BRISBANE AIRPORT

TARINGA SHORT-TERM NOISE MONITORING

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PREPARED FOR

BRISBANE AIRPORT CORPORATION PTY LTD
11 THE CIRCUIT
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TABLE OF CONTENTS

GLOSSARY OF TERMS

L_{Amax}	The maximum noise level over a sample period is the maximum level measured during the sample period. For aircraft noise, the maximum noise level is measured using slow response.
N-above	'Number-above', or 'N-above', describe the number of aircraft noise events that exceed a particular noise threshold. The most common 'N-above' are N70 and N60, describing the number of events above 70 dB(A) and 60 dB(A) respectively.
RNP-AR	Required Navigation Performance Authorisation Required (RNP-AR) is a precision arrival or departure procedure which uses satellite navigation. RNP-AR is typically developed to provide a shortened arrival procedure (as is the case at Brisbane Airport).
ILS	Instrument Landing System is a radio navigation system. ILS is typically available in most weather conditions, including poor conditions that may prohibit some other navigation methods. ILS require a long, straight arrival path.
CNE	Correlated Noise Events (CNE) are events recorded in the noise monitoring data that are correlated with a simultaneous aircraft operation nearby, for which valid air traffic surveillance data has also been collected.
AHD	The Australian Height Datum (AHD) is the official national vertical datum for Australia.

AIRCRAFT TYPES AND ABBREVIATIONS

717-200	Boeing 712-200 (narrow body jet)
737-300	Boeing 737-300 (narrow body jet)
737-400	Boeing 737-400 (narrow body jet)
737-700	Boeing 737-700 (narrow body jet)
737-800	Boeing 737–800 (narrow body jet)
777-300ER	Boeing 777-300ER (wide body jet)
787-8	Boeing 787-8 (wide body jet)
787-10	Boeing 787-10 (wide body jet)
A320-200	Airbus A320-200 (narrow body jet)
A321-200	Airbus A321-200 (narrow body jet)
A330-200	Airbus A330-200 (wide body jet)
A350-900	Airbus A350-900 (wide body jet)
A350-1000	Airbus A350-1000 (wide body jet)
A380-800	Airbus A380-800 (wide body jet)
B463	British Aerospace BAe-146-300 (narrow body jet)
E190	Embraer E190-100 (narrow body jet)
F100	Focker 100 (narrow body jet)
F70	Focker 70 (narrow body jet)
DH8D	DeHavilland Dash 8 (turbo propeller)
SF34	Saab 340 (turbo propeller)
BE20	Beech 200 Super King Air (turbo propeller)

1 INTRODUCTION

Brisbane Airport operates a north-south oriented parallel runway system. The system comprises the legacy runway, Runways 01R/19L, and the new runway, Runways 01L/19R.

Brisbane Airport Corporation (BAC), in cooperation with Airservices Australia (Airservices) engaged Envirosuite to undertake short-term noise monitoring in Taringa in response to community enquiries regarding aircraft noise. SoundIN Pty Ltd (SoundIN) has been engaged by BAC to review and analyse the results of that noise monitoring. This report details the results of that analysis.

