

SHORT TERM NOISE MONITORING PROGRAM

Strathmore Heights, Essendon Airport, Melbourne

Version 1.0

Effective 18 September 2020

CHANGE SUMMARY

Version	Date	Change Description
0.1	30 June 2020	Initial draft for internal review
1.0	18 September 2020	Final version approved for release

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EXECUTIVE SUMMARY

Essendon Airport (YMEN) is a public airport serving scheduled commercial, corporate-jet, charter and general aviation flights. It is located in the northern suburb of Essendon Fields of Melbourne, approximately 13 km from the Melbourne Central Business District (CBD). Essendon Airport also acts as the operating base for emergency services aircraft servicing the Melbourne region. There has been a recent adoption by some emergency operators of Augusta Westland AW139 helicopters (AW139), replacing their fleets of Bell 412 (B412) helicopters in service. A request was received from the Essendon Airport Community Aviation Consultation Group (CACG) in mid-2019, requesting a short-term noise monitor in the Strathmore Heights area, in relation to community concerns about increased noise levels related to this change in helicopter type.

The purpose of this short term noise monitor deployment by Airservices was therefore to provide aircraft noise information to the community of Strathmore Heights and surrounding areas, regarding the noise impacts of changes to helicopter operations at Essendon Airport. It also offers insights into the overall impact of aircraft noise within the Strathmore Heights area. Airservices has previously conducted noise monitoring at the Boeing Reserve location in 2012. Noise information from this noise monitoring deployment was used to identify trends in helicopter noise from emergency services operations.

The following conclusions can be made regarding helicopter operations between the 2012 and 2019 short term noise monitoring periods in the Strathmore Heights area near Essendon Airport:

1. There has been an increase in emergency services helicopter operations between 2012 and 2019, with a doubling of average daily operations during the 'night time' period of 11pm to 6am (as defined by curfew legislation).
2. Emergency services helicopters are perceptibly louder than non-emergency services helicopters.
3. Noise analysis of the emergency services helicopters showed the AW139 was measured to be 2dB(A) quieter than the B412 helicopters it replaced. However, this change is unlikely to be perceived by community members. Aerospatiale AS365 noise levels were similar in the 2012 and 2019 noise monitoring periods.
4. There has been no significant change to the distribution of flight tracks of helicopter operations (both emergency and non-emergency operations) in 2012 and in 2019.

1. PURPOSE

Essendon Airport (YMEN) is a public airport serving scheduled commercial, corporate-jet, charter and general aviation flights. It is located in the northern suburb of Essendon Fields of Melbourne, approximately 13 km from the Melbourne Central Business District (CBD). Essendon Airport also acts as the operating base for emergency services aircraft servicing the Melbourne region. There has been a recent adoption by some emergency operators of Augusta Westland AW139 helicopters (AW139), replacing their fleets of Bell 412 (B412) helicopters in service. A request was received from the Essendon Airport Community Aviation Consultation Group (CACG) in mid-2019, requesting a short-term noise monitor in the Strathmore Heights area, in relation to community concerns about increased noise levels related to this change in helicopter type.

The purpose of this short term noise monitor deployment by Airservices was therefore to provide aircraft noise information to the community of Strathmore Heights and surrounding areas, regarding the noise impacts of changes to helicopter operations at Essendon Airport. It also offers insights into the overall impact of aircraft noise within the Strathmore Heights area. Airservices has previously conducted noise monitoring at the Boeing Reserve location in 2012. Noise information from this noise monitoring deployment was used to identify trends in helicopter noise from emergency services operations.

In accordance with the *Air Navigation (Essendon Fields Airport) Regulation 2018*, there is a curfew on aircraft operations in place at Essendon Airport. During the curfew period, take-offs and landings at the airport are restricted to specific types of aircraft and operations. Helicopters below 45,000kg with a noise certificate in force are permitted to conduct operations during curfew hours.

2. AIRSERVICES AIRCRAFT NOISE MONITORING

Airservices Noise and Flight Path Monitoring System (NFPMS) collects noise and flight path data at Brisbane, Cairns, Canberra, Gold Coast, Sydney, Melbourne, Essendon, Adelaide and Perth airports. This system operates 24-hours-a-day, seven-days-a-week, collecting data from every aircraft operating to and from the airport. NFPMS uses monitors located within local communities and is the world's largest, most geographically-spread system of its type.

Noise monitoring is not undertaken to determine compliance with aircraft noise regulations—there are no regulations which specify a maximum, allowed level of aircraft noise. Rather it is undertaken to:

- determine the contribution aircraft noise makes to the overall noise to which a community is exposed
- provide information to the community
- help local authorities make informed land use planning decisions (monitoring data can assist in decision making, however it cannot overturn a decision)
- inform estimates of impact to changes in air traffic control procedures—including changes to reduce aircraft noise impacts
- validate noise modelling
- inform the determination of aviation policy by government
- assist the government in implementing legislation, such as curfew acts and regulations.

Information and data from Airservices network of noise monitors is available from the Airservices website (<https://www.airservicesaustralia.com/community/environment/aircraft-noise/>). This includes;

- short-term noise monitor reports, including this report, and
- data from the long-term noise monitoring through each city's WebTrak site and regular online reporting, for the relevant airport.

