MARSHALL DAY Acoustics

CHRISTCHURCH AIRPORT
2024 ANNUAL NOISE MONITORING REPORT

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Project: **CHRISTCHURCH AIRPORT 2024 Annual Noise Monitoring Report**

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DEFINITIONS AND ACRONYMS

Definitions

Aircraft Operations	Also referred to as 'Operational Noise' (refer Section 6.1) a) the landing and take-off of aircraft; and b) aircraft flying along any flight path associated with a landing or take-off. For the purposes of Rule 6.1.6 Activity specific noise rules, it excludes: a) aircraft operating in an emergency for medical or national/civil defence reasons; b) air shows; c) military operations; d) Antarctic operations; e) helicopter operations; f) aircraft using the airport as an alternative to a scheduled airport elsewhere; g) aircraft taxiing; and h) aircraft engine testing.
Air Noise Compliance Contour	The 65 dB L_{dn} noise contour included in the Christchurch District Plan that cannot be exceeded. The determination of compliance or otherwise with this control is demonstrated by the preparation of the AANC for the preceding year's aircraft operations and reported annually.
Air Noise Boundary (ANB)	A composite line formed by the outer extremity of the 65 dB L_{dn} noise contour and the 95 dB L_{AE} noise contour. The Air Noise Boundary defines an area in which the future daily aircraft noise exposure from aircraft operations is sufficiently high as to require land use planning controls.
Decibel (dB)	The unit of sound level. Expressed as a logarithmic ratio of sound pressure relative to a reference pressure.
L_{AE}	The Sound Exposure Level. The sound level of one second duration which has the same amount of energy as the actual noise event measured. Usually used to measure the sound energy of a particular event, such as an aircraft flyover.
L_{Aeq}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
L_{dn}	The day night noise level which is calculated from the 24-hour L_{Aeq} with a 10dB penalty applied to the night-time (2200-0700 hours) $L_{Aeq.}$
L_{AFmax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
Noise Calculations	Noise levels calculated using computer modelling software, typically to predict current and future noise levels. Noise measurements are used to verify accuracy of calculated noise levels.
Noise Measurements	In-situ noise measurements of actual noise levels using either semi-permanent noise monitoring terminals or hand-held equipment (sound level meters).
Noise Monitoring	Monitoring of noise levels (generally with respect to assessing compliance with the District Plan), using both noise measurements and calculated noise levels.
On-Aircraft Engine Testing	The testing of engines on aircraft.

Acronyms

AANC	Annual Aircraft Noise Contour
ANB	Air Noise Boundary
ANLC	Airport Noise Liaison Committee
CIAL	Christchurch International Airport Limited
ETMS	Engine Testing Management Software
INMP	Integrated Noise Modelling Program
NMP	Noise Management Plan
NMR	Annual Noise Monitoring Report
NZS 6805	New Zealand Standard NZS 6805:1992 “Airport Noise Management and Land Use Planning”
USAP	United States Antarctic Programme

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1.0 INTRODUCTION

Christchurch International Airport Limited (CIAL) is required to prepare an Annual Noise Monitoring Report each year in accordance with the provisions of Chapter 6 of the Christchurch District Plan (CDP).

This report has been prepared by Marshall Day Acoustics (MDA) on behalf of CIAL and provides an overview of the noise monitoring programme for 2024 including:

- Calculation of noise contours known as the Annual Aircraft Noise Contours (AANC) to determine compliance;
- Calculation of engine testing noise level emissions at the Engine Testing Compliance Monitoring Positions (ETCMPs) to determine compliance;
- Update of the Acoustic Treatment Programme (ATP) schedule of eligible dwellings; and
- A summary of noise complaints.

In-field verification measurements of aircraft operations noise were not undertaken in 2024. These measurements were carried out in 2022 and are not required again until 2025.

2.0 STATUTORY REQUIREMENTS

The full list of rules relating to airport noise compliance at Christchurch is given in Appendix A.

Rule 6.1.6.2.5a.iv of the Christchurch District Plan requires CIAL to prepare and submit annually an aircraft operations noise monitoring report, including the following information:

- the calculated AANC;
- the results of the verification measurements (if conducted);
- analysis of compliance with reference to Rule 6.1.6.2.5a.i and ii. (including the number of exceedances and the reasons for them); and
- a summary of complaints received over the previous year in relation to noise from aircraft operations, and any actions taken in response.

Rule 6.1.6.2.6a.vii of the Christchurch District Plan requires CIAL to prepare and submit annually an on-aircraft engine testing noise monitoring report, including the following information:

- the results of verification measurements in accordance with activity standard v.B.; and
- analysis of compliance with reference to Rule 6.1.6.2.6a.i; and
- a summary of complaints received over the previous year in relation to noise from on-wing aircraft engine testing, and any actions taken in response.

Rule 6.1.6.2.7.2 of the Christchurch District Plan sets out the requirements for CIAL to implement an Acoustic Treatment Programme (ATP) and identify annually if additional dwellings become eligible for treatment within the AANC 65 dB L_{dn} contour.