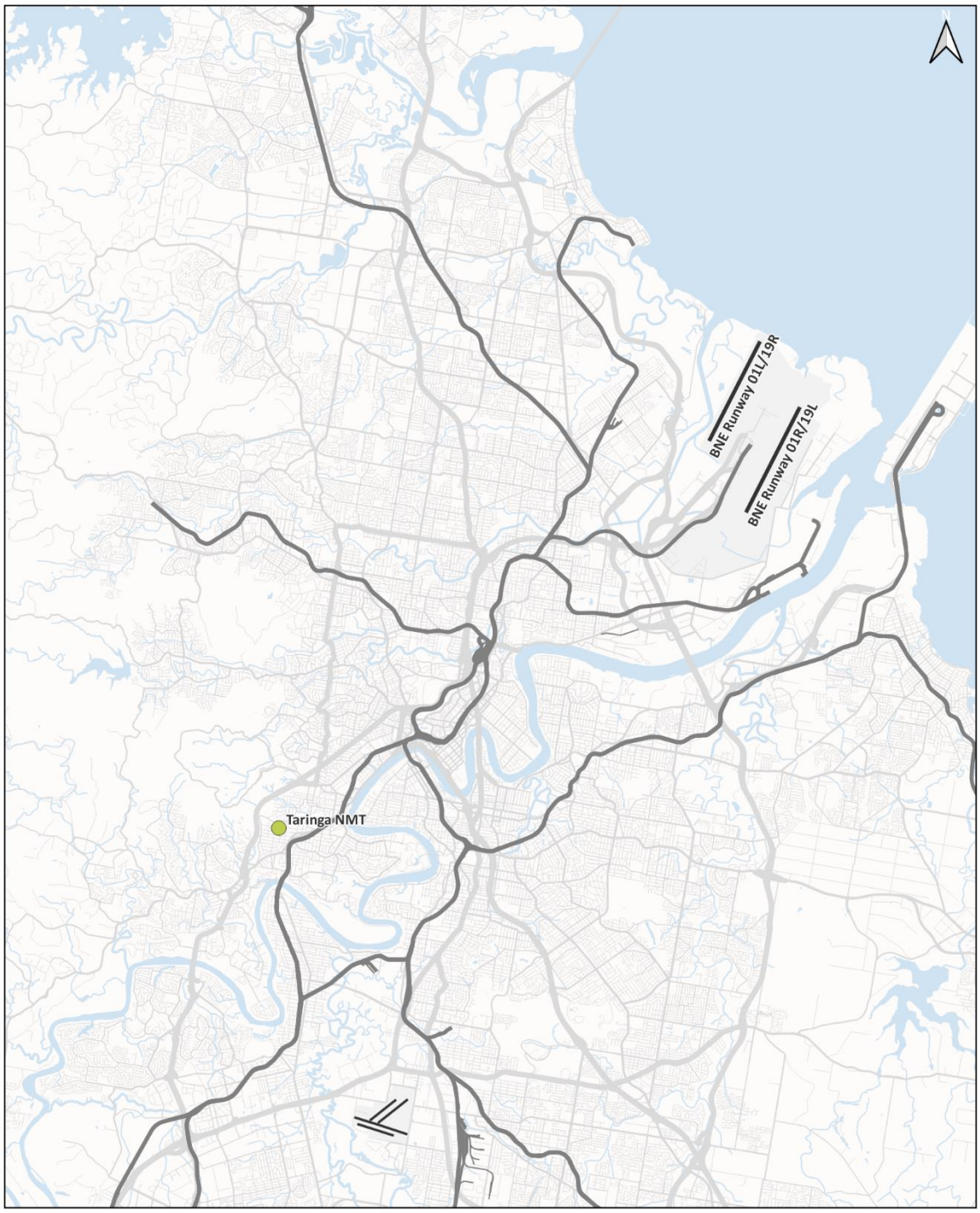
Short-term noise monitoring is periodically undertaken by BAC at locations surrounding the airport based on community feedback. This short-term noise monitoring augments the permanent Noise and Flight Path Monitoring System (NFPMS) operated by Airservices.

The short-term monitoring detailed in this report was undertaken for the purposes of:

- Recording the aircraft noise levels at the Taringa site from aircraft arriving and departing from Brisbane Airport; and
- Recording the relative altitude of aircraft overflying those areas; and
- Facilitating an investigation into noise and flight path data affecting the area.

Brisbane Airport and the noise monitoring site are indicated in **Figure 1-1**.

Figure 1-1 Site Locality



TARINGA SHORT-TERM NOISE MONITORING

SITE LOCALITY

LEGEND

Noise monitor

0 2 4 6 8 km

Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to the noise assessment.