3. METHODOLOGY

The short-term noise monitoring terminal (NMT) was deployed at Boeing Reserve in Strathmore Heights (Figure 1). The NMT was placed to capture fixed wing aircraft movements from RWY17/35 at Essendon Airport, as well as helicopter operations over Strathmore Heights and surrounding suburbs. The NMT also picked up overflights and Melbourne Airport movements. The NMT was set up to capture noise events associated with aircraft movements within a 2.5km radius and up to 8,000ft altitude (above ground level), as shown below in Figure 2. This is known as the aircraft noise event 'capture zone' (as shown in pink shading in Figure 2).



Figure 1: Satellite image of short term noise monitoring location (NMT-364) at Boeing Reserve in Strathmore Heights, near Essendon Airport.

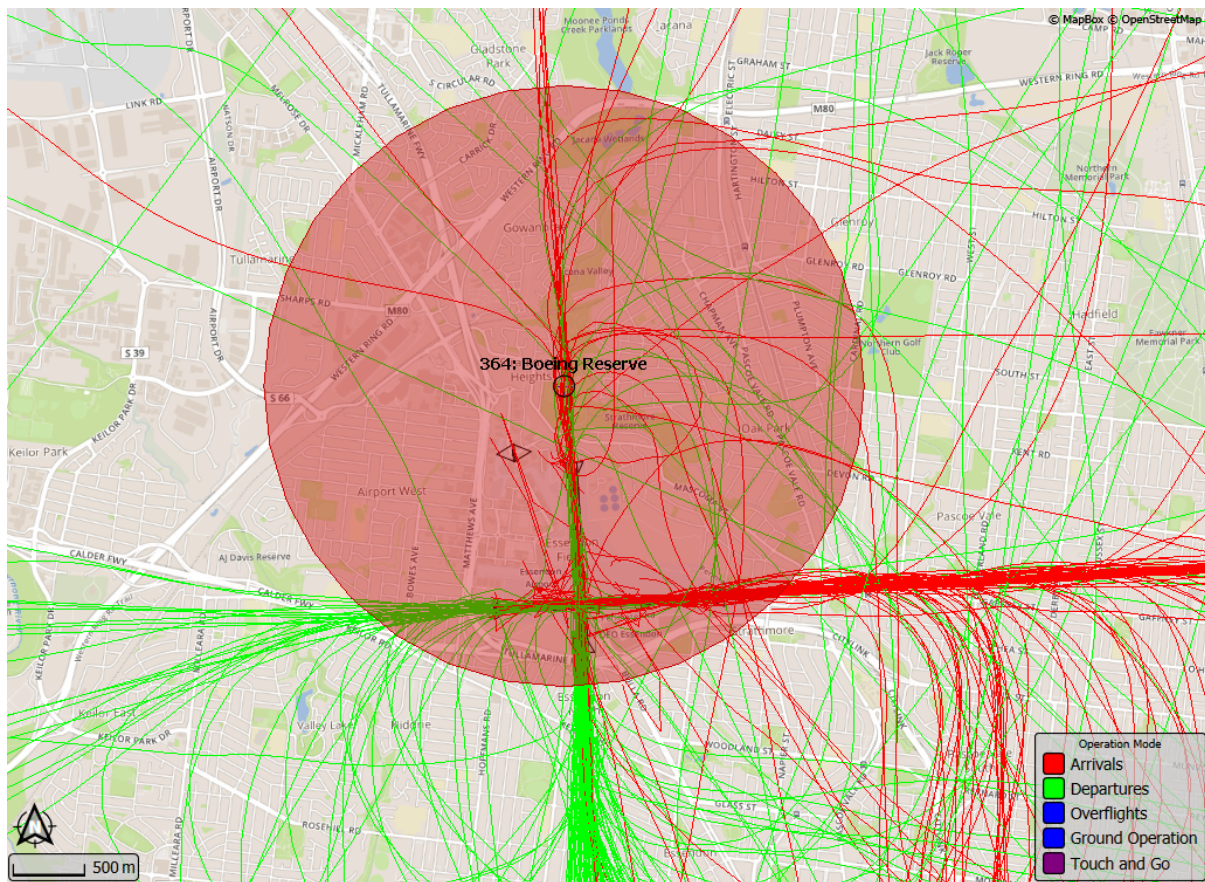


Figure 2: Location of short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport, with noise monitor 'capture zone' shown in pink. Arrival and departure tracks for operations at Essendon Airport are shown as red and green lines (15 October 2019 to 18 October 2019).

4. NMT DETAILS

Location details and capture settings of the short term NMT deployment at Boeing Reserve in Strathmore Heights are listed below in Table 1.

Table 1: Deployment details of Airservices short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport in 2019-20.

NMT ID	364
Deployment Period	07/10/2019 - 07/01/2020
Location	Boeing Reserve, Boeing Rd, Strathmore Heights, VIC, 3041
Latitude	-37.714701
Longitude	144.899984
NMT Altitude	187ft above mean sea level
Capture Zone	2.5km x 8,000ft
Data Availability	99.98%
Threshold Settings	58 dB(A) to 62 dB(A) depending on time of day

4.1. NOISE CORRELATION SUMMARY

The total number of aircraft correlated noise events (CNEs) that were captured by the noise monitor during the three-month deployment period is shown in the following table.

Table 2: CNE summary for the deployment period (7 October 2019 to 7 January 2020) of short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport.

