Short Term Noise Monitoring Program, *Wynnum*

21 December 2023 – 13 October 2024

Version Control

Version	Date	Comments	Sections
1.0	29 January 2025	Initial Version	All

Summary

Deployment Purpose

This deployment aims to capture noise levels of non-jet departures from runway 19L turning sharply over the Brisbane River towards Moreton Bay.

Deployment monitoring Period

The short-term noise monitoring program in Wynnum/Wynnum West was carried out through three separate deployments:

- Astley Street, Wynnum West: 21 December 2023 – 15 May 2024
- Jared Place, Wynnum West: 13 March 2024 – 12 June 2024
- Constellation Way, Wynnum: 9 May 2024 – 13 October 2024 (Final deployment is the focus in this report)

Monitoring Details

Capture zone: 2.5km radius x 6,561ft (2,000m) altitude.

Noise threshold settings by time of day: 00:00-06:59 = Threshold 54dB(A), 07:00-09:59 = Threshold 56dB(A), 10:00-20:59 = Threshold 53dB(A), 21:00-23:59 = Threshold 51dB(A)

Key Findings

- Noise Correlation

  79.6% of the focus group aircraft were correlated to a noise event.
- Noise Daily Distribution

  The distribution of the maximum noise levels generated by aircraft falls within the following ranges:

  - 64.8% within the range of 60dB(A) to 70dB(A)
  - 31.4% less than 60dB(A)
  - 3.8% greater than 70dB(A)
- Most Common aircraft

  The most prevalent aircraft type during the deployment period was the DH8D aircraft.
- Top loudest noise events

  The top 10 noise events for this deployment originated from community sources, with one of the top 10 correlated noise events also associated with community sources in addition to aircraft noise.
- Busiest Day

  The purpose was to analyze the day that had the most significant impact on the community. The busiest day during the deployment period was Wednesday 9 October 2024.

Glossary of Terms

A	Arrivals
Background noise Level (L90)	The noise level in dB(A) that is exceeded 90% of the time. It is considered the background noise level of an environment.
Capture Zone	The region relative to the noise monitor that an aircraft can be within and be able to be correlated to a noise event.
Correlated Noise Event (CNE)	A noise event matched to an aircraft movement that flew through the capture zone.
D	Departures
Data Availability	The degree of data completeness achieved during the deployment period. The data availability percentage factors in any monitor outages that occur.
Day	6:00am-10:00pm
dB(A)	A-weighted decibel. It is an expression of the relative loudness of sounds as perceived by the human ear.
H	Helicopter operations
LaMax	Each noise event will have a peak noise level which is referred to as the maximum sound level in dB(A) or LaMax
Movement	An aircraft operation, such as an arrival or departure
Night	10:00 pm to 6:00 am
NMT	Noise Monitoring Terminal also referred to as the noise monitor.
Noise Event	A noise event is created when the noise level exceeds the threshold settings for a specified period.
O	Overflight i.e. an aircraft movement that flew over the area but did not arrive or depart from the airport of concern.
Overall Correlation Percentage	The total number of correlated noise events (CNE) is divided by the total number of aircraft movements through the capture zone to calculate the overall correlation percentage.
RWY	Runway
T	An operation by an aircraft that arrives and departs on a runway without stopping or exiting the runway. It is also known as Touch and Go.
Threshold	The threshold represents the value that the noise level must surpass for a specified period to create a noise event.
YBBN	Brisbane Airport, Queensland

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1 Purpose

The short-term noise monitoring program targets locations in suburbs chosen by Airservices Australia with consideration for community feedback. This deployment aims to capture noise levels of non-jet departures from runway 19L turning sharply over the Brisbane River towards Moreton Bay. Furthermore, we conducted an extensive analysis on a selected day, specifically the busiest day of the deployment period. This day was chosen for its potential to provide significant statistical data and insight into a day that had the greatest impact on the community during the deployment. The analysis provided details of the loudest noise events experienced and the most prevalent aircraft operations observed.

The short-term noise monitoring commenced in December 2023 with the installation of the first noise monitoring terminal (NMT) on Astley Street, Wynnum West. In January 2024, environmental background levels changed at this location, with increased community noise from birds, dogs, and vehicles contaminating the correlated aircraft audio captured by the NMT. Additionally, it was found that non-jet departures turning sharply from runway 19L were not captured.

Therefore, a second NMT was deployed at Jared Place, Wynnum West, in March 2024. It was positioned closer to the focus group flight path, on an inner road. However, it was found that not all non-jet departures from runway 19L, particularly those turning sharply, were captured. Further adjustments to the location were required to capture all focus group aircraft operations.

A third NMT was installed on Constellation Way, Wynnum, in May 2024. It was positioned directly under the non-jet departures from runway 19L, where aircraft turned sharply towards the water. Additionally, the location was chosen for its low community noise interference, as it was situated away from main roads and wildlife. This report provides a detailed analysis of the third deployment.