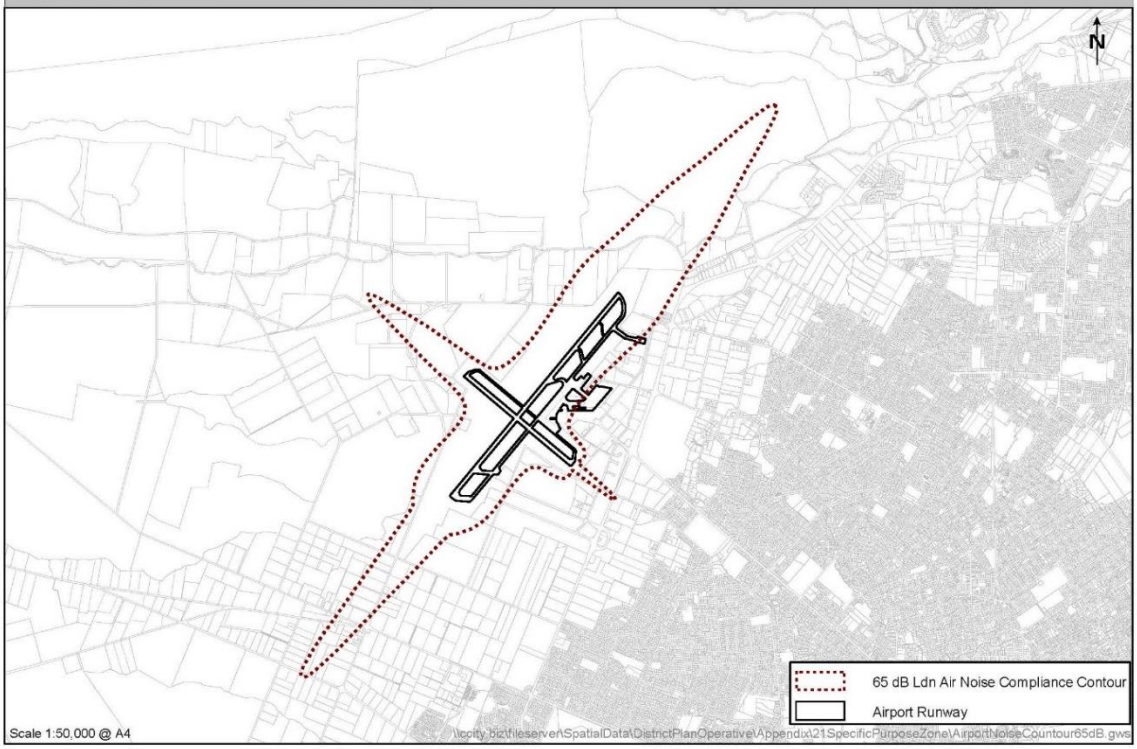
The following noise monitoring report details information required under both 6.1.6.2.5a.iv (aircraft operations) and 6.1.6.2.6a.vii (on aircraft engine testing) and under 6.1.6.2.7.2b.ii provides an updated schedule of eligible dwellings for the ATP. The purpose of this report is to assess compliance of aircraft operations with rule 6.1.6.2.5a and on-aircraft engine testing with rule 6.1.6.2.6a.i and v for the period of 1 January 2024 to 31 December 2024.

2.1 Noise Limits - Aircraft Operations

Aircraft operational noise limits are set in rule 6.1.6.2.5a.i:

"Noise from aircraft operations shall not exceed 65 dB Ldn outside the 65 dB Ldn Air Noise Compliance Contour shown in Figure 1, other than as provided for in Rule 6.1.6.2.5a.ii."

Figure 1: Map of 65 dB Ldn Air Noise Compliance Contour



insert from rule 6.1.6.2.5 (a) (i) in the Christchurch District Plan.

Rule 6.1.6.2.5a.iii of the District Plan describes the noise monitoring required to determine compliance with rule 6.1.6.2.5a.i.

2.2 Noise Limits - On Aircraft Engine Testing

Table 5 in rule 6.1.6.2.6a of the District Plan sets out noise limits for on-aircraft engine testing. These are reproduced in Table 1 below.

Table 1: On-aircraft engine testing noise limits

Noise Limit	Engine testing compliance monitoring positions (ETCMP) – refer Figure 2
65 dB L_{dn}, 7 day	8 points
55 dB L_{dn}, 7 day	8 points
75 dB L_{Amax} 22:00 to 07:00 only	Edge of residential zone – 3 points

Rule 6.1.6.2.6a.v of the District Plan describes the monitoring required to determine compliance with rule 6.1.6.2.6a.

3.0 OPERATIONAL NOISE

As defined in the Christchurch District Plan, aircraft operational noise includes:

The landing and take-off of aircraft and aircraft flying along any flight path associated with a landing or take-off. Operational noise excludes aircraft operating in an emergency for medical or national/civil defence reasons, air shows, military operations, Antarctic operations, helicopter operations, aircraft using the airport as an alternative to a scheduled airport elsewhere, aircraft taxiing and aircraft engine testing.

3.1 Summary of Operational Aircraft Movements

Prior to COVID-19, Christchurch Airport had approximately 95,000 - 110,000 aircraft movements per year, of which around 75,000 were scheduled commercial movements.

Due to widespread travel restrictions, the pandemic led to a sudden decrease in operations in 2020. Aircraft movements have been gradually increasing since then but have not yet reached pre-pandemic levels. Aircraft movement data from Airways Corporation NZ for the year 2024 shows there were:

- 71,380 scheduled commercial aircraft movements, and
- 93,158 total aircraft movements.

Scheduled commercial movements over the last 8 years are as shown in Table 2 below.

Table 2: Scheduled Commercial Aircraft Movements

Aircraft Movements	2024	2023	2022	2021	2020	2019	2018	2017
Scheduled Commercial Movements	71,380	68,521	62,143	56,813	49,084	75,663	75,738	76,585

The busiest three month period for scheduled aircraft movements in 2024 was October, November and December. A summary of the aircraft movement data from this period used to calculate the 2024 Annual Aircraft Noise Contours (AANC) is provided in section 3.2 of this report.

3.2 Modelling Methodology

Since 2022, the AANC has been calculated using the Aviation Environmental Design Tool (AEDT3e) developed by the US Federal Aviation Authority. Previous AANC were calculated using the Integrated Noise Model (INM) software to be consistent with the software used to produce the Christchurch District Plan contours. The INM has been replaced by the AEDT and is no longer supported or updated with data for new aircraft types. In New Zealand there is no national statutory requirements for noise modelling software and the Christchurch District Plan does not define the software to be used.

The AEDT has been used to calculate the AANC since 2022 for the following reasons:

- AEDT contains noise data for newer aircraft types that are now prevalent in New Zealand whereas the INM does not;
- Recent flight path analysis for Christchurch Airport has been modelled in AEDT rather than INM meaning the AEDT model contains more accurate flight paths for current operations.

A review of the AEDT shows that predicted noise levels are very similar to the INM for the same operational scenarios therefore is reasonably consistent with the software used to produce the Christchurch District Plan contours.

The 2024 AANC is based on aircraft movements provided by Airways Corporation NZ. Rule 6.1.6.2.5a.iii.B requires that the AANC is calculated on actual aircraft movements over the busiest three month period of the previous year. The busiest three month period was determined by the scheduled commercial movements which in 2024 was October, November and December.