	Aircraft Movements through Capture Zone	Correlated Noise Events (CNEs)	Correlation Summary
All	13,317	2,386	18%
Essendon Airport	11,891	2,305	19%
Melbourne Airport	1,052	23	2%
Moorabbin Airport	191	9	5%
Mangalore Airport	62	2	3%
Ballarat Airport	11	0	0%

From Table 2, it can be seen that 89% of all aircraft operations that passed through the capture zone during the monitoring period were Essendon Airport movements. The other operations captured by the NMT were predominantly Melbourne Airport Runway 16 and 34 arrivals. Only a handful of operations (<2%) that passed through the zone were from other airports, including Moorabbin, Avalon and Lilydale airports.

The overall figure of 18% CNEs to total aircraft movements in the capture zone is a low result, compared to other Airservices short-term NMT installations at other airports, which typically see correlation rates in the range of 50-90%. This is due to many operations being captured at the edge of the zone or not meeting the correlation parameters in Table 1, as shown over a one-week period below.

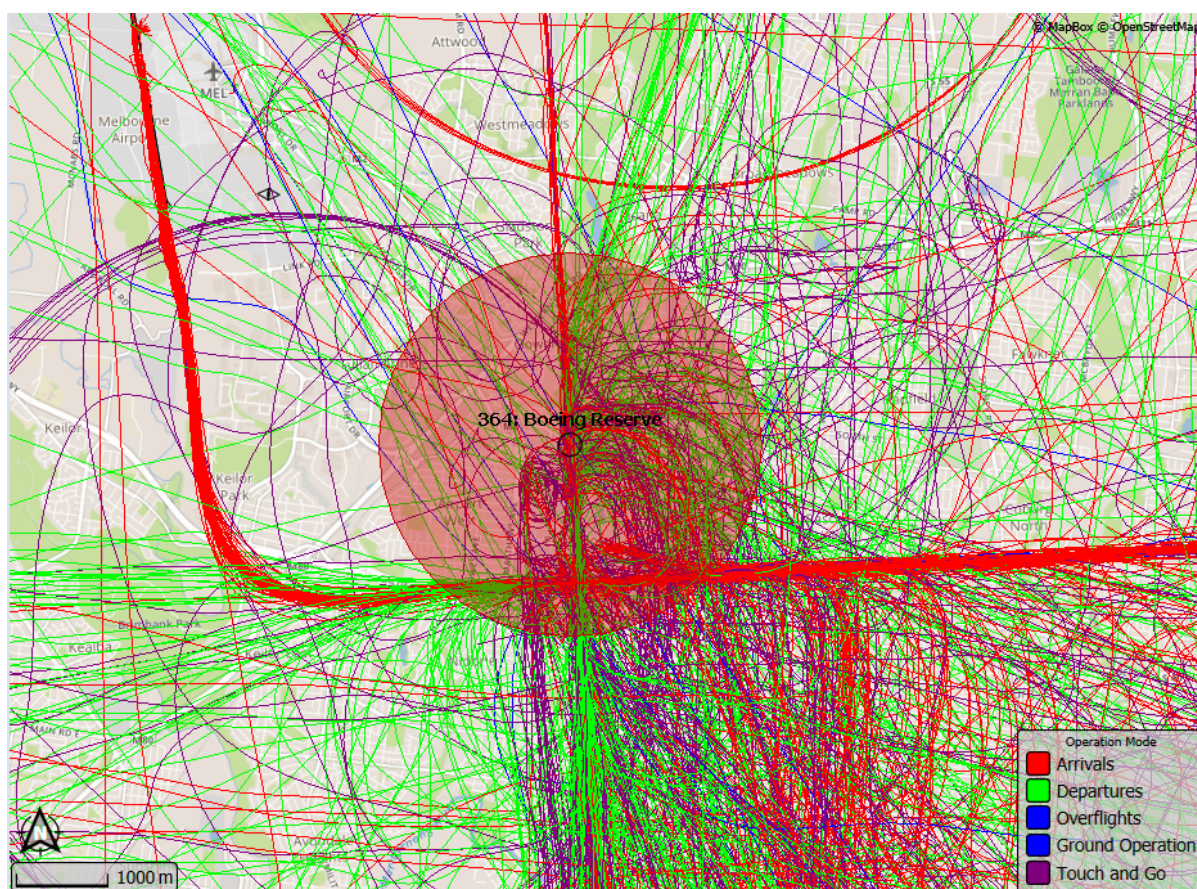


Figure 3: One week of flight tracks (14 October 2019 to 21 October 2019) passing through the capture zone (pink circle) of short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport.

A summary of the total number of CNEs by time of day is shown in Table 3 below, as well as the minimum and maximum number of CNEs per day.

Table 3: Breakdown of CNEs by time of day at short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport during deployment period (7 October 2019 to 7 January 2020).

CNEs over the Deployment Period	Day Time (6:00am-11:00pm)	Night-time (11:00pm-6:00am)	Number of CNE per day (min to max)
Above 60 dB(A) (N60)	2,282	420	2 to 99
Above 70 dB(A) (N70)	1,676	284	1 to 76

Table 4 below shows all AW139 helicopter operations that flew through the NMT-364 capture zone during the deployment period, and the percentage of operations that were correlated to aircraft noise events measured by the monitor.

Table 4: AW139 correlation at short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights for the deployment period (7 October 2019 to 7 January 2020).