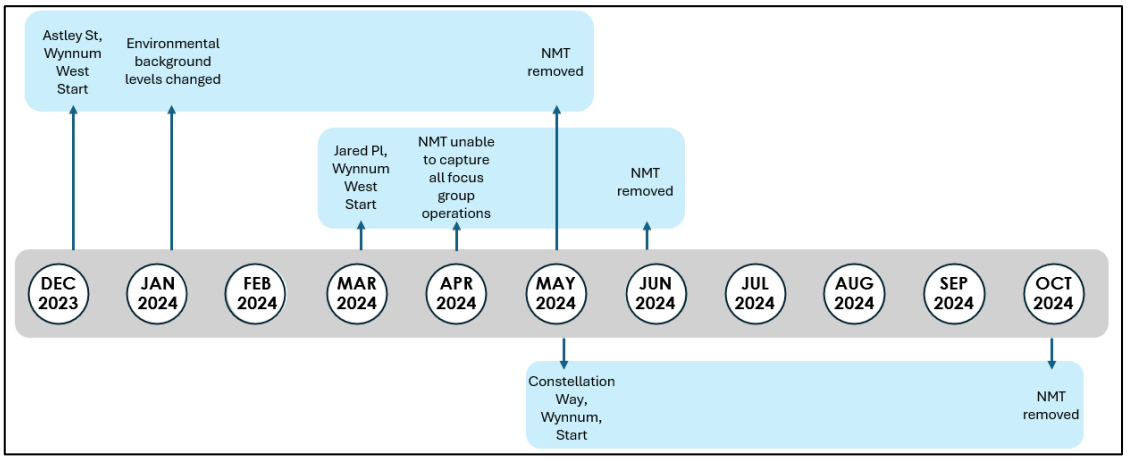

Figure 1: Wynnum/Wynnum West NMT deployment timeline

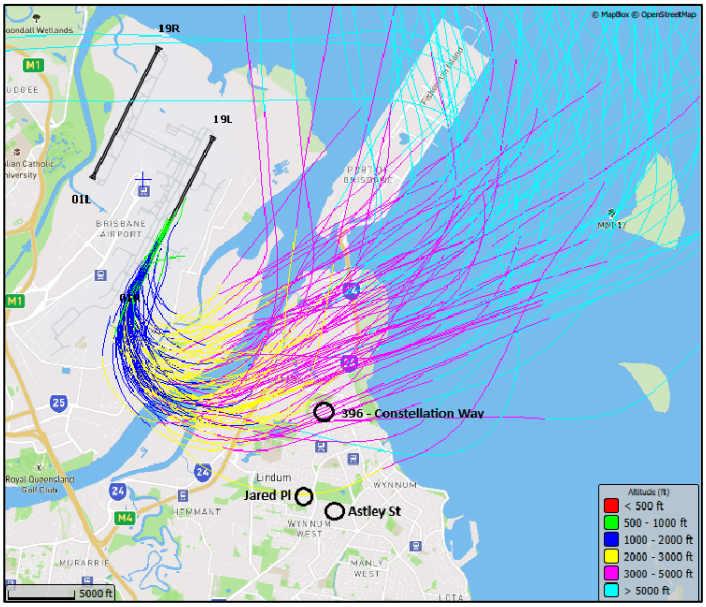

Figure 2: All Wynnum NMT deployment locations

This final short-term monitor was deployed in the northern part of Wynnum. The NMT was positioned to capture aircraft within a three-dimensional cylinder capture zone. The zone spans a radius of 2.5km and extends to 6,561ft (2,000m) above the NMT site level as depicted in Figure 3. Considering that the focus group of aircraft operate below 5,000ft (1,524m) in this location, a ceiling of 6,561ft (2,000m) was adopted to accommodate potential variations.

The Focus Group for this deployment consists of aircraft operating to the south of Brisbane Airport which includes:

- Non-jet aeroplanes departing from runway 19L of YBBN turning sharply over the Brisbane River towards Moreton Bay.

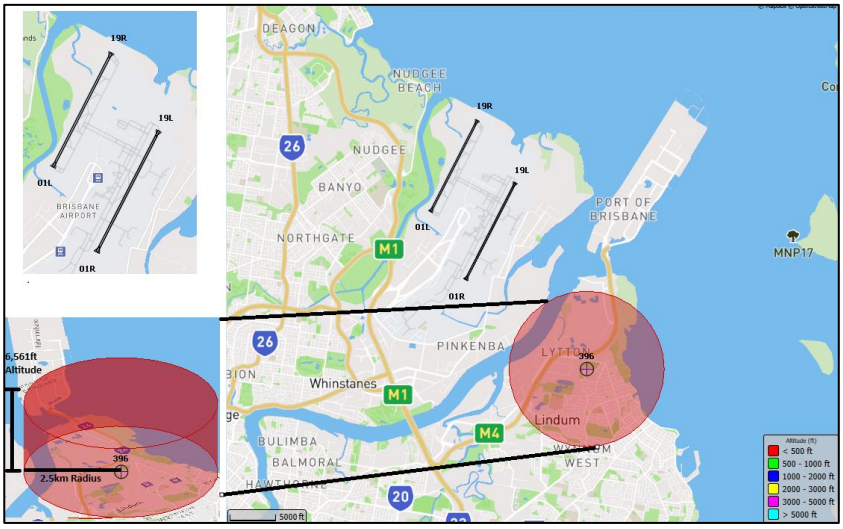

Figure 3: NMT396 Wynnum Correlation Zone

2 Deployment Details

The Wynnum monitor (focus of this report) was installed on 8 May 2024 and removed on 14 October 2024. Complete data is available from 9 May 2024 to 13 October 2024.

NMT ID	396
Deployment Period	09/05/2024 – 13/10/2024
Location	Constellation Way, Wynnum, QLD 4178
NMT Altitude	56ft (17m)
Capture Zone	2.5km radius x 6,561ft (2,000m) altitude
Data Availability	99.97%
Threshold Settings[1]	The noise detection thresholds which have been selected: • 00:00-06:59 = Threshold 54dB(A) • 07:00-09:59 = Threshold 56dB(A) • 10:00-20:59 = Threshold 53dB(A) • 21:00-23:59 = Threshold 51dB(A)

Table 1: NMT Details

3 Findings

3.1. Noise Correlation Summary

The total number of aircraft correlated noise events (CNE) that were captured by the noise monitor during the 5-month deployment period is shown in Table 2 below.