2 NOISE MONITORING DESCRIPTION

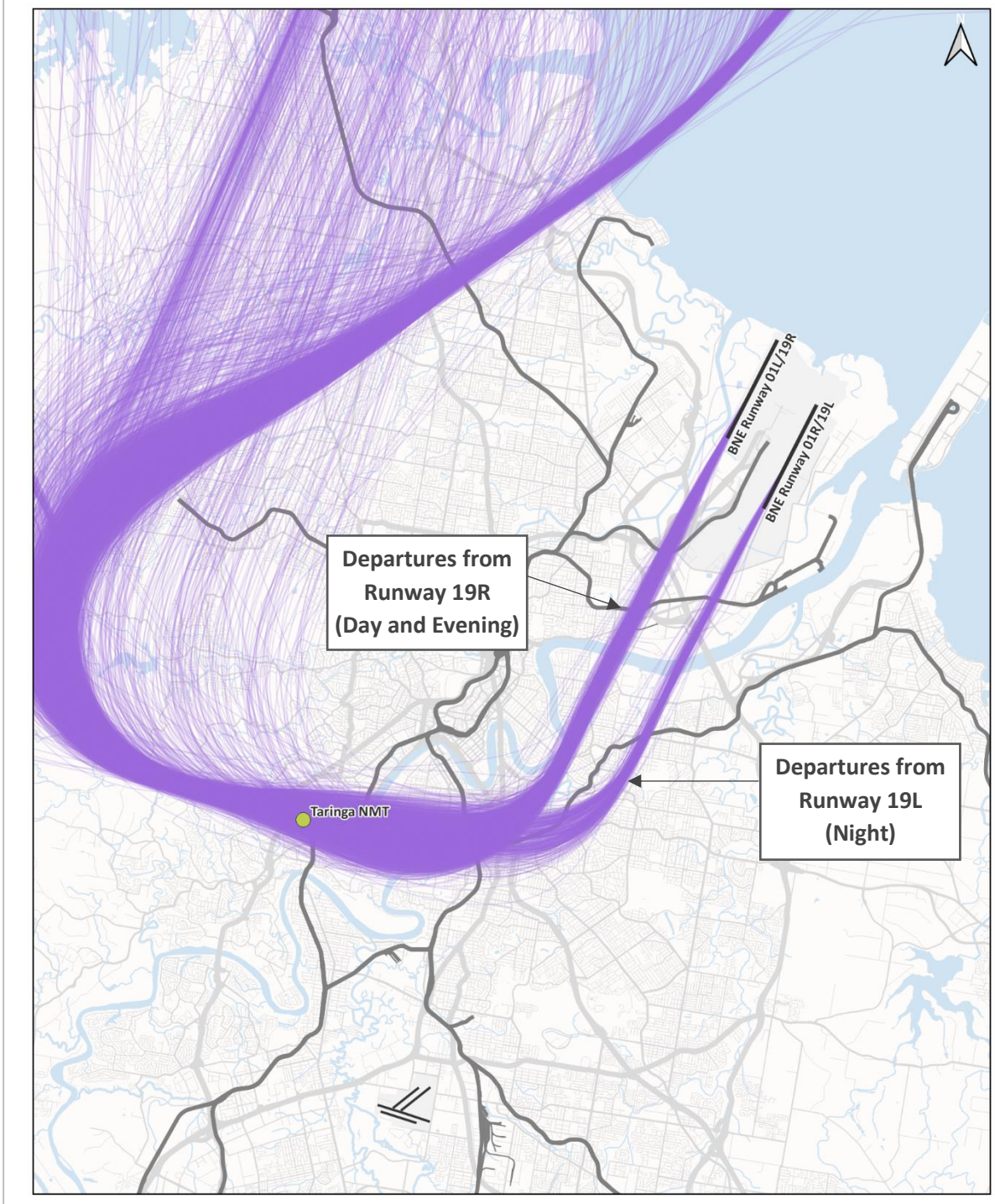
2.1 Details of the Short-Term Noise Monitor Deployment

The following details of the noise monitor deployments are pertinent.