AW139 Helicopter Operation Type	Operations	Correlated (no.)	Correlated %
Departures	401	77	19%
Arrivals	272	203	75%
Local*	30	29	97%
Overflights	57	31	54%
Total	760	340	45%

**Movement that departs and arrives at the same airport, including circuits and training flights.*

Although noise events created by aircraft movements may be audible, they must meet following parameters to create a CNE:

- The aircraft flight path must be within the capture zone set for the monitor (Figure 2).
- Maximum noise levels must be greater than a set threshold (ranging from 58 to 62 dB(A), depending on time of day).
- Maximum noise levels must remain over the monitors' set threshold for a certain, minimum period (6 seconds).
- The temporal distribution of the measured noise event matches a pattern representative of an aircraft noise event.

Aircraft that flew within the vicinity of the monitor but did not cause a CNE may have failed to meet some of the parameters above. This occurs frequently in areas where aircraft noise is similar to other noise sources in the area.

5. OVERALL FINDINGS

5.1. Overall Results

The top 100 loudest single noise events from the noise monitor deployment at Strathmore Heights were verified using audio playback, to ensure these events were correctly correlated as aircraft noise events. The noise events identified as non-aircraft events have been removed from the CNE counts.

Correlated noise events above 60 dB(A) were most common on weekdays between 16:00 and 18:00 and weekends between 15:00 and 17:00.

The top 10 loudest single noise events (L_{Amax}) captured during the deployment period are shown in Table 5 below, including those identified from other noise sources (and therefore not CNEs).

Table 5: Top 10 loudest noise events by L_{Amax} captured by short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights during deployment period (7 October 2019 to 7 January 2020).

Start Date/Time	Correlated to Aircraft?	L_{Amax} dB(A)	Noise Source	Aircraft Type	Operation Type
01/12/2019 11:47	Yes	93.7	Propeller aircraft	C185	D
04/11/2019 7:53	No	93.4	Birds	-	-
19/10/2019 15:52	Yes	92.6	Helicopter	AS65	A
05/01/2020 12:35	Yes	92.4	Propeller aircraft	P180	A
10/10/2019 16:34	Yes	92	Helicopter	AS65	A
04/11/2019 20:05	No	91.4	Thunderstorm	-	-
26/11/2019 21:12	Yes	91.2	Helicopter	AS65	A
28/11/2019 11:03	No	90.3	Siren	-	-
31/10/2019 9:38	Yes	90.2	Jet aircraft	C560	D
11/11/2019 8:01	Yes	90	Propeller Aircraft	AC6L	D

5.2. Busiest Day

The busiest day (of correlated aircraft noise events) from this deployment period was on 24th October 2019, with 100 correlated noise events. The noise events were related to a variety of aircraft, including helicopters, jets, turboprops and piston aircraft that used Essendon and Melbourne Airport. The most common movements were operations from Essendon Airport, however the NMT also captured jet arrivals to Melbourne Airport's Runway 34, as shown in Figure 4 below.