The definition of aircraft operations in the Christchurch District Plan (given in Appendix A) excludes military, Antarctic and helicopter movements therefore these are not included in the AANC calculation. The 65 dB L_{dn} Air Noise Compliance Contour in the Christchurch District Plan did not include general aviation (GA) operations. Therefore, the AANC has also been calculated without GA movements. In summary, the AANC includes aircraft movements from the Airways data that is categorised as either scheduled or non-scheduled but excludes military, Antarctic, helicopter and GA movements.

Based on the nature and frequency of GA flights at the time of preparing the 65 dB L_{dn} Air Noise Compliance Contour, it was considered that GA aircraft noise would not significantly affect the extent of the noise contours. It was also noted that GA aircraft are generally light aircraft.

The 2009 CIAL Noise Monitoring Report confirmed that noise from light aircraft does not contribute significantly to overall noise levels within the 65 dB L_{dn} contour, this conclusion was confirmed in all subsequent noise monitoring reports to date. MDA calculated the effect of GA operations on the AANC and concluded that GA operations typically contribute less than 0.1 dB to the noise contours which is a negligible difference. A review of the annual number of GA movements between 2008 and 2024 shows that GA activity is still at a lower relative level (to scheduled commercial operations) than in 2009, so this conclusion remains valid.

The movements for the modelled scenario are shown in Table 3 as well as a breakdown of the day and night-time movements. Night-time movements are those that occur between 10pm and 7am. The number of night-time movements is relevant as night-time activity receives a +10 decibel weighting when calculating L_{dn}.

Table 3: Summary of modelled aircraft movements (scheduled and non-scheduled)

	Busiest 3 Months (Oct, Nov, Dec 2024)
Total Movements	19,505
Day Time Movements	17,085
Night-time Movements	2,420

A summary of the 2024 scheduled and non-scheduled aircraft movements by month is shown in Table 4 and a breakdown of the average daily aircraft movements by aircraft type and runway is included in Table C1, Appendix C.

Table 4: Summary of 2024 scheduled and non-scheduled aircraft movements

Month (2024)	Monthly total	Consecutive 3 months total
Jan	6,021	
Feb	6,057	
Mar	6,433	18,511
Apr	6,197	18,687
May	6,276	18,906

Month (2024)	Monthly total	Consecutive 3 months total
Jun	5,707	18,180
Jul	6,085	18,068
Aug	6,007	17,799
Sep	6,043	18,135
Oct	6,387	18,437
Nov	6,500	18,930
Dec	6,618	19,505

Data provided by Airways includes actual runway usage data which has been used in the preparation of the 2024 AANC. For the busy three months the main runway (RW02/20) was used 97% of the time and the crosswind runway (RW11/29) used 3% of the time. The 12-month runway usage for 2024 was also 97% main runway and 3% crosswind runway. A diagram of the Christchurch Airport runway system is included in Appendix B for reference.

3.3 Flight Tracks

Prior to modelling the 2024 AANC, a representative of Airways NZ and MDA discussed the proposed approach for modelling flight tracks which is summarised below. Airways NZ supported the proposed approach as a reasonable approximation of the average flight tracks flown in 2024. Airways NZ also advised there are no significant planned changes to flight paths for the coming year.

The flight tracks used in the model are based on a 2022 study of actual flown flight tracks at Christchurch Airport using radar data[1]. For the 2023 AANC Airways NZ advised that visual arrival tracks for jets onto runway 29 and 20 are rarely used, therefore the allocation of aircraft onto these tracks has been updated accordingly.

3.4 Verification Noise Measurements

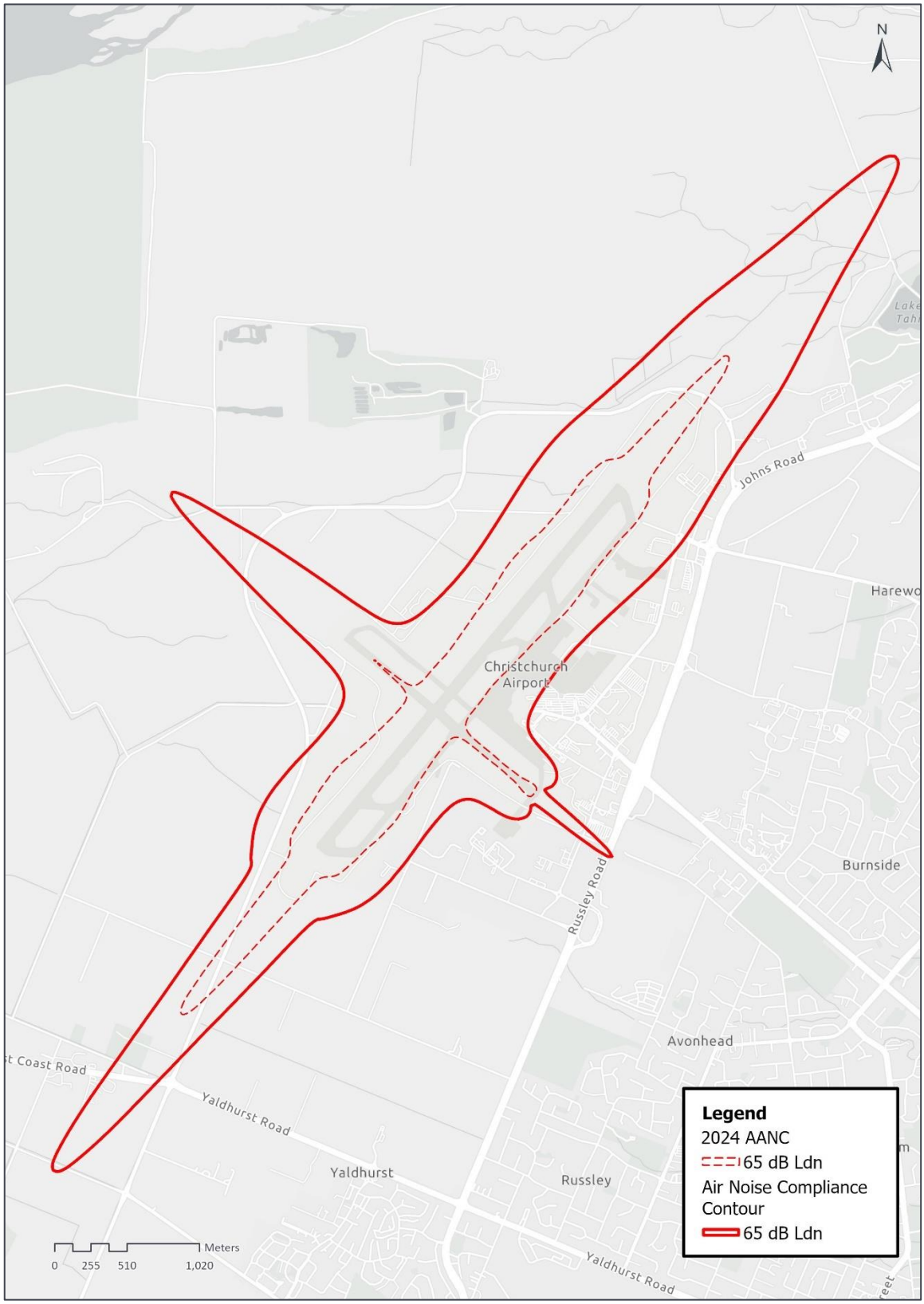
Rule 6.1.6.2.5a.iii.D of the Christchurch District Plan sets out that the calculated AANC shall be verified by noise measurements carried out in accordance with the Airport Noise Management Plan (NMP). Section 6.1.2 of the NMP states that verification measurements are to be carried out no less than every three years. Verification measurements were carried out in 2022 and detailed in the 2022 noise monitoring report. Therefore, measurements are not required for 2024 and are next due in 2025.