- Monitoring was undertaken at the Taringa site between 30 May 2023 and 14 August 2023.
- The duration of this monitoring (approx. 11 weeks) is considered sufficient to collect a representative sample of operations from Brisbane Airport, including variations in operating modes, aircraft flown, and weather conditions.
- The Taringa noise monitor was installed at an elevation of approximately 56 m AHD.
- The monitor primarily captured departure operations.
- Operations in the area are generally limited to departures from the new runway during the day and evening (departures from Runway 19R).
- At night, distinct flight paths are available from the legacy runway (departures from Runway 19L) during periods not permitting the use of “Simultaneous Opposite Direction Parallel Runway Operations” (SODPROPS).
- The short-term noise monitoring consisted of a noise monitor terminal equipped with a AU-2000 Outdoor Smart Microphone. The microphone was verified in conformance with IEC 61672-1 before the deployment.
- Self-calibration checks on the noise monitor terminal occurred daily on time, and the monitor remained within the calibration range throughout the deployment period.

Figure 2-1 demonstrates the location of the noise monitoring site with respect to the various flight paths.

Figure 2-1 Noise Monitoring Site and Flight Paths



2.2 Aircraft Noise Event Detection

Noise events exceeding a defined threshold were automatically identified by the noise monitoring terminals and noise level data saved. Events which were correlated with a simultaneous aircraft operation nearby were automatically identified as aircraft noise events. These events are described as correlated noise events (CNE). The noise level data and aircraft operation data for these events were subsequently associated and saved for post-processing and analysis.

To permit the correlation of aircraft events with measured noise events, a three-dimensional cylinder-like capture zone at each deployment site was established in the processing software. The capture zone was defined by a circular radius 2,500 m, projected 3,048 m (10,000 ft) up from the monitor site. The capture zone is shown in **Figure 2-2**.

The capture zone includes the various flight paths described in section 2.1 – i.e., day and evening departures from the new runway; and distinct night-time departures from the legacy runway.

The automated noise monitoring system requires several criteria to be met in order to classify an aircraft noise event. These criteria relate to the validity of recorded noise level and air traffic control (ATC) surveillance data, the proximity of aircraft (i.e., within the relevant capture zone) and that the noise level, duration and rise and fall accords with that of an aircraft noise event.

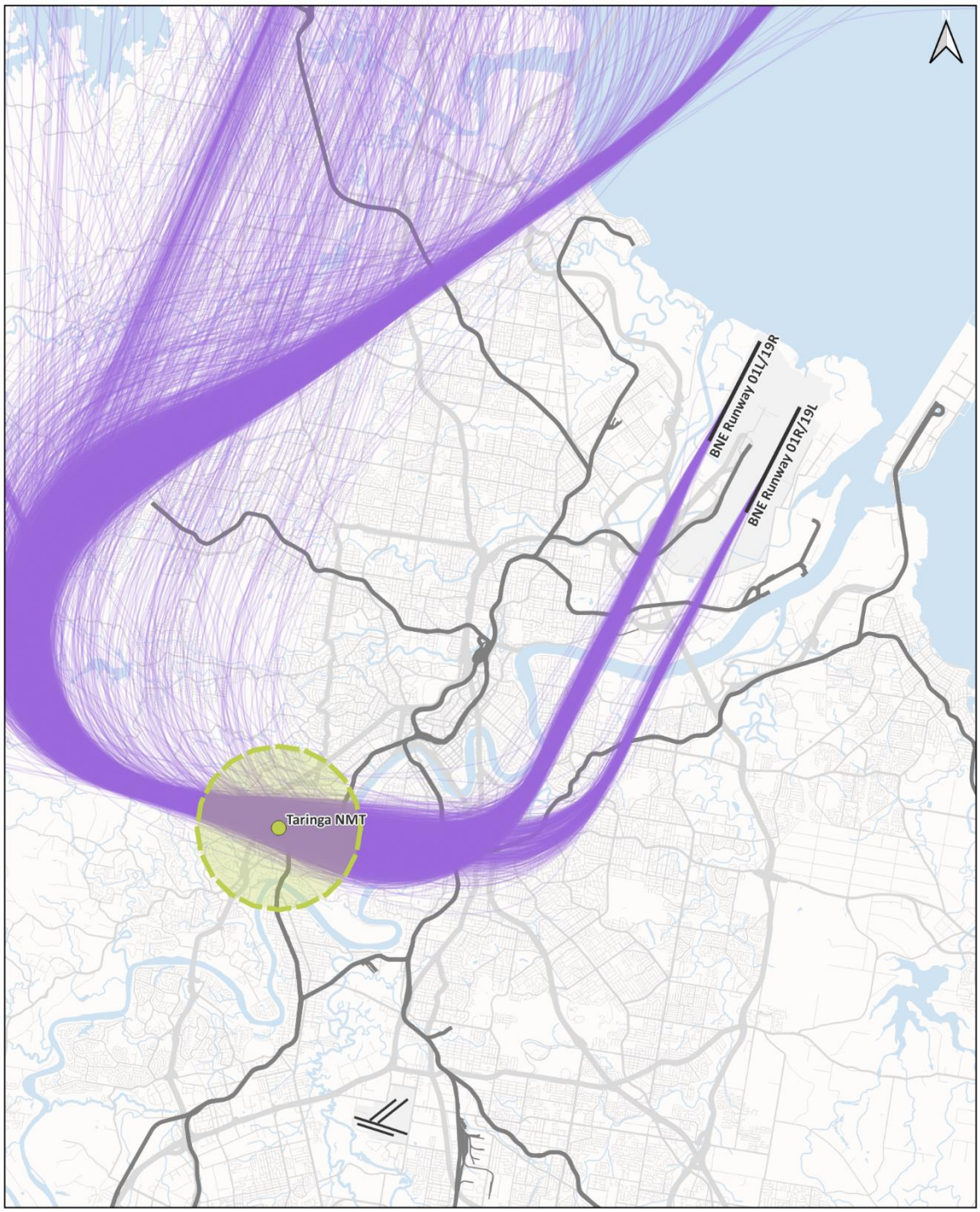
In this way, the system is able to automatically eliminate most extraneous noise events. However, it is possible that some aircraft noise events are not recorded. Most often these are due to the absence of valid ATC surveillance data, or due to the aircraft noise levels being insufficient to satisfy the defined thresholds for noise level and duration.