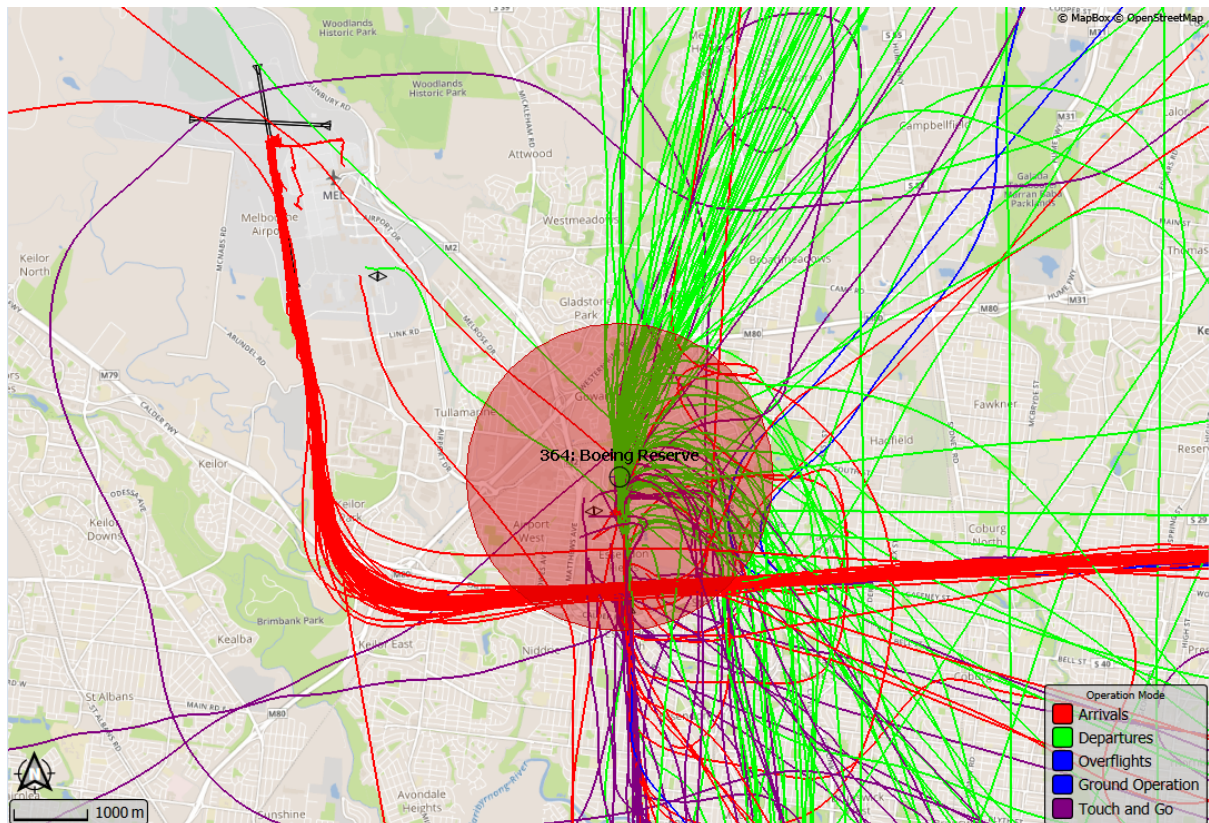


Figure 4: Busiest day (24th October 2019) flight tracks captured by short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport, during deployment period (7 October 2019 to 7 January 2020). Noise monitor capture zone shown as a pink circle.

The time history of NMT-364 sound levels at Boeing Reserve during the busiest day of CNEs (24th October 2019) are shown in Figure 5. It can be seen that background noise levels reach a peak at approximately 6:00am and reduce throughout the day.

The time history graph provided in Figure 5 offers insight into the sound landscape at this noise monitoring location, including a comparison of noise contributions from community activities to correlated aircraft noise contributions.

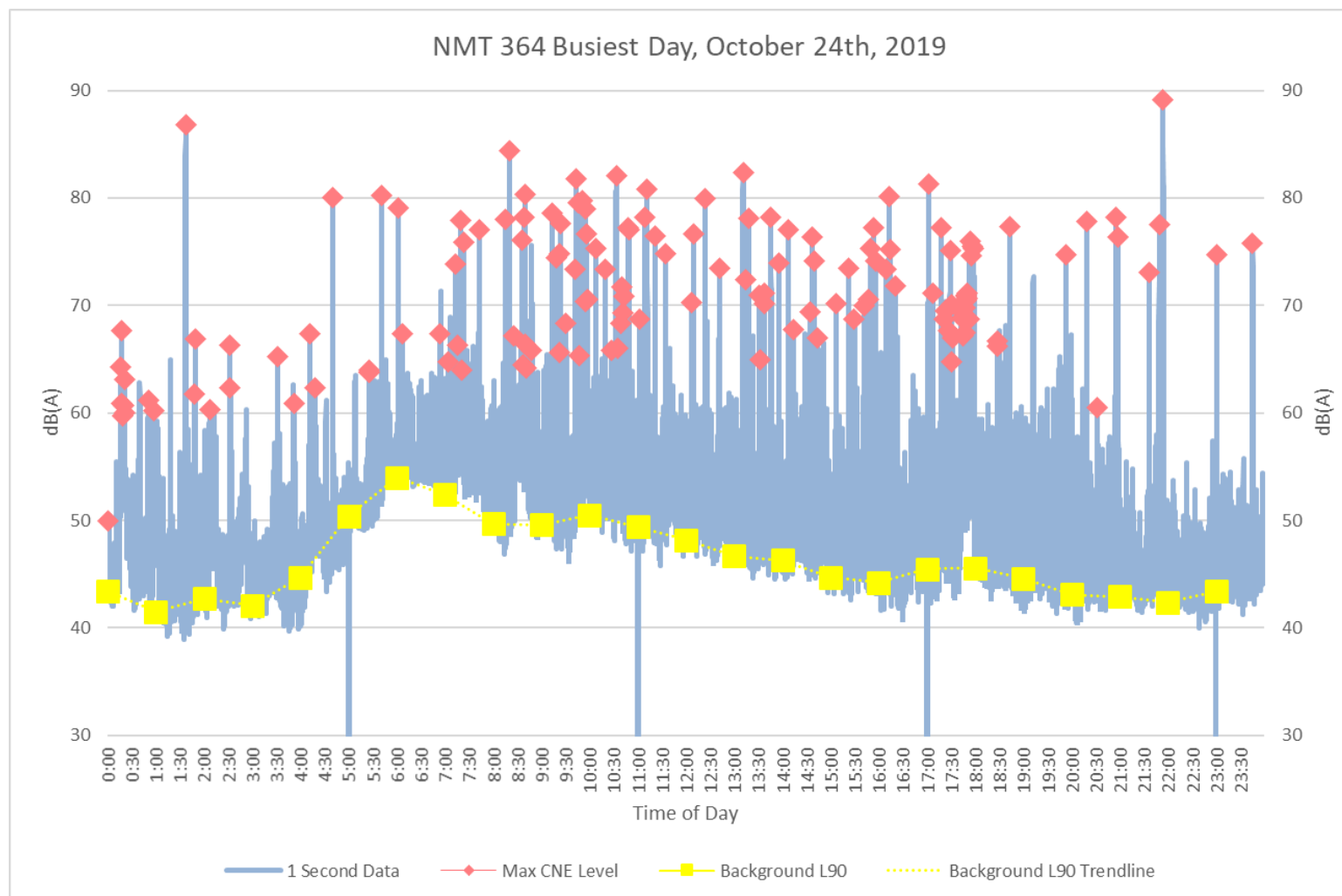


Figure 5: Sound level time history for busiest day of correlated noise events (24th October 2019) at short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport.

