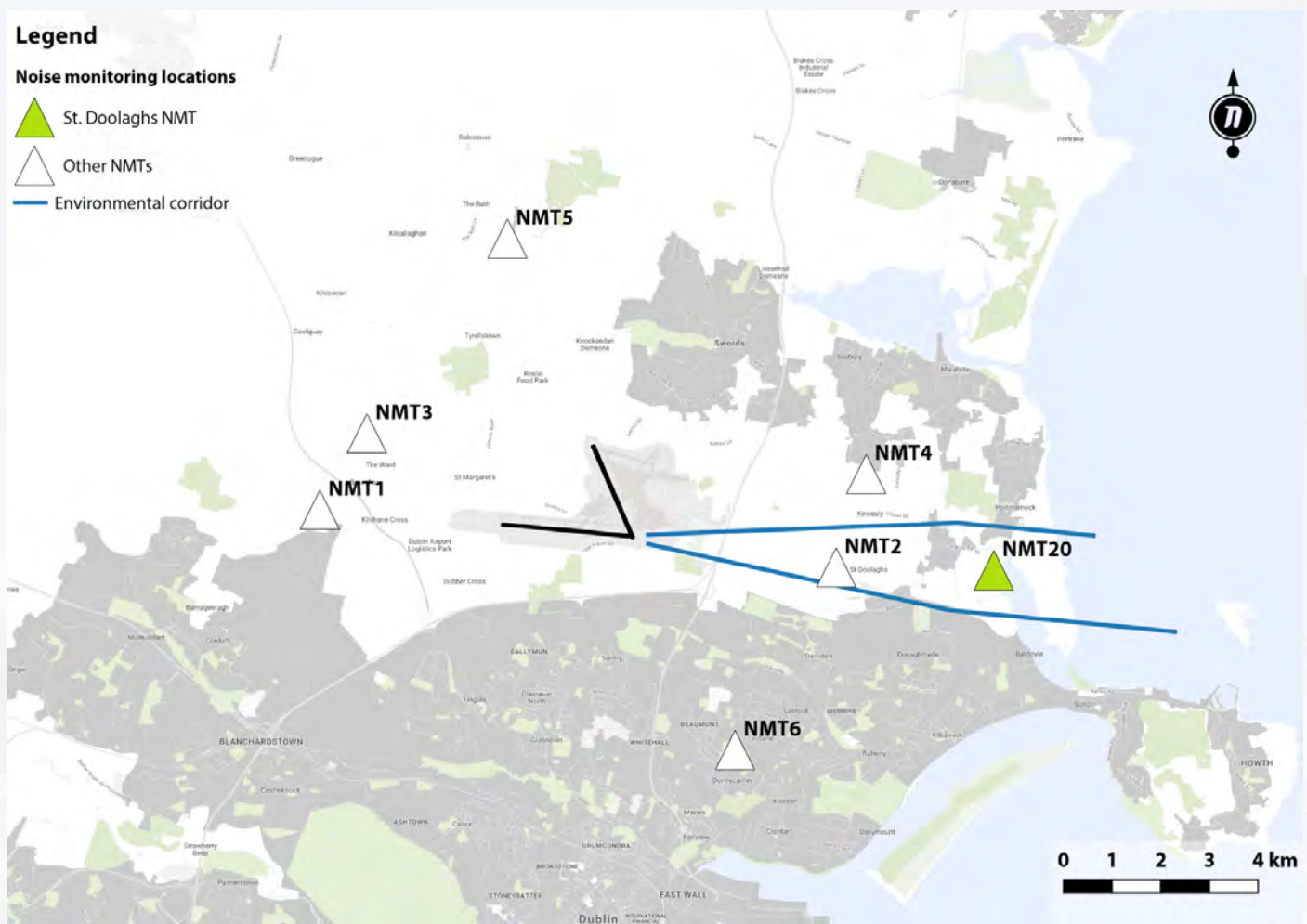


Figure 41: Noise Monitoring Terminal Coast Road Location

Noise Events

The results are presented in Figure 42. 48,568 registered noise events were attributable to aircraft noise (77.5%). These noise events include both correlated and uncorrelated aircraft noise events. Correlated aircraft noise events are coupled with a specific arriving or departing aircraft overflying the NMT, while uncorrelated aircraft noise events are not.