	All Movements[2]	Brisbane Airport Movements	Brisbane Airport Focus Group
Number of Movements through capture zone	1,643	1,555	445
Number of CNE	1,175	1,111	354
Correlation Summary	71.5%	71.4%	79.6%

Table 2: Aircraft correlation rate

94.6% of all operations that passed through the capture zone were Brisbane Airport movements. A one-week sample of these movements is shown in Figure 4, below. Other operations included traffic from other airports, including Amberley, Archerfield, and Wellcamp Airports. A correlation of 79.6% was achieved for the focus group of Brisbane Airport movements.

[1] Threshold setting procedures are explained in section 6.1.1.
[2] All-movement tab accounts for operations to and from other airports (E.g. Amberley, Archerfield and Wellcamp) as well as YBBN operations.

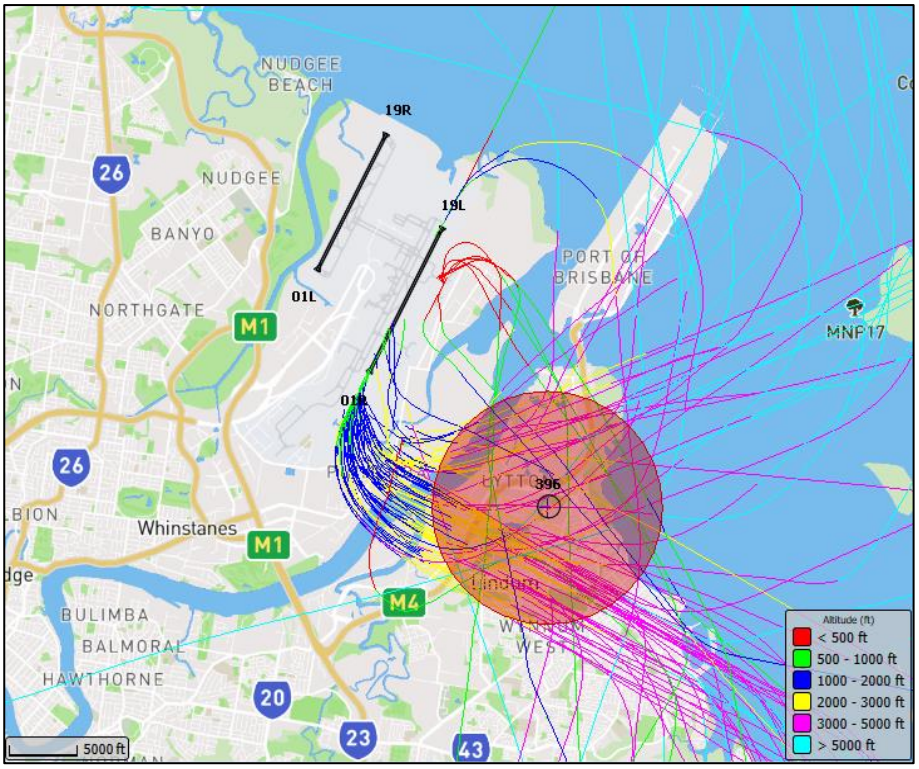

Figure 4: One week of Brisbane Airport flight tracks passing through the correlation zone

The findings obtained during the short-term deployment at Wynnum are as follows:

- Departure runways 19L, H and 01R accounted for 84.5%, 3.3% and 2.1% of the operations respectively from Brisbane Airport over the noise monitor. The distribution of aircraft types departing from runway 19L is as follows:
  - 95.2% turboprop operations (37.0% of these turboprop operations involved early turns towards the water)
  - 3.4% piston aircraft operations (48.0% of these piston operations involved early turns towards the water)
  - 1.4% jet aircraft operations
- Arrival runway 19L and H account for 0.5% and 6.4% of the operations respectively from Brisbane Airport over the noise monitor.
- The average LaMax and highest LaMax for arrival and departure runways are detailed in Table 3, below.

Operation Type	Runway	Average LaMax noise dB(A)	Highest LaMax dB(A)
Brisbane Airport Departure	19L	63.0	75.8
Brisbane Airport Departure	H	67.2	73.1
Brisbane Airport Departure	01R	63.1	70.5
Brisbane Airport Arrival	19L	63.8	68.5
Brisbane Airport Arrival	H	68.4	78.2
Focus Group	19L	62.7	72.2

Table 3: Average LaMax and highest LaMax noise levels corresponding to each runway.

3.2. Daily Distribution of Correlated Noise Events

A summary of the total number of CNE by time of day, and the minimum to maximum number of CNE on any day, are summarized below in Table 4.

CNE	Day Time Count (6:00am-10:00pm)	Night-time Count (10:00pm-6:00am)	Min number of CNE per day	Max number of CNE per day
N- Above[3] 50 dB(A) (N50+[4])	783	372	1	23
N- Above 60 dB(A) (N60+[4])	571	226	0	21
N- Above 70 dB(A) (N70+[4])	41	3	0	2

Table 4: Total CNE during deployment period by time

Examination of the N-above distribution values in Figure 5 and Figure 6 (below) show that the highest daytime noise levels (N70+) were recorded on 18 May 2024, 24 May 2024, 30 May 2024, 15 June 2024, 26 June 2024, 08 July 2024 and 9 October 2024. The highest nighttime (N70+) distribution peaks were observed on 25 September 2024, 27 September 2024 and 11 October 2024. 64.8% of the maximum noise level generated by aircraft falls within a range of 60dB(A) to 70dB(A), 31.4% of the maximum noise level generated by aircraft is less than 60dB(A) and 3.8% of the maximum noise level generated by aircraft is greater than 70dB(A).