5.3. Busiest Day Discussion

The loudest event on the busiest day of correlated aircraft noise events (24 October 2019) during this noise monitor deployment period was created by a Hawker 800 H25B corporate jet, departing from Runway 35 at Essendon Airport at 21:54 in the evening. This aircraft was recorded by NMT-364 with a maximum noise level (L_{Amax}) of 89.1 dB(A).

The loudest event during 'night-time' hours (11pm to 6am) was created by an AeroSpatiale (now Eurocopter) AS-365 Dauphin 2 (AS65) emergency services helicopter, arriving at 01:36 in the morning. This created a maximum noise level (L_{Amax}) of 86.8 dB(A).

5.4. Most Common Aircraft

The following table shows the top 10 average and maximum noise levels of CNEs for the deployment period.

Table 6: Top 10 aircraft by total number of CNEs captured at short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights near Essendon Airport (YMEN) during deployment period (7 October 2019 to 7 January 2020).

Aircraft Type	Aircraft Category	Airport Code	Operation Type	Runway	Total CNEs	Average dB(A)	Max dB(A)
Aerospatiale AS365/366/565 (AS65)	Helicopter	YMEN	Local*	Helipad	341	76.6	92.6
Agusta Westland AW139 (AW139)	Helicopter	YMEN	Arrival	Helipad	248	76.5	86.9
Beech 200&1300S (BE20)	Turboprop	YMEN	Arrival	17	207	80.4	85.4
Unknown ~	Helicopter	YMEN	Arrival	Helipad	148	75.8	86.2
Aerospatiale AS365/366/565 (AS65)	Helicopter	YMEN	Arrival	Helipad	147	80.0	91.2
Beech 200&1300S (BE20)	Turboprop	YMEN	Departure	35	141	77.2	87.2
Agusta Westland AW139 (AW139)	Helicopter	YMEN	Departure	Helipad	77	73.8	81.3
Unknown ~	Helicopter	YMEN	Local*	Helipad	73	71.7	87.5
Cessna Skyhawk (C172)	Piston	YMEN	Departure	35	50	69.1	73.4
Aerospatiale AS355 (AS55)	Helicopter	YMEN	Local*	Helipad	45	70.9	81

* Local movement including circuits (departure and arrival at the same airport).

~ Unknown aircraft movements are recorded when a detailed flight plan is not submitted by the aircraft operator.

6. EMERGENCY HELICOPTER ANALYSIS

6.1. Overview

As stated in Section 1, the primary purpose of this short term noise monitoring deployment at Strathmore Heights was to compare emergency helicopter operations with a similar study completed in 2012, to identify trends in community noise impacts. The noise monitoring location at Boeing Reserve was nearly identical to a similar short term noise monitor deployment by Airservices between 11 August and 7 September 2012.

Using historical data from this noise monitoring location, trends in emergency helicopter operations over time were identified. Three key questions were analysed in this section, as follows:

1. How have the number of daily helicopter operations (emergency and non-emergency) changed since 2012? See Section 6.2.
2. How have noise levels of helicopter (emergency and non-emergency) operations changed since 2012 with the change in helicopter types? See Section 6.3.
3. Has there been a change in flight tracks of emergency helicopter operations since 2012? See Section 6.4.

Emergency services helicopter operations include medical, police and fire services. Emergency helicopter operations were identified in this analysis using a combination of flight number, beacon ID and call sign designations including AM (medical), POL (police) and FD (fire services).

6.2. Helicopter daily operation counts

The average daily helicopter operations between 2012 and 2019-20 are shown in Table 7, over. Key trends in the daily helicopter operations between the 2012 and 2019-20 measurement periods are:

- **Non-Emergency Services Helicopters** – there has been a 56% reduction in the daily number of movements of non-emergency services helicopters during ‘day time’ hours (6am-11pm). There were no night time (11pm-6am) non-emergency helicopter operations recorded during either measurement periods (in 2012 or 2019-20).
- **Emergency Services Helicopters** – there has been a 50% increase in the number of emergency service helicopter operations between 2012 and 2019-20 during ‘day time’ hours (6am-11pm). The average number of ‘night time’ (11pm to 6am) emergency helicopter operations has doubled since 2012.

Table 7: Comparison of daily average helicopter movements captured by short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights, between the initial study period (11 August 2012 and 7 September 2012) and the current study period (7 October 2019 to 7 January 2020).

	Time of Day	2012 – average daily movements (1 month data)	2019-20 – average daily movements (3 months data)
Non-Emergency Services	Day (6am-11pm)	3.4	1.5 (-56%)
	Night (11pm-6am)	0.0	0.0 (0%)
	Total	3.4	1.5 (-56%)
Emergency Services	Day (6am-11pm)	3.8	5.7 (+50%)
	Night (11pm-6am)	0.6	1.2 (+100%)
	Total	4.4	6.9 (+57%)
All Helicopters	Day (6am-11pm)	7.2	7.2 (0%)
	Night (11pm-6am)	0.6	1.2 (+100%)
	Total	7.8	8.4 (+8%)

6.3. Helicopter noise event levels

Comparisons of the average single event maximum helicopter noise levels (L_{Amax}) by helicopter type between 2012 and 2019-20 are shown over in Table 8. From the *Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, Queensland Department of Transport and Main Roads 2013*, community perceptions of changes in noise levels can be described as follows:

- <3 dB(A) is not likely to be perceived,
- 3-5 dB(A) may be perceptible, and
- 5-10 dB(A) is likely to be perceptible

Key trends in the daily helicopter operations between 2012 and 2019-20 measurement periods are:

- Single event maximum noise levels (L_{Amax}) for emergency helicopter types (AS65, B412 and A139) were typically >5 dB(A) louder than non-emergency services helicopter types (e.g. Robinson R44). These emergency services helicopters were therefore likely to be perceived as louder than non-emergency services helicopters during each noise event.
- The AS65 helicopter had a consistent L_{Amax} noise level in both monitoring periods, with only 1 dB(A) difference.
- The A139 helicopters were on average quieter than the Bell B412 helicopters. However, the average difference of 2dB(A) is unlikely to be perceived as quieter by community members.