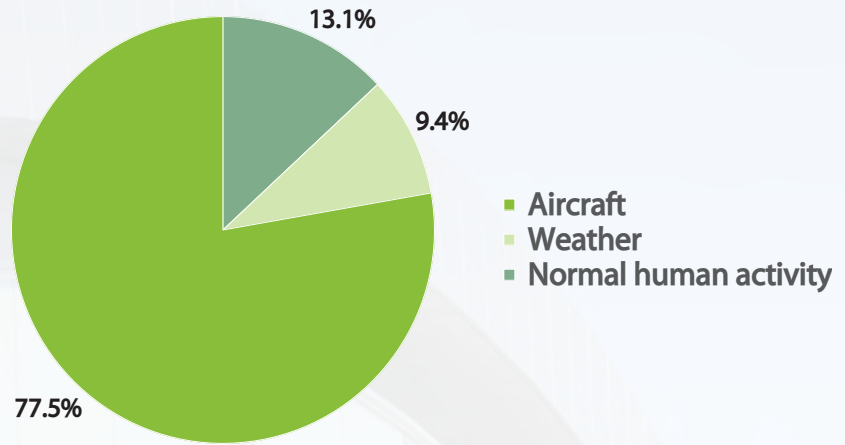


Figure 42: NMT 20 Noise Event Types

NMT Operational Status

To ensure that Noise Monitoring Terminals keep working within specific limits, internal calibration checks are completed every 6 hours. During this period, the NMTs are out of operation for short periods of time and do not record noise events. The operational status of NMT 20: Coast Road is presented in Figure 43.

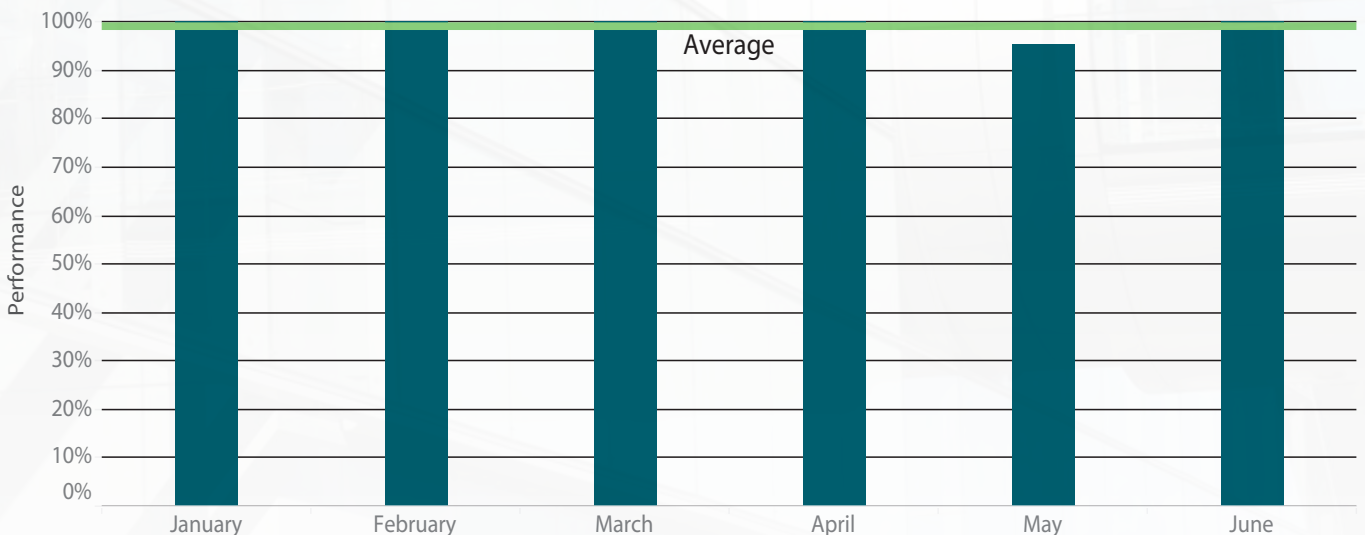


Figure 43: Operational status of NMT 20, January – June 2019

Noise Levels

Figure 44 presents the average noise levels measured at NMT 20 during daytime periods, which are defined to be from 07:00 in the morning to 22:59 in the evening. Recorded noise levels during these time segments are therefore averaged over a 16-hour window.