3.5 2024 Annual Aircraft Noise Contour

The calculated 2024 AANC is shown below in Figure 1. The 2024 AANC demonstrates that aircraft operations comply with the 65 dB L_{dn} Air Noise Compliance Contour.

[1]Published by Airbiz '*2023 Airport Noise Contours Update Volume 4:Flight Tracks Report*' (5 May 2023).

Figure 1: 2024 AANC



Towards the north-east of RW02/20, the 2024 AANC is 5 decibels less than the CDP Air Noise Compliance Contour.

Towards the south-west of RW02/20 the 2024 AANC is 3.5 decibels less than the CDP Air Noise Compliance Contour.

At the southeastern end of RW11/29 the 2024 AANC is 6.5 decibels less than the CDP Air Noise Compliance Contour.

At the northwestern end of RW11/29 the 2024 AANC is more than 10 decibels less than the CDP Air Noise Compliance Contour.

When compared to the 2023 AANC, the 2024 AANC is similar in extent.

CIAL's Noise Management Plan (Rev D, dated May 2019) states in section 6.1.1:

"*Where the AANC are calculated to be within 2 decibels of the District Plan compliance contour, Christchurch Airport will conduct an initial summary review as to the extent and cause of this margin. The Compliance and Development Manager and Acoustic Engineer will be responsible for making the decision to conduct the initial summary review and any further analysis that may be required*."

For 2024, there is no requirement to conduct such a summary review.

Overall, the 2024 AANC is considered an accurate representation of aircraft noise exposure around the airport for the busiest three months in 2024 and has been calculated in accordance with the relevant requirements of the CDP, CIAL's NMP and New Zealand Standard NZS 6805:1992 *Airport Noise Management and Land Use Planning*.

In accordance with the rule contained in Appendix 6.11.14a.ii.C of the CDP, the 2024 AANC showing one decibel increments from 55 dB to 70 dB L_{dn} is shown in Appendix D.

The noise modelling, aircraft movement analysis and AANC calculation was conducted by a person suitably qualified and experienced in airport noise modelling and acoustics assessments, in accordance with rule 6.1.6.2.5a.iii.C. The person who undertook the airport noise modelling, acoustical assessment and preparation of the technical content of this 2024 NMR is the author of this report, Svetlana Kotenko of Marshall Day Acoustics.

4.0 ON-AIRCRAFT ENGINE TESTING

As defined in the Christchurch District Plan on-aircraft engine testing includes the testing of engines on an aircraft. It excludes off-wing engine testing, such as the operation of engine test cells.

4.1 Summary of On-Aircraft Engine Testing

Based on information obtained from the Engine Testing Management Software (ETMS), for the year 2024 there were:

- 641 scheduled on-wing engine tests (633 successfully completed)
- 381 turboprop tests (ATR72-600 and Q300)
- 171 jet tests
- 81 other tests (including those associated with Antarctic operations).

The total number of recorded engine testing events over the last 8 years is as follows.

Table 5: Engine testing events by year

Engine Testing Events	2024	2023	2022	2021	2020	2019	2018	2017
Number of completed tests	633	856	623	843	1045	1114	1369	1384

4.2 Verification Noise Measurements

Rule 6.1.6.2.6a.v.B, in the CDP states that the engine testing calculations "*shall be verified by measurements undertaken with reference to at least four ETCMPs for a sample of at least two different on-aircraft engine test configurations".*

The definition of the engine test configuration has been agreed between CIAL and CCC, to mean consideration of two different engine test events with at least one of the following being different between the tests; aircraft type, location of test, orientation or power setting.

The rule requires that this be undertaken "*at least once every two years*". The last engine testing measurements were conducted in 2023. Therefore, measurements were not required for 2024 and are next due in 2025.

4.3 Engine Testing Management Software 2024 Summary

The ETMS is used to calculate noise levels emitted from on-aircraft engine testing including the 7-day rolling average noise level. CIAL has recorded engine testing data since 2010 and in July 2017 the software was updated to meet new provisions in the District Plan including:

- The requirement to calculate the 7-day rolling average;
- Development of the ETMS on a web-based platform; and
- An initial 6-month long verification of the ETMS calculated noise levels at the Engine Testing Compliance Monitoring Positions (ETCMP), using in-situ noise measurements and thereafter biannual verification measurement.

4.3.1 Calculated Engine Testing Noise Levels

Calculated noise levels for 2024 generated from the ETMS at the ETCMPs are detailed in Table 6 (65 dB L_{dn} limit) and Table 7 (55 dB L_{dn} limit) below. The location of the ETCMPs is shown in Figure 2 below.