Table 8: Comparison of average single maximum noise event levels (L_{Amax}) in dB(A) for helicopter movements captured by short term noise monitor (NMT-364) in Boeing Reserve at Strathmore Heights between the initial study period (11 August 2012 and 7 September 2012), and the current study period (7 October 2019 to 7 January 2020).

Helicopter Type	Emergency Services	2012		2019-20	
		Event Count	Average L_{Amax} dB(A)	Event Count	Average L_{Amax} dB(A)
Aérospatiale AS-365 Dauphin (AS65)	Yes	61	83	262	82
Bell 412 (B412)	Yes	38	82	-	-
Augusta Westland AW139 (A139)	Yes	-	-	215	80
Other (eg. Robinson R44)	No	75	76	104	73
All Helicopters	-	174	80	589	79

Note: Only overflights with angles of elevation to the noise monitor of $>30^\circ$ have been considered, as per ISO20906:2009 Acoustics — Unattended monitoring of aircraft sound in the vicinity of airports.

6.4. Flight tracks

A comparison of helicopter flight tracks between Airservices 2012 and 2019-20 noise monitoring periods is shown below in Figure 4 and Figure 5. This analysis found that there have been no major changes in the distribution of flight tracks between the two periods.

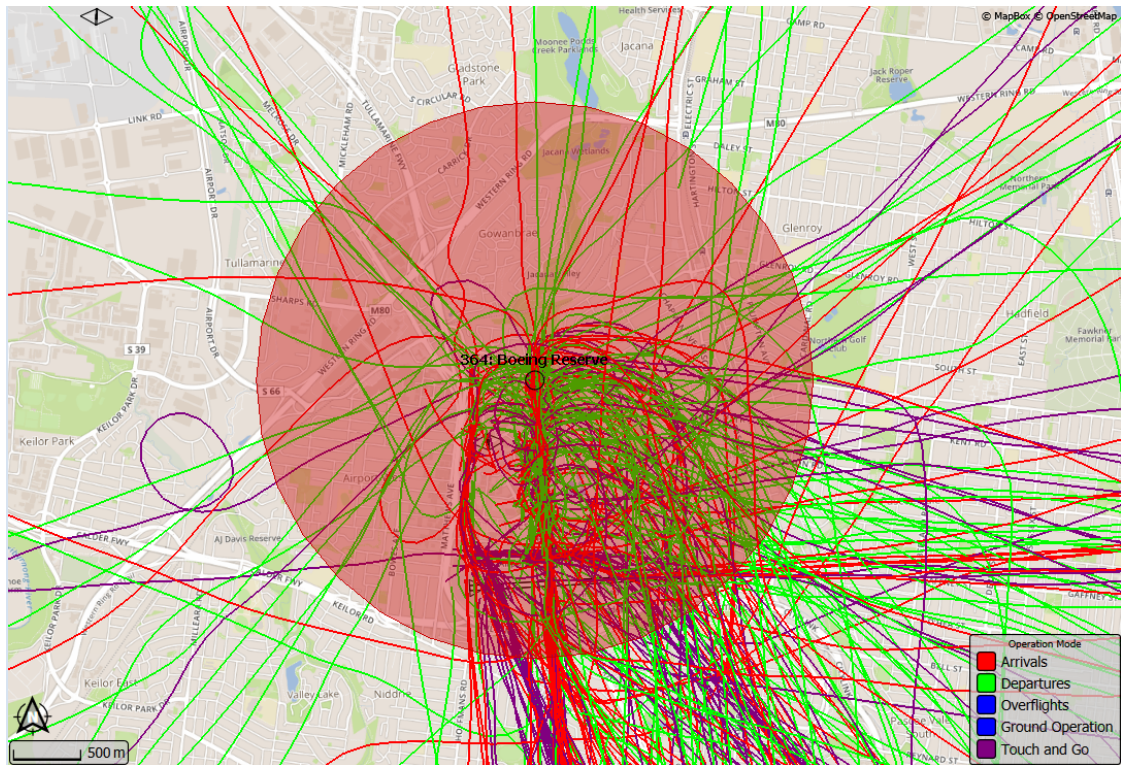


Figure 6: One week (11-17 August 2012) of helicopter flight tracks (238 operations shown) captured by short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights, during the initial study period (11 August 2012 and 7 September 2012). Noise monitor capture zone shown as a pink circle.