This procedure is followed both for all noise events, and for those events that were correlated to aircraft movements. The results shown are presented monthly.

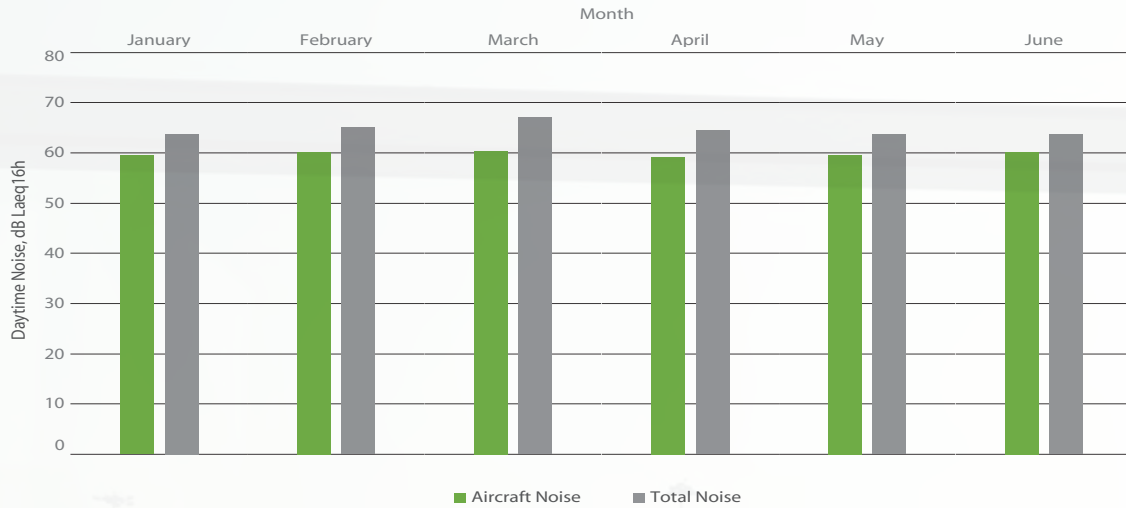


Figure 44: Averaged daytime noise levels for NMT 20, January – June 2019

Noise levels during the night are determined using a similar method. The night period is defined as a period between 23:00 in the evening to 06:59 in the morning. Noise levels are therefore averaged over an 8-hour window. Figure 45 presents these results monthly.

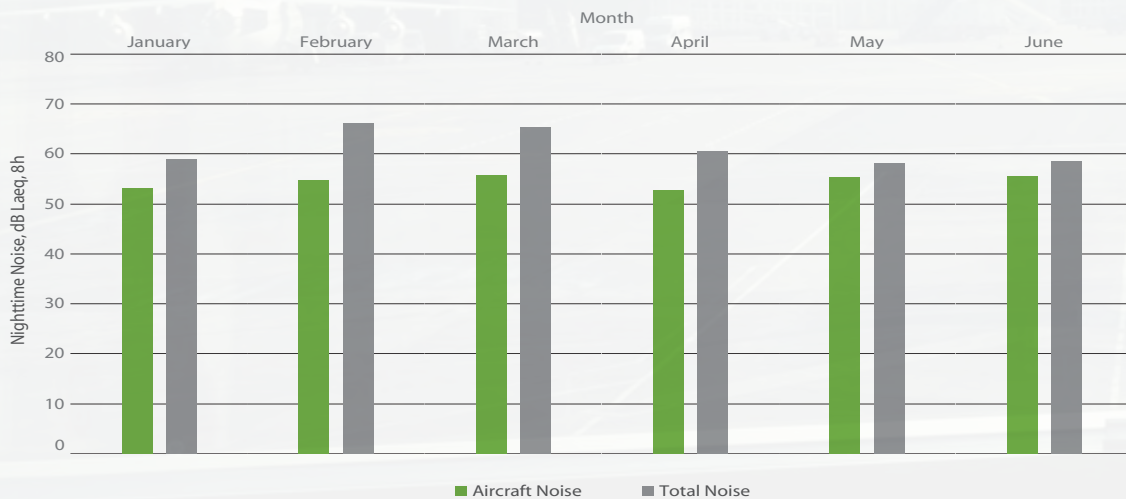


Figure 45: Averaged nighttime noise levels for NMT 20, January – June 2019

The hourly noise distribution at NMT 20 as shown in Figure 46.