Figure 2: Insert from Christchurch District Plan On-Aircraft Engine Testing Compliance Monitoring

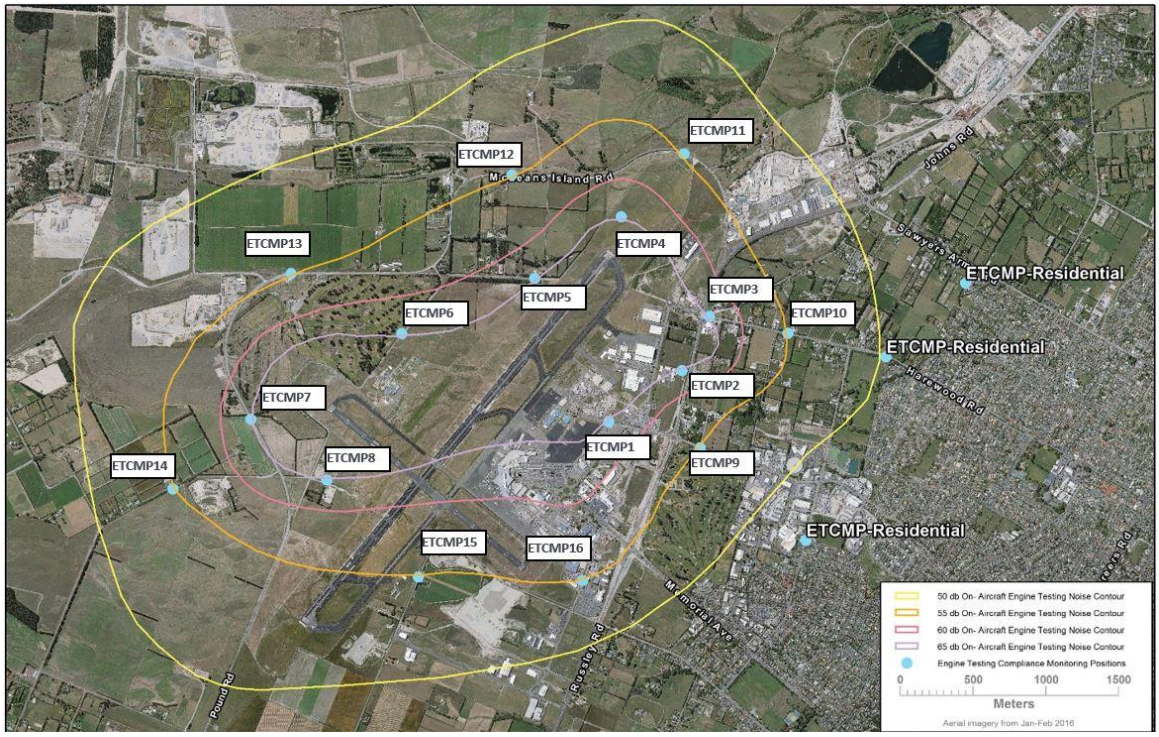


Table 6 and Table 7 below show calculated noise levels generated using the ETMS are compliant with noise limits detailed in rule 6.1.6.2.6a.i.

Table 6: ETMS calculation results: 65 dB L_{dn} limit – highest 7 day L_{dn} rolling average

ETCMP Location	Min	Max	Median	Average
1	33	61	51	51
2	25	52	45	44
3	28	58	49	49
4	27	59	50	49
5	32	58	51	51
6	25	58	41	41
7	15	56	32	33
8	16	57	36	36

Table 7: ETMS calculation results: 55 dB L_{dn} limit – highest 7 day rolling average

ETCMP Location	Min	Max	Median	Average
9	27	52	45	45
10	21	50	42	42
11	22	50	42	42
12	22	49	42	42
13	18	49	34	34
14	9	44	28	28
15	15	47	36	36
16	23	50	41	40

Maximum noise levels at ETCMP 17-19 were all below the noise limit of 75 dB L_{AFmax} contained in rule 6.1.6.2.6a.i. The maximum noise level for each of these was 60, 63 and 60 dB L_{AFmax}, respectively.

Figure 3 andFigure 4 below display the 7-day rolling average calculated noise levels at each of the ETCMPs for 2024. As shown in the two graphs, compliance was assessed to be achieved at all ETCMPs for the logged engine testing events in that period.

Figure 3: ETMS predicted noise levels for ETCMP 1 to 8 located on the 65 dB L_{dn} engine testing contour