The noise detection thresholds applied for the monitoring described are described in **Table 2-1**. Noise detection thresholds were established based on the measured background noise levels.

Table 2-1 Noise Detection Thresholds

Time Period	Threshold
12 midnight to 5 am	52 dBA
5 am to 9 am	59 dBA
9 am to 12 midnight	55 dBA

Figure 2-2 Capture Zone



TARINGA SHORT-TERM NOISE MONITORING

CAPTURE ZONE

0 2 4 6 8 km

LEGEND

Noise monitor
Departures
Capture zone

Note: Locations of features are indicative only and are shown solely to demonstrate features pertinent to the noise assessment.

3 NOISE MONITORING RESULTS

This section of the report presents the noise monitoring results for the Taringa site.

3.1 Correlated Aircraft Departure Operations

Table 3-1 presents a summary of the correlated aircraft departure noise events at the Taringa site.

Table 3-1 Summary of Correlated Aircraft Departure Noise Events at Taringa

Aircraft [1]	Number of CNE	Average L_{Amax} - dB(A)	90th Percentile L_{Amax} [2] - dB(A)	Standard Deviation of L_{Amax}	Average Slant Distance [3] - feet	10th Percentile Slant Distance [3,4] - feet
737-800	1184	62.8	65.2	2.2	7235	6352
F100	465	63.9	66.3	2.1	6137	5613
F70	402	62.8	65.6	2.5	6729	5876
A320-200	300	61.1	63.9	2.6	7354	6478
E190	250	62.6	65.3	2.2	6891	6131
A350-900	158	62.3	64.2	2.3	5901	5337
777-300ER	99	66.5	69	2.4	5987	5431
737-700	92	61.6	65.4	2.5	8172	7092
737-300	56	63.8	66.9	2.8	7149	5814
A330-200	53	67.7	70.2	2.6	6088	5317
All Jet	**3459**	**63.0**	**66.6**	**2.8**	**6876**	**5764**
All Jet Rwy 19R	3002	63.0	66.2	2.7	6917	5823
All Jet Rwy 19L	457	63.2	68.5	3.7	6003	5526
All Turboprop	**45**	**60.8**	**62.8**	**2.1**	**7248**	**5827**

Note: 1. Presentation of individual aircraft types in **Table 3-1** is limited to the ten aircraft types with the most correlated departure events.
2. The 90th percentile L_{Amax} presents the loudest 10% of events.