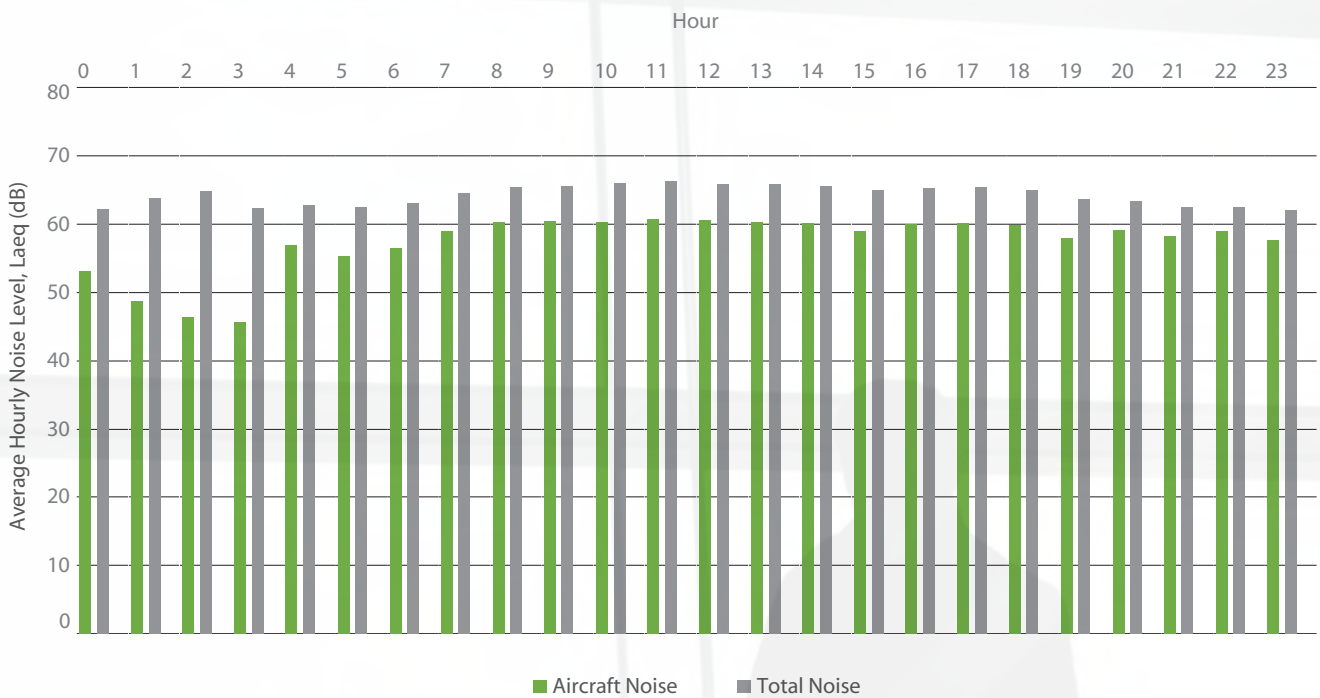


Figure 46: Averaged hourly noise levels for NMT 20, January – June 2019

Figure 47 shows the $L_{A,MAX}$ distribution, for aircraft noise, for the first half year of 2019 for NMT 20.