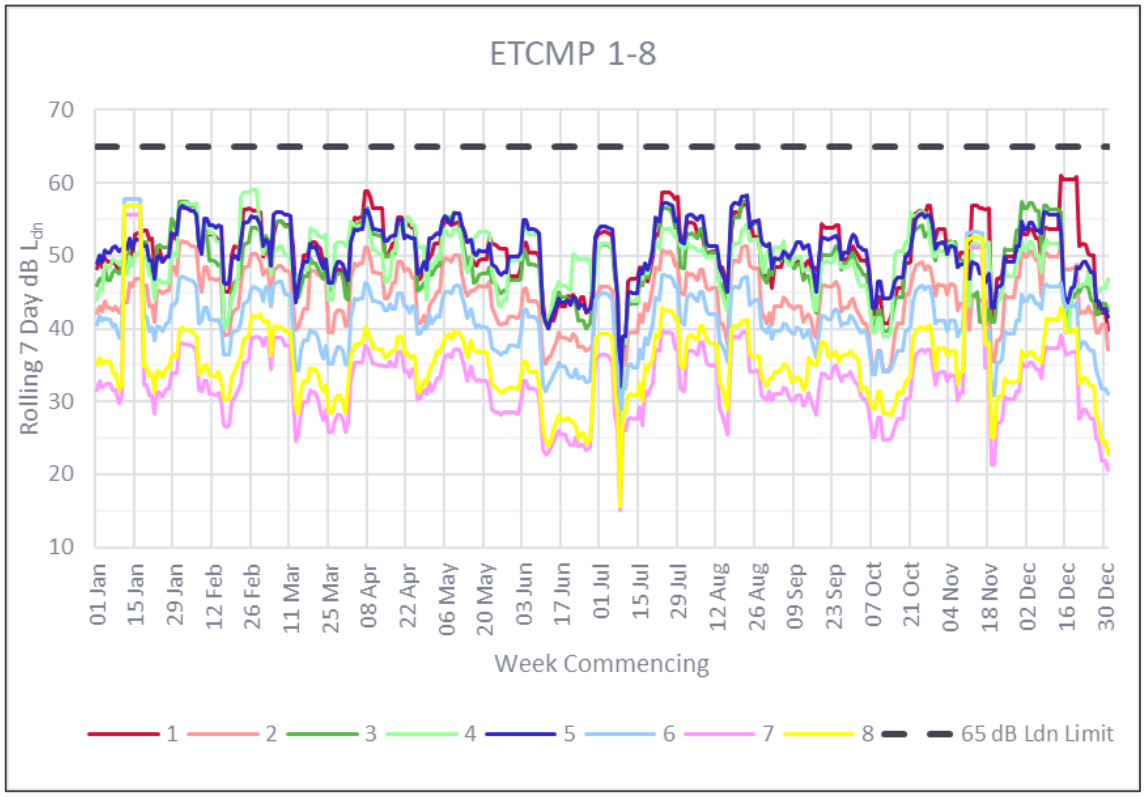
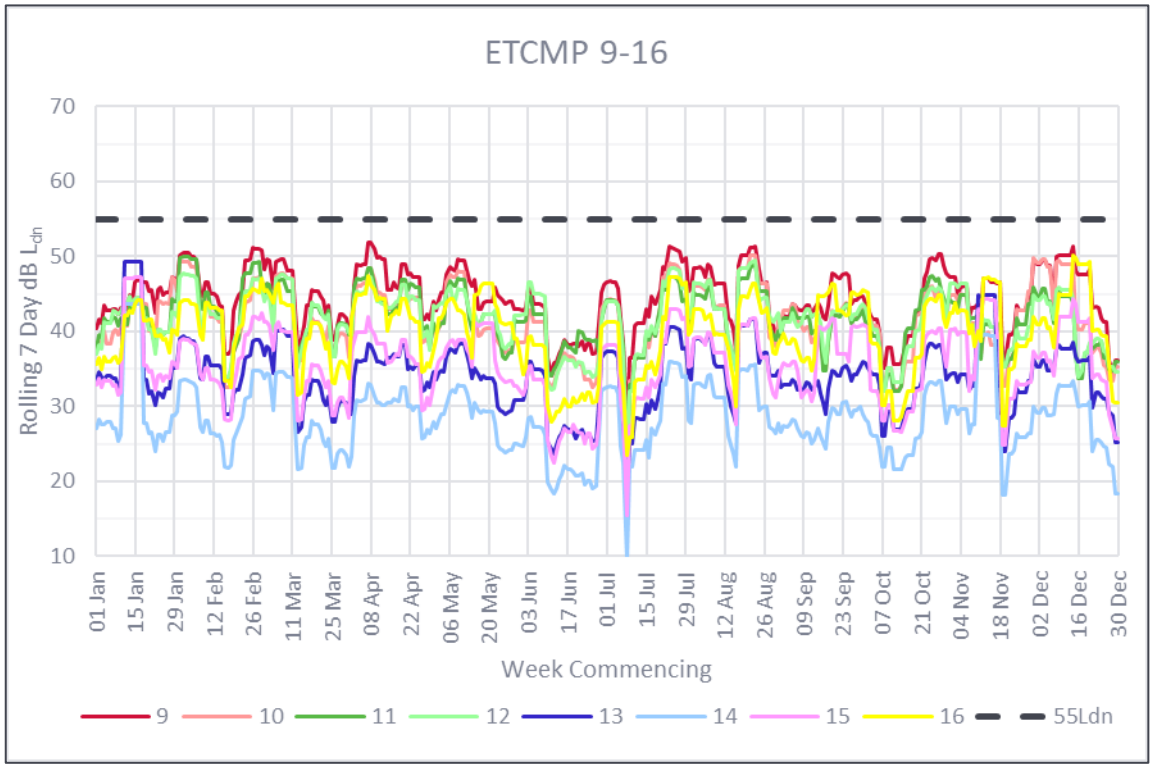


Figure 4: ETMS predicted noise levels for ETCMP 9 to 16 located on the 55 dB Ldn engine testing contour



The figures identify a variation in calculated noise levels across the ETCMPs with some distinct peaks. These peaks are a result of noise emissions from a given test; notably, high power runs near the ETCMP.

5.0 COMPLAINTS

5.1 Complaints Summary

In accordance with Rule 6.1.6.2.5a.iv.D and Rule 6.1.6.2.6a.vii.C of the CDP, the noise complaints summary below details complaints received in 2024 in respect to aircraft operations and on-aircraft engine testing, and any actions taken in response to these complaints.

All names and addresses have been omitted for privacy purposes. Complaints have been grouped by the type of operation and aircraft. The actions taken for each complaint are included in the table.

In summary, 19 complaints were received from 16 individuals during the period 1 January to 31 December 2024.

There were two unresolved complaints that continued into 2024:

- One about helicopter movements near the complainant's home, first raised in 2022, is no longer active as the complainant has moved.
- One about noise from aircraft departing the southern runway following the DMAPs flight paths, first raised in 2021, remains open at the end of 2024.

CIAL continues to address community concerns by promptly responding to noise complaints, investigating, and analysing the cause of the noise, communicating with relevant agencies, and managing complaints with guidance from the Airport Noise Liaison Committee.

Type of Operation	Type of aircraft	No of complaints	Actions Taken
Low Flying Aircraft (APMW)	Jet & turboprop	11	In March 2024, nine complaints were made about low-flying jets, and two additional complaints about unknown low-flying aircraft. These complaints coincided with CIAL's annual airfield pavement maintenance works (APMW), which required the main runway to be closed from 9pm to 5:30am. As a result, aircraft had to land and take off on the cross runway at night and early morning. CIAL responded to all 11 complainants, explaining the APMW schedule, the reasons for the works, and providing a link to their website for more information. One complainant did not want follow-up contact, but CIAL acknowledged their complaint and invited them to reach out if needed. The complainant later replied, and CIAL provided additional information. Two complaints mentioned not receiving any communication about the APMW works. CIAL acknowledged this and stated that a more thorough communication plan would be created for future APMW programs if cross runway use is required.
Low Flying Aircraft	Jet	2	The first complaint was about an A320 Neo jet flying over the complainants home late at night. The complainant did not wish to be contacted but a contact email was provided. CIAL sent an email offering to answer any questions, but no response was received. The second complaint was about jet noise near the complainant's street. They said the planes seemed louder than usual for about 30 minutes at night. Six flights occurred within an hour, within 1km of their location, and there was a high-powered engine test at the same time, though it likely didn't contribute to the noise. The complainant thanked CIAL for the response.
	Helicopter	1	This complaint was about helicopter noise at night, caused by a Westpac Rescue Helicopter heading to Christchurch Airport. No further communication was received.