[3] N-above (or Number-above) is defined as the number of noise events with a LaMax above the specified (eg.N50+) value.

[4] N50+, N60+, N70+ are expressed as number of noise events with a LaMax above 50dB(A), 60 dB(A) and 70 dB(A), respectively.

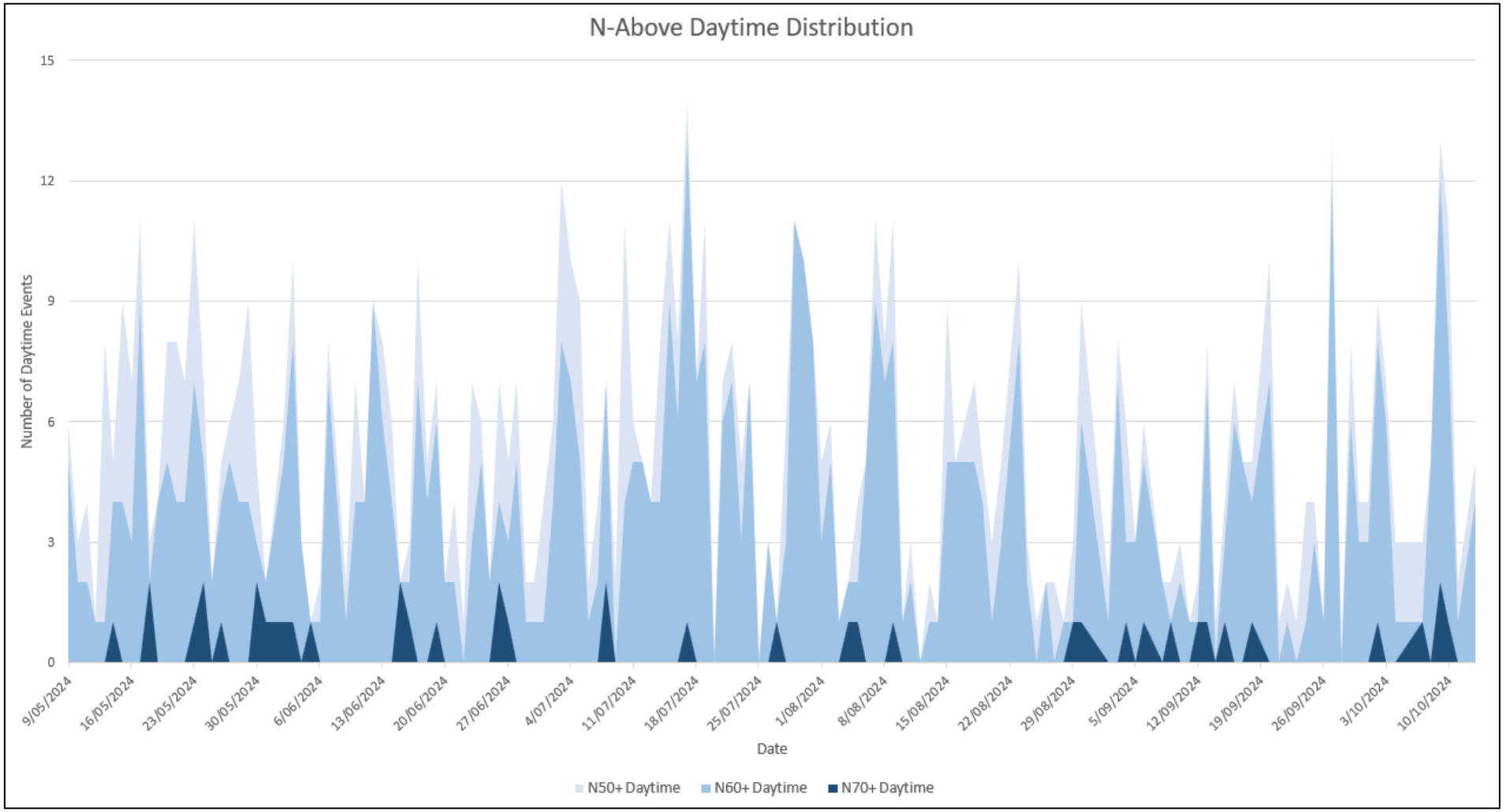

Figure 5: Daytime Daily N-Above Distribution Graph

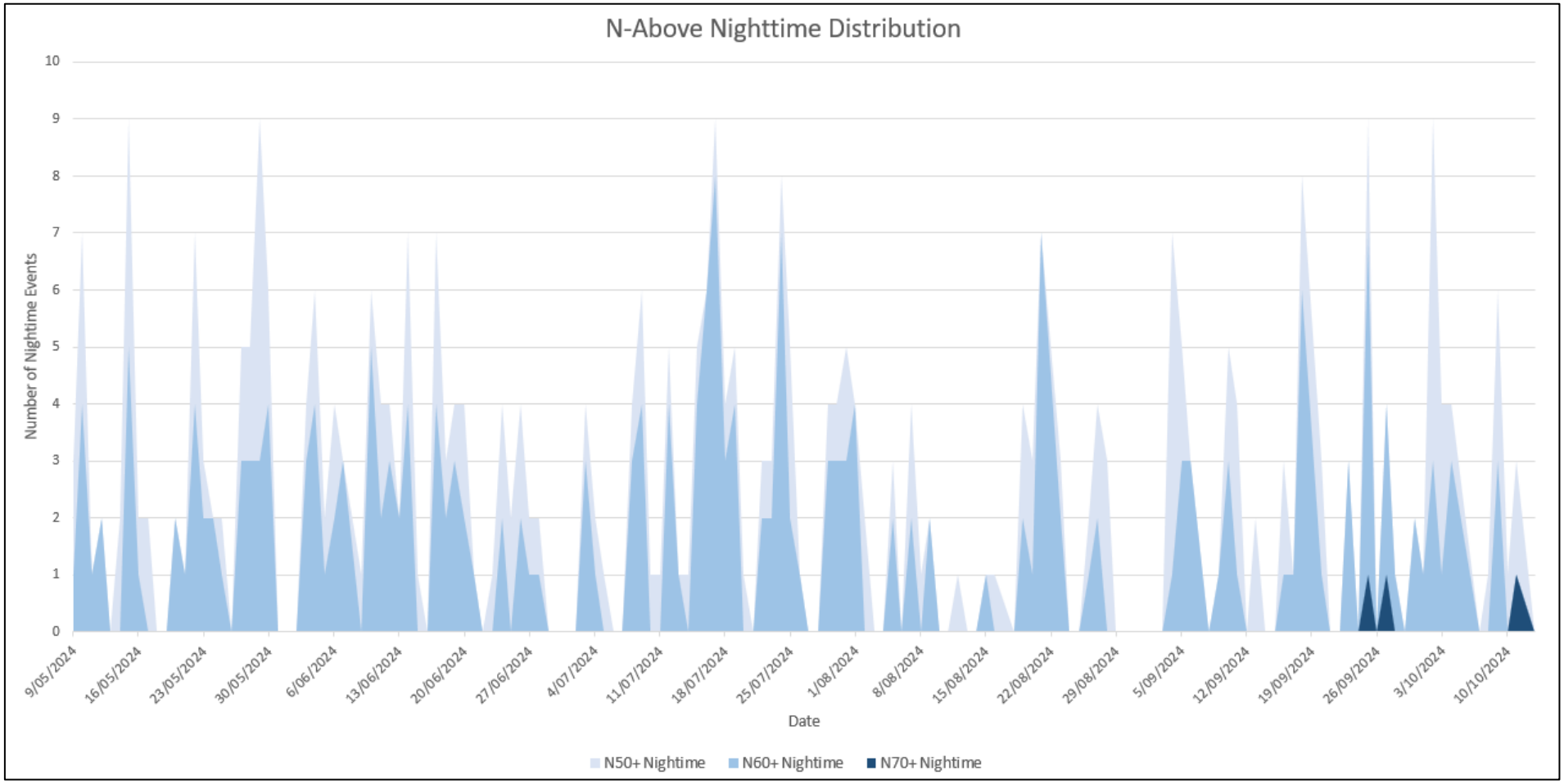

Figure 6: Nighttime Daily N-Above Distribution Graph

3.3. Most Common Aircraft

The most common aircraft type that flew through the zone during the deployment period is a DH8D aircraft as shown in Table 5, below.

Brisbane Airport Operation Type	Operations	Correlated %
Arrival	-	-
Departure	373	68.1%
Touch and Go	1	100.0%
Overflight	-	-

Table 5: DH8D correlation percentage across the deployment period

3.4. Top 10 Correlated Aircraft

The following table shows the average and maximum noise levels for the 10 most common aircraft registering a CNE during the deployment period from 9 May 2024 to 13 October 2024. The highest average LaMax of 68.2 dB(A) is attributed to A139 helicopter arrival.

Aircraft Type	Aircraft Category	Airport Code	Operation Type	Runway	Total CNE	Average LaMax dB(A)	Max dB(A)
DH8D	T	YBBN	D	19L	258	61.5	67.5
SF34	T	YBBN	D	19L	211	63.3	70.7
SW4	T	YBBN	D	19L	199	63.1	70.5
A139	H	YBBN	A	H	68	68.2	78.2
C441	T	YBBN	D	19L	63	61.9	66.6
D228	T	YBBN	D	19L	56	60.4	65.3
BE20	T	YBBN	D	19L	43	62.8	68.8
JS32	T	YBBN	D	19L	28	62.4	68.4
A139	H	YBBN	D	H	25	68.1	73.1
AT75	T	YBBN	D	19L	21	62.5	68.5

Table 6: Top 10 aircraft in the deployment period by total CNE

Aircraft Type: *T = Turboprop, H = Helicopter.* ***Operation Type:*** *D = Departure, A = Arrival*

3.5. Noise Event Analysis

The audio verification process involved listening to and confirming the accuracy of the top 100 loudest (LaMax) noise events.

Table 7 outlines the top 10 noise events from all sources. The maximum noise levels (LaMax) of the noise events for this deployment originated from community sources such as birds, vehicles, machinery and train horn.

Table 8 outlines the top 10 CNE (that is, correlated with aircraft noise). The maximum noise levels (LaMax) of CNE for this deployment originated from other nearby local airport movements (Overflights) as well as Brisbane Airport movements.

Some CNE were associated with community sources in addition to aircraft. This can be seen in the 'noise source' details in Table 8 and Figure 7. Consequently, there may be some benefit in conducting further noise monitoring in this location to explore and confirm the spectrum of noise levels attributed to aircraft, with the exclusion of any impact from community noise contamination.

Future aircraft noise monitoring in the Wynnum area can achieve greater precision by:

- Choosing a location further away from the railway line to minimise contamination of the aircraft noise events from the community.
- Choosing a location with fewer trees will minimise the contamination of the aircraft noise events by wildlife.