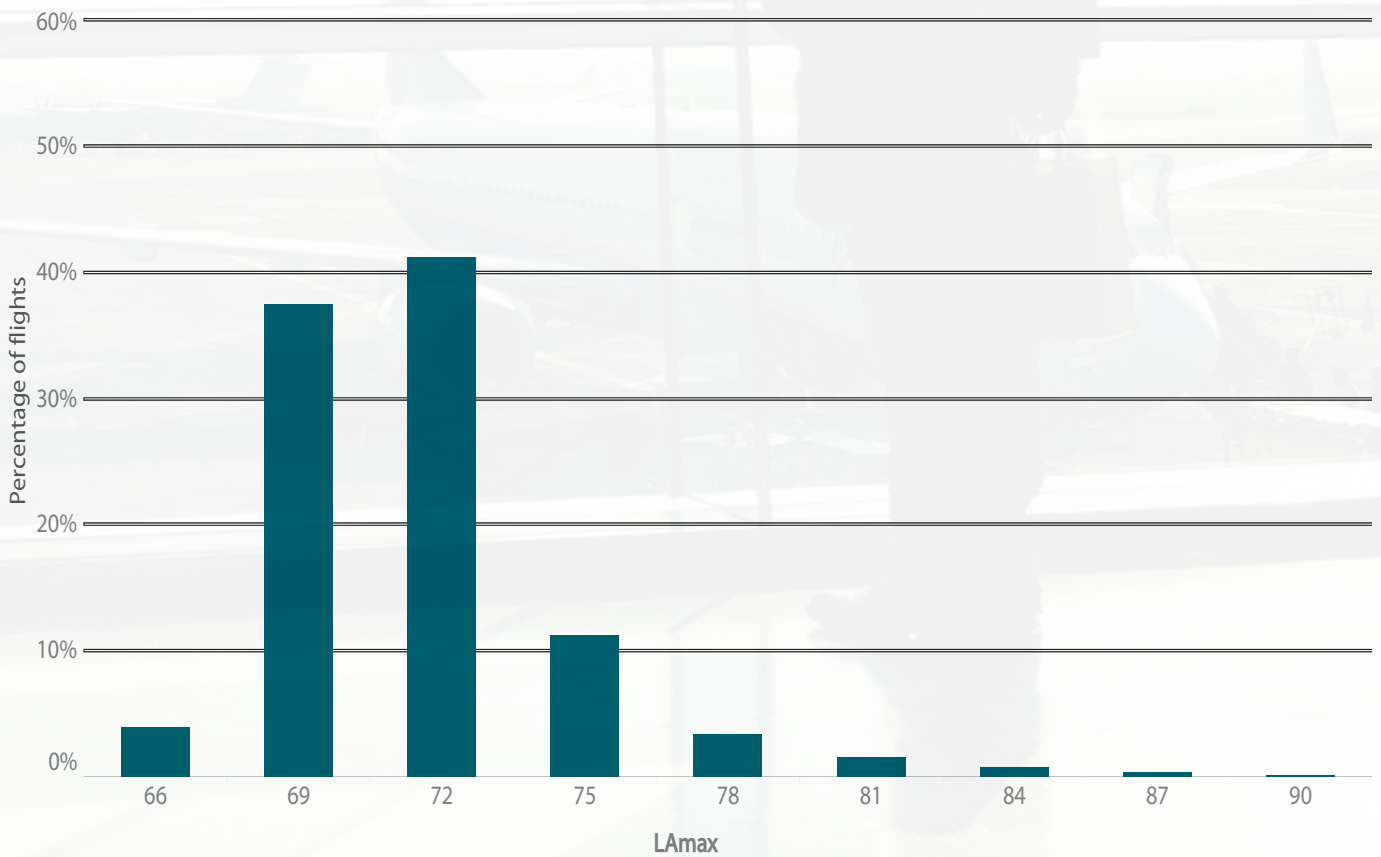


Figure 47: $L_{A,MAX}$ levels distribution for NMT 20, January – June 2019

Glossary

Symbol	Description	Unit
L_{Aeq}	A-weighted, equivalent noise level, averaged per hour over a half year period.	[dB]
$L_{Aeq, 8 h}$	A-weighted, equivalent noise level, averaged over eight hours per month between 23:00 and 07:00 (nighttime), hence 8 hour equivalent.	[dB]
$L_{Aeq, 16 h}$	A-weighted, equivalent noise level, averaged over 16 hours per month between 07:00 and 23:00 (daytime), hence 16 hour equivalent.	[dB]
$L_{A,MAX}$	A-weighted, maximum recorded noise level per correlated aircraft-noise event, instead of indicating the average noise levels for a reference duration.	[dB]

Report inquiries

Phone: 1-800-200-034

Online form: <https://www.dublinairport.com/about-us/-community-affairs/noise-complaint>

This report is drafted by To70 Aviation Consultants on behalf of Dublin Airport.