Type of Operation	Type of aircraft	No of complaints	Actions Taken
Low Flying Aircraft	All aircraft	4	One person made four complaints over five days about aircraft flying too low and often over their home at night. Initially, they did not want to be contacted, but CIAL sent a courtesy email offering further discussion. The person responded with questions. Their main concern was about aircraft noise in their Christchurch suburb since moving from Auckland, and they wanted to know about future noise control. CIAL replied with a detailed email explaining how noise is managed, airport operations, future growth, flight paths, airspace management, noise contour information and the contours proximity to their area. No further response was received.
Engine Testing	Non-specific	1	A resident near Christchurch Airport asked if there was an engine testing facility and requested information about it. CIAL explained how the facility operates and how to view recent tests carried out over the last seven days on CIAL's website. CIAL also offered to investigate specific noise events if the resident provided times, but no response was received.

6.0 SCHEDULE OF ACOUSTIC TREATMENT

In accordance with Rule 6.1.6.2.7.2 of the Christchurch District Plan, CIAL has developed an Acoustic Treatment Programme (ATP) whereby dwellings existing as of 6 March 2017 within Rural Urban Fringe and Rural Waimakariri Zones become eligible for acoustic treatment.

There are three circumstances when owners are to be offered the opportunity for acoustic treatment,

- Dwellings located within the 65 dB L_{dn} Annual Aircraft Noise Contour;
- Dwellings located within the 65 dB L_{dn} Engine Testing Contour; and
- Dwellings located within the 60 to 65 dB L_{dn} Engine Testing Contour (mechanical ventilation only).

Unlike the Annual Aircraft Noise Contour, the Engine Testing Noise Contours have been fixed by the District Plan. Therefore, there is no change to the number of eligible dwellings inside the engine testing noise contours. Within the engine testing contour there are ten dwellings eligible for the installation of mechanical ventilation.

For operational noise, a schedule of eligible dwellings is maintained and updated annually when the AANC is prepared. The schedule contains a complete list of 'Existing Dwellings' located within the Future Aircraft Operations Contour (65 dB L_{dn}) and each year the AANC is mapped to identify which of these Existing Dwellings fall within the 65 dB L_{dn} AANC and hence become eligible for treatment.

The 2024 AANC incorporates no additional dwellings compared with the 2023 AANC. Therefore, no additional mitigation offers are required this year.

7.0 CONCLUSION

Marshall Day Acoustics has prepared a compliance report for noise from aircraft operations and on-aircraft engine testing at the Christchurch International Airport. The report has been prepared in accordance with Rules 6.1.2.1.5 and 6.1.2.1.6. The main conclusions are:

- The 2024 AANC demonstrates compliance with the 65 dB L_{dn} Air Noise Compliance Contour contained in the CDP and is similar in its extent to the 2023 AANC.
- In all areas, the 2024 AANC is 3.5 or more decibels below the 65 dB L_{dn} limit.
- Verification measurements of noise from aircraft operations occurred in 2022 so were not required in 2024.
- Predictions of engine testing noise levels using the ETMS software shows compliance with noise limits detailed in the CDP.
- Verification measurements of engine testing noise were performed in 2023 so were not required in 2024.
- The 2024 AANC is similar in its extent to the 2023 AANC. No additional dwellings are eligible for acoustic treatment.

APPENDIX A REGULATORY REQUIREMENTS

6.1.2.1.5 Policy – Airport Noise

a. Require the management of aircraft operations and engine testing at Christchurch International Airport, so that:

i. noise generated is limited to levels that minimise sleep disturbance and adverse effects on the amenity values of residential and other sensitive environments so far as is practicable;

ii. where practicable, adverse noise effects are reduced over time.

b. Mitigate adverse noise effects from the operations of the Christchurch International Airport on sensitive activities, by:

i. prohibiting new sensitive activities within the Air Noise Boundary and within the 65 dB Ldn engine testing contour; and

ii. requiring noise mitigation for new sensitive activities within the 55 dB Ldn air noise contour and within the 55 dB Ldn engine testing contour; and

iii. requiring Christchurch International Airport Limited (CIAL) to offer appropriate acoustic treatment in respect of residential units existing as at 6 March 2017 within the 65 dB Ldn Annual Airport Noise Contour, and within the 60 dB Ldn engine testing contour.

Note: Policy 17.2.2.10 also mitigates noise effects from the operations of Christchurch International Airport on rural land.