3. Slant distance is the nearest three-dimensional distance from the aircraft to the noise monitoring terminal.
4. The 10th percentile slant distance presents the nearest 10% of events.

The following can be observed from the noise monitoring results.

- The most numerous aircraft demonstrate similar average noise levels around 62-64 dB(A).
- Narrow body jets are most prevalent (737-800, F100, F70, A320-200, E190, 737-700, 737-300 and others not shown), representing 83% of the total correlated aircraft departures for fixed-wing aircraft.
- Wide body jets (A350-900, 777-300ER, A330-200 and others not shown) represent only 15% of the total correlated departures for fixed-wing aircraft.
- Turboprop aircraft represent approximately 1% of the total correlated aircraft departures for fixed-wing aircraft.
- All aircraft exhibit some variation in L_{Amax}; demonstrated by the standard deviation of L_{Amax} and the difference between the 90th percentile and average. For most aircraft, the 90th percentile L_{Amax} is approximately 2-4 dB higher than the average L_{Amax}.
- Slant distances and altitudes are consistent among most aircraft of a similar type, though some variation is evident. The average slant distance for most jets is approximately 6,900 ft.
- The 10th percentile slant distance (i.e. lowest 10%) ranges between 500 ft and 1,300 ft lower than the mean across the presented aircraft.
- The A330-200 is the loudest (by average and 90th percentile) of the presented aircraft. The A330-200 also demonstrated one of the lowest slant distances (by average and 10th percentile), potentially contributing to the higher noise levels.
- The average L_{Amax} from jet aircraft departing Runway 19L was similar to those departing Runway 19R, though the 90th percentile L_{Amax} was 2.3 dB louder. Inspection of the flight paths impacting the site indicates that night-time departures off Runway 19L (when "SODPROPS" is unavailable) overfly the site. It is likely that these night departures are responsible for the departures off Runway 19L in the dataset. We note that Runway 19L departures were far less prevalent in the data compared to Runway 19R departures – representing 13% and 87% of all jet departures respectively. It is noted, however, that wide body jets represent a larger proportion of the total departures off Runway 19L – being 45% of all fixed wing departures.

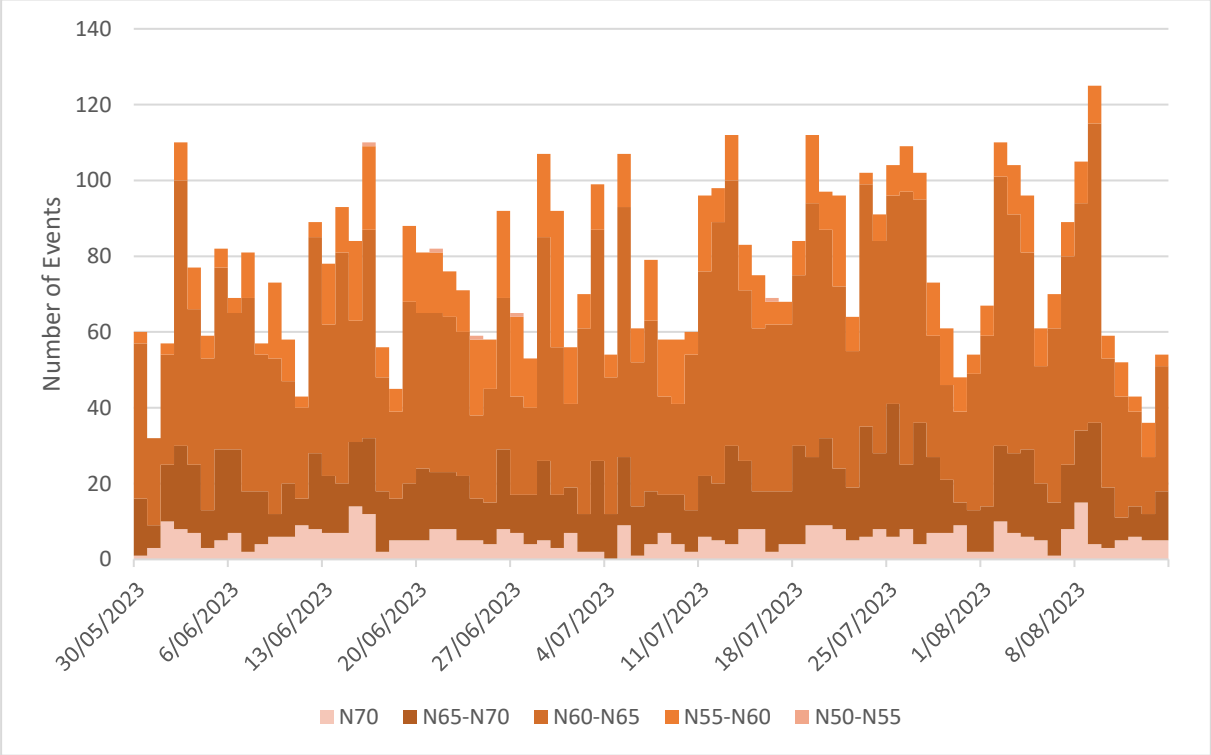
3.2 Daily Distribution of Correlated Noise Events