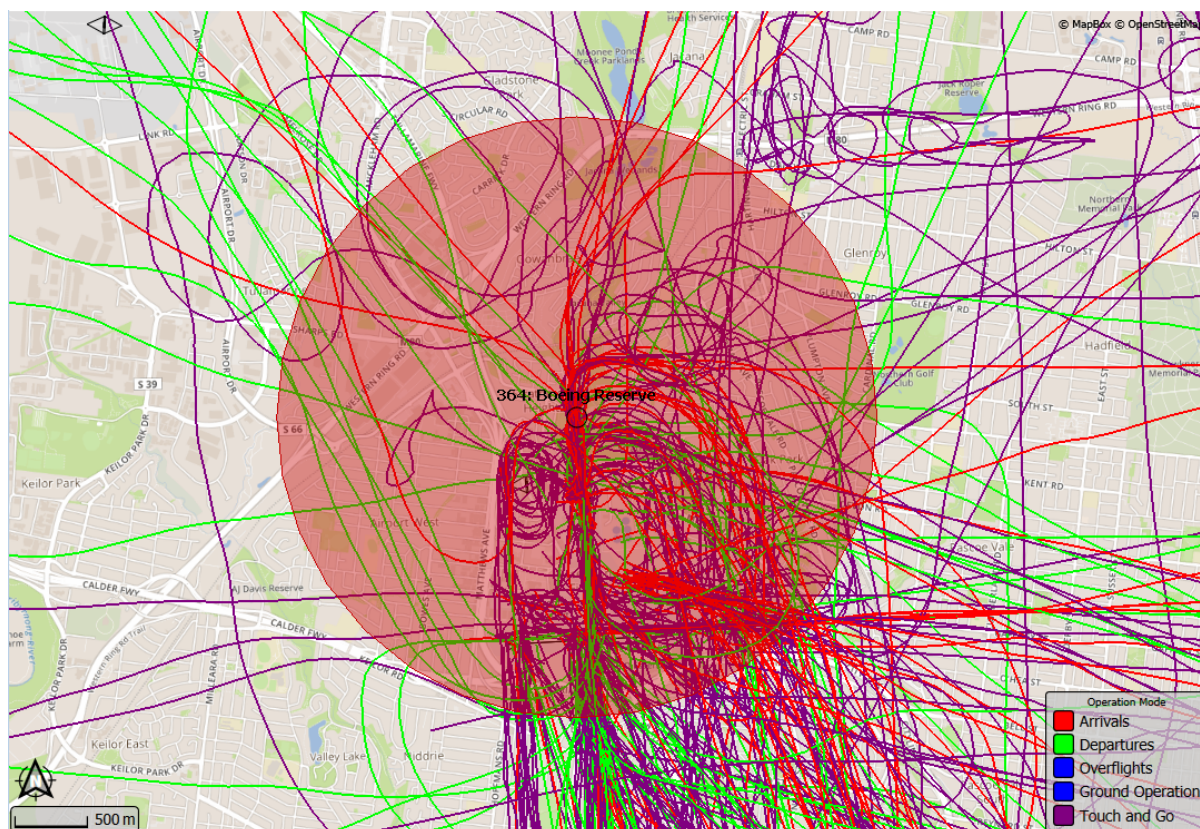


Figure 7: One week (14-20 October 2019) of helicopter flight tracks (242 operations shown) captured by short term noise monitor (NMT-364) at Boeing Reserve in Strathmore Heights during the current study period (7 October 2019 to 7 January 2020). Noise monitor capture zone shown as a pink circle.

6.5. Conclusions of emergency services helicopter noise analysis

Airservices has made the following conclusions regarding noise levels from emergency services helicopter operations at Essendon Airport between the 2012 and 2019-20 short term noise monitoring periods at Strathmore Heights:

- There has been an increase in emergency services helicopter operations between 2012 and 2019-20, with a doubling of average daily operations during the 'night time' period of 11pm to 6am.
- Emergency services helicopters are perceptibly louder than non-emergency services helicopters. The A139 was measured to be 2dB(A) quieter than the B412 helicopters it replaced. However this change is unlikely to be perceived by community members. AS65 noise levels were similar between the 2012 and 2019-20 monitoring periods.
- There have been no major changes to the distribution of flight tracks of helicopter operations at Essendon Airport (both emergency and non-emergency operations).

7. DEFINITIONS

Within this document, the following definitions apply:

Term	Definition
Background noise Level (L ₉₀)	The sound level in dB(A) that is exceeded 90% of the time
Capture Zone	The region around a noise monitor that will record an aircraft movement as a correlated noise event
Correlated Noise Event (CNE)	A noise event matched to an aircraft movement that flew through the capture zone
Day time	6:00am to 11:00pm (as per curfew legislation)
NMT	Noise Monitoring Terminal
General Aviation	Movements other than scheduled commercial airline operations. This includes private, sports, charter and training operations.
L _{Amax}	Maximum sound level in dB(A)
Local	Movement that departs and arrives at the same airport, including circuits and training flights
Movement	An aircraft operation, such as an arrival or departure
Night time	11:00pm to 6:00am (as per curfew legislation)
NMT	Noise monitoring terminal
Noise Event	A noise that exceeds the threshold sound level for longer than the threshold time that is set
Overflight	Aircraft movement that flew over the area but did not arrive or depart from the airport of concern
Threshold	Determined level on noise monitor that triggers a noise event when exceeded
YMEN	Essendon Airport

8. REFERENCES

Title	Document Number
Acoustics - Unattended monitoring of aircraft sound in the vicinity of airports	ISO20906:2009
Air Navigation (Essendon Fields Airport) Regulations 2018	
Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, Queensland Department of Transport and Main Roads 2013	