Start Date/Time	Correlated to Aircraft?	LaMax dB(A)	Noise Source	Aircraft Type	Operation Type	Runway
29/08/2024 06:52	No	98.8	Birds	-	-	-
14/07/2024 15:25	No	91.6	Vehicle	-	-	-
13/05/2024 12:07	No	90.3	Machinery	-	-	-
03/10/2024 17:34	No	89.2	Vehicle	-	-	-
23/09/2024 04:58	No	88.7	Vehicle	-	-	-
01/09/2024 13:59	No	88.7	Train horn	-	-	-
27/08/2024 15:03	No	88.5	Train horn	-	-	-
10/07/2024 10:21	No	88.5	Birds	-	-	-
27/08/2024 13:43	No	87.7	Train horn	-	-	-
18/08/2024 18:13	No	87.7	Vehicle	-	-	-

Table 7: Top 10 loudest noise events during the deployment period by LaMax

Start Date/Time	Movement Airport[5]	LaMax dB(A)	Noise Source	Aircraft Type	Operation Type[6]	Runway
02/06/2024 17:23	Brisbane	78.2	Aircraft	A139	A	Heli
06/09/2024 17:28	Brisbane	77.8	Aircraft	A139	A	Heli
15/09/2024 14:29	Brisbane	77.6	Aircraft	A139	T	Heli
24/05/2024 17:28	Brisbane	75.9	Aircraft	A139	T	Heli
09/10/2024 17:03	Brisbane	75.8	Aircraft and thunder	GLEX	D	19L
18/05/2024 07:22	Brisbane	74.9	Aircraft	AS50	A	Heli
30/05/2024 10:34	Brisbane	74.9	Aircraft	A400	D	19L
05/07/2024 09:50	Overflight	74.8	Aircraft	B429	O	Heli
12/09/2024 19:27	Brisbane	74.1	Aircraft	B738	D	19L
30/08/2024 12:53	Brisbane	73.9	Aircraft	A139	A	Heli

Table 8: Top 10 loudest aircraft CNE during the deployment period by LaMax

[5] Overflights refers to movements from Amberley Airport, Archerfield Airport, Toowoomba Airport, etc. [6] Operation types A = Arrival, D = Departure, O = Overflight, T = Touch and Go

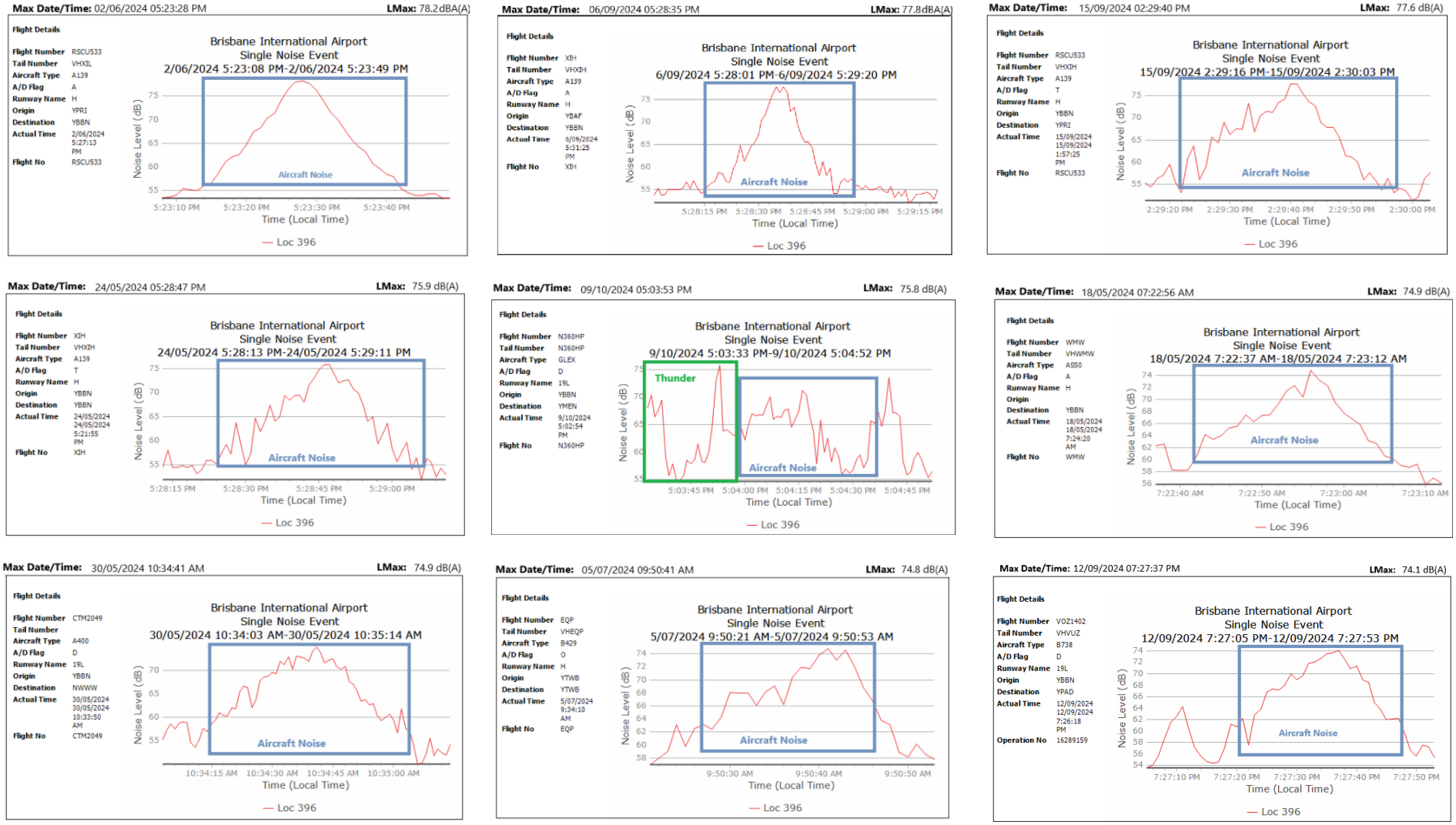

Figure 7: Top 9 CNE from Table 8 graphed and analysed.