Figure 3-1 presents the number of events within various noise thresholds for each day of the monitoring. The number of events above a noise level threshold is denoted 'number-above' or 'N-above' and is typically expressed in the form N70 (i.e., the number of events above 70 dB(A)).

The following is noted from **Figure 3-1** and statistical analysis of the daily N-above values.

- The number of correlated noise events can be seen to vary significantly from day to day. This is likely largely due to different wind conditions requiring Brisbane Airport to utilise different operating modes (i.e., runway directions). Varying traffic numbers and schedules from day to day are also a likely contributing factor.
- The maximum N60 measured was 115 and the average was 65.3. Aircraft noise events above 70 dBA were frequently observed; the maximum N70 was 15 and the average was 5.7.
- On most days, the largest proportion of measured aircraft noise events were in the range 60-65 dBA. This accords with the data presented in the previous sections.

Figure 3-1 N-above Distribution During the Monitoring



3.3 Aircraft Noise Events Not Associated with Brisbane Airport

In addition to the results presented above, 2,302 aircraft operations were recorded without flight plan information. Most often, this is due to the flights being associated with another airport (i.e., not landing or departing Brisbane Airport). For reference, the average L_{Amax} from these events was 64.7 dBA and the 90th percentile L_{Amax} was 72.0 dBA.

4 CONCLUSION

SoundIN has undertaken an analysis of short-term aircraft noise monitoring in Taringa.

The following observations have been made in our analysis.

Departure Aircraft Events at the Taringa Site

- Average noise levels for departures were similar amongst the most prolific aircraft – approximately 62-64 dB(A).
- All aircraft exhibited some variation in L_{Amax}; meaning that even for like operations, the noise level on the ground can be expected to vary from flight to flight. For most aircraft, the 90th percentile L_{Amax} (i.e., the 10th loudest out of every 100 events) is approximately 2-4 dB higher than the average L_{Amax}.
- Slant distances and altitudes are consistent among most aircraft of a similar type, though some variation is evident. The most prolific aircraft had an average slant distance of approximately 6,900 ft.
- Flight paths affecting the area include day and evening departures from Runway 19R, and night-time departures from Runway 19L.
- The prevalence of departures from Runway 19L was far lower than departures from Runway 19R. Departures from the two runways exhibited a similar average L_{Amax}, though the 90th percentile L_{Amax} from Runway 19L departures was approximately 2.3 dB louder. This is likely due to the higher proportion of wide body jets among the departures from Runway 19L.

Daily Distribution of Correlated Noise Events at the Taringa Site

- The number of correlated noise events varies significantly from day to day.
- The majority of aircraft noise events produced a maximum noise level in the range 60-65 dB(A).
- Aircraft noise events above 60 dB(A) are frequent, with an average of 115 per day.
- Though they represent a small proportion of the total correlated noise events, aircraft noise events above 70 dB(A) are frequent, with a maximum of 15 events on any day and an average of 5.7 per day.