4 Busiest Day Analysis

4.1. Discussion

The busiest day during the deployment period occurred on 9 October 2024, with a total of 235 noise events. The noise events consisted of turboprops, birds, trains, machinery, thunder, wind and vehicle noise. There were 26 aircraft captured passing through the zone from Brisbane Airport movements, of which 11 aircraft operations were from the focus group. The predominant movement over the capture zone was from turboprop operations, accounting for 21 of the 26 aircraft operations (including turboprops travelling to destinations to the south and east).

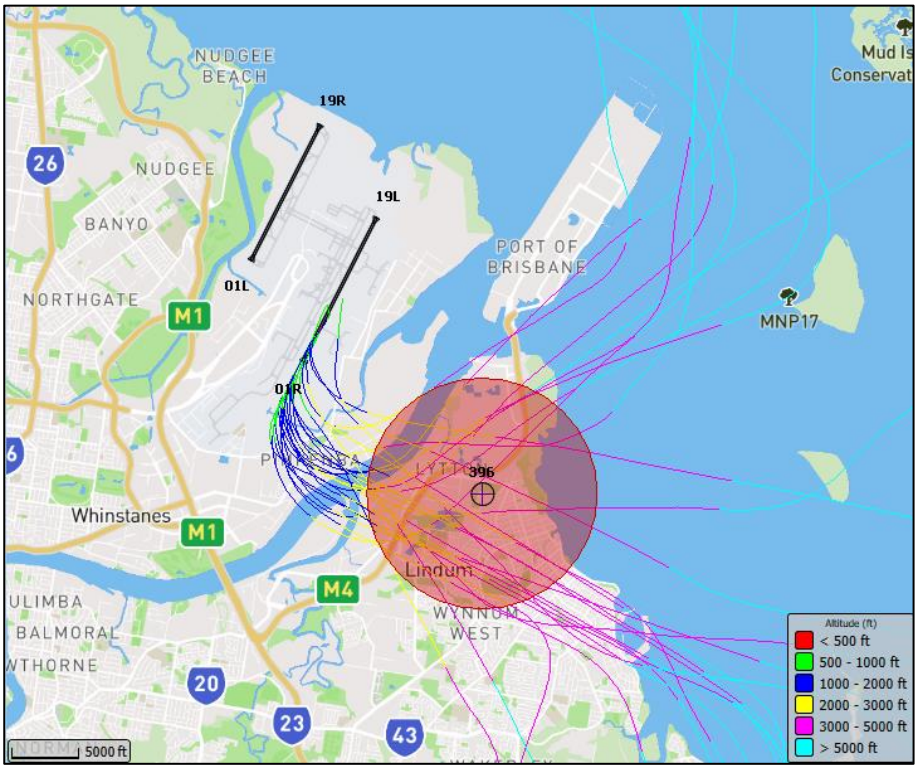

Figure 8: Busiest day flight tracks

4.2. Busiest Day Graph

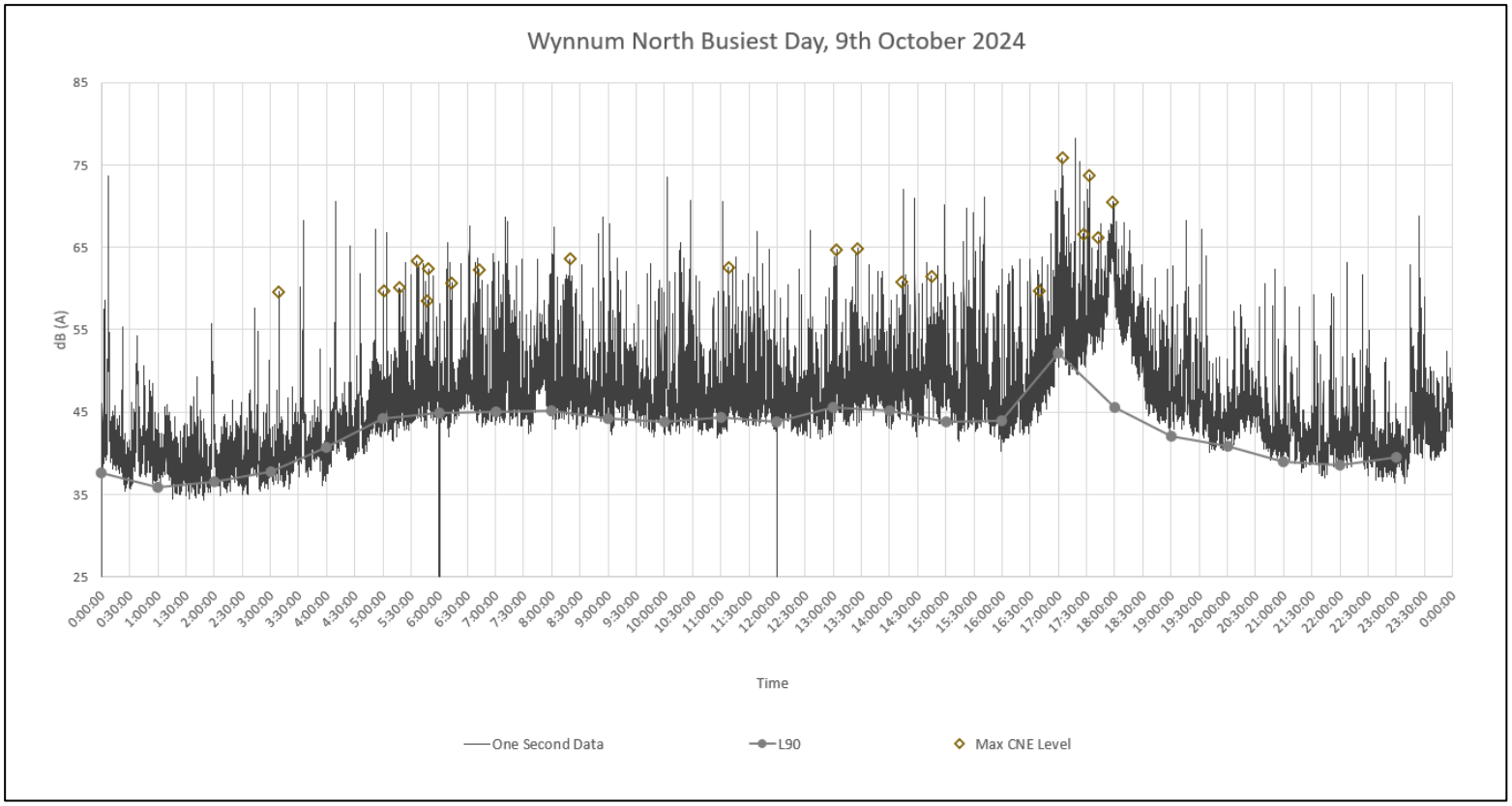

Figure 9: Distributions of hourly L90, max CNE level and one-second noise data on the busiest day. Hourly L90 refers to background noise levels; see Section 6.1.1 for more information. Max CNE level refers to the maximum noise level of the noise event, known as LaMax, which occurs when the aircraft is within the capture zone of the noise monitor; see Section 6.1.2 for more information. One-second noise data refers to the sound levels that are recorded every second by the noise monitor.

4.3. Busiest Day Noise Levels

The loudest event on the busiest day was created by wind and thunder, reaching a maximum noise level of 78.2 dB(A) at 17:17:40 in the afternoon, lasting for 80 seconds.

The loudest Brisbane Airport movement on the busiest day was created at 17:03:53 in the afternoon, registering a maximum noise level of 75.8 dB(A).

5 Further Information

The following platforms provide further information on Brisbane aircraft noise monitoring.

5.1. Airservices Australia

Information on the noise and flight path monitoring system including approach to noise monitoring and frequently asked questions:
https://www.airservicesaustralia.com/community/environment/aircraft-noise/monitoring-aircraft-noise/

5.2. Aircraft in Your Neighbourhood

Brisbane Noise Monitoring Report (interactive tool to explore monthly noise monitoring data):
https://aircraftnoise.airservicesaustralia.com/2020/10/29/brisbane-noise-monitoring-report/

The Brisbane Noise and Flight Path Monitoring System (long term noise monitor terminal locations):https://aircraftnoise.airservicesaustralia.com/2020/06/03/the-brisbane-noise-and-flight-path-monitoring-system-nfpms/

5.3. WebTrak

Aircraft noise data is displayed from live noise monitors across Brisbane, along with historical data: https://webtrak.emsbk.com/bne3

5.4. Brisbane Airport

Dashboard for live noise monitor and PDF reports from past monitor locations provided by Brisbane Airport Corporation (all short term monitor placements):
https://www.bne.com.au/corporate/community-and-environment/flight-paths-aircraft-noise/noise-management

6 Appendix

6.1. Noise Event Detection Details:

ISO 20906 provided technical guidance in this short-term noise monitoring. The NMT (i.e., sound level monitor) used for testing passed the Class 1 periodic calibration tests outlined in clauses of IEC 61672-3:2013 and IEC 61260-3:2016. The placement of NMT considered the vicinity of reflective surfaces and the height of the NMT relative to the target aircraft operations to minimise potential unintended anomalies. The NMT height is fixed on a supporting pole and the captured noise events were observed acceptable throughout the deployment. The background noise levels were taken into account in the monitoring area, to appropriately capture aircraft noise levels.

6.1.1. Threshold Settings

Noise monitor threshold settings are established by collecting hourly average L90 data over a period of two to five days following installation of the noise monitor. L90 represents noise level which are exceeded 90% of the time. It is considered the background noise level of an environment. For instance, if the L90 hourly noise level reads 50dB(A), it means that for 90% of that hour, the noise level is above 50dB(A). The threshold is set close to the average L90+10dB(A). The addition of 10dB(A) effectively filters out most community noise, such as birds and animal sounds, machinery, and vehicle noises. As a result, the created noise event will predominantly contain aircraft noise with minimal community noise.

6.1.2. Aircraft and Noise Event Correlation

The correlation of a noise event with an aircraft requires meeting the following conditions:

- The aircraft passes through the defined capture zone set by the monitor as shown in Figure 3.
- The rise and fall time of the measured event matches a sound pattern representative of an aircraft flyover.
- Noise levels are greater than the specified threshold for a specified period when aircraft flies over, this creates a noise event.
- Maximum noise level of the noise event known as LaMax must occur while the aircraft is within the capture zone of the noise monitor.

Aircraft that flew within the vicinity of the monitor but did not trigger a CNE may have failed to meet some of the parameters above. In other instances, this could be attributed to the lack of air traffic control data (ATC). This occurs when aircraft do not have an operating transponder or when there are radar outages. Despite a noise event being created by the aircraft, without available ATC data, there will be no aircraft to correlate with the noise event.

6.2. Calibration Check

The integrity of the noise monitor relies on regularly verifying the accuracy of the microphone recording levels and time synchronisation of samples with radar data. The microphones are replaced with laboratory certified microphones every 12 months and electrostatic calibration tests are automatically performed daily to ensure data quality.