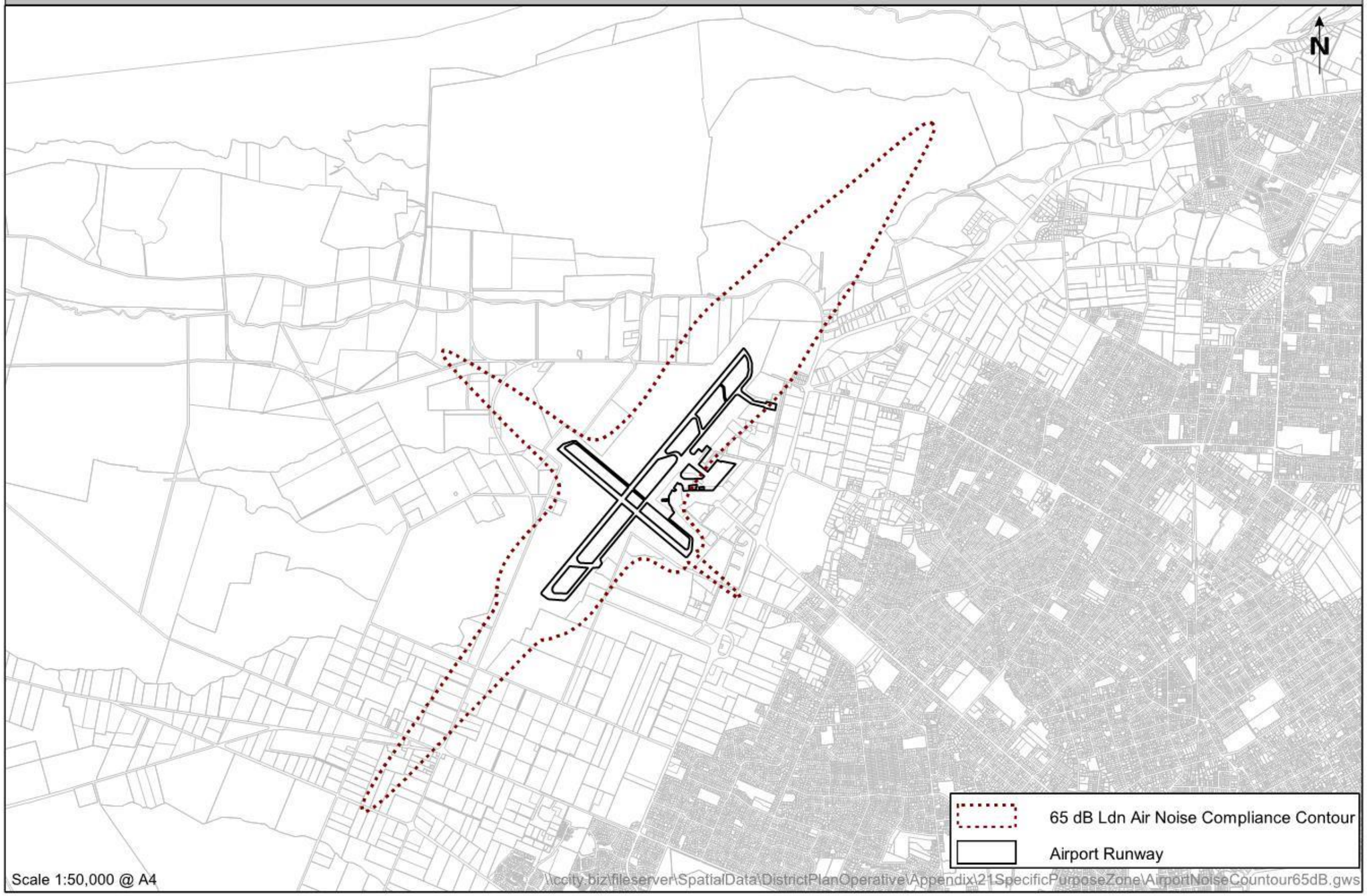
The relevant rules relating to aircraft operation and engine testing noise are given in 6.1.6.2.5 – 6.1.6.2.7.1 and Appendix 6.11.14. They state:

6.1.6.2.5 Aircraft operations at Christchurch International Airport

a. Aircraft operations at Christchurch International Airport shall meet the following activity standards:

i. Noise from aircraft operations shall not exceed 65 dB Ldn outside the 65 dB Ldn Air Noise Compliance Contour shown in Figure 1, other than as provided for in Rule 6.1.6.2.5 a.ii.

Figure 1: Map of 65 dB Ldn Air Noise Compliance Contour



ii. *Noise from aircraft operations may exceed the aircraft noise limit in Rule 6.1.6.2.5 a.i by not more than 2 dB, provided that such exceedance is due to atypical weather, national flight disruption, natural disaster or other unplanned circumstances.*

iii. *Monitoring and determining compliance with activity standards i. and ii. above shall be as follows:*

A. *Noise monitoring of aircraft operation shall be based on calculations from an operational aircraft noise model, and records of actual aircraft operations at Christchurch International Airport over the previous year's aircraft operations.*

B. *Noise from aircraft operations shall be calculated as the Annual Aircraft Noise Contour (AANC), over the busiest three month period of the previous year.*

C. *The calculations shall be performed by a person with appropriate qualifications and experience in airport noise modelling and acoustics assessments.*

D. *The calculated results shall be verified by noise measurements carried out in accordance with the Airport Noise Management Plan required under Rule 6.1.6.2.7.1.*

E. *The measurement of aircraft sound exposure levels and the derivation of the 65 dB Ldn contour shall be in accordance with NZS 6805:1992.*

iv. *An Aircraft Operations Noise Monitoring Report shall be provided annually by the airport operator to the Council, with the first required by the 6 March 2018. The report shall include:*

A. *the calculated AANC;*

B. *the results of the verification measurements;*

C. *analysis of compliance with reference to Rule 6.1.6.2.5 a.i. and ii. (including the number of exceedances and the reasons for them); and*

D. *a summary of complaints received over the previous year in relation to noise from aircraft operations, and any actions taken in response.*

v. *The additional activity standards in Rule 6.1.6.2.7 for aircraft operations at Christchurch International Airport shall be met.*

Definition: Aircraft operations

means:

a. *the landing and take-off of aircraft; and*

b. *aircraft flying along any flight path associated with a landing or take-off.*

For the purposes of Rule 6.1.6 Activity specific noise rules, it excludes:

c. *aircraft operating in an emergency for medical or national/civil defence reasons;*

d. *air shows;*

e. *military operations;*

f. *Antarctic operations;*

g. *helicopter operations;*

h. *aircraft using the airport as an alternative to a scheduled airport elsewhere;*

i. *aircraft taxiing; and*

j. *aircraft engine testing.*

6.1.6.2.6 On-aircraft engine testing at Christchurch International Airport

a. The testing of engines on aircraft at Christchurch International Airport shall meet the following activity standards:

i. Noise from testing of engines on aircraft shall not exceed the noise limits shown in Table 5 below at the engine testing compliance monitoring positions (ETCMPs) shown in Figure 2.

Table 5: On-aircraft engine testing noise limits

Noise Limit	***Engine testing compliance monitoring positions (ETCMP) (refer Figure 2)***
65 dB Ldn, 7 day	*8 points*
55 dB Ldn, 7 day	*8 points*
75 dB L_{Amax} 22:00 to 07:00 only	*Edge of residential zone – 3 points*

ii. All high power testing of jet engines on an aircraft shall occur between the hours of 07:00h and 22:00h, except that a maximum of 5 unplanned engine testing events within any three month period, up to a maximum of 12 unplanned engine testing events per annum, may occur between the hours of 22:00h and 07:00h.

iii. Testing of turbo prop engines on an aircraft between the hours of 22:00h and 07:00h, when the total duration of testing at high power is five minutes or more per aircraft, shall be conducted in the vicinity of the threshold of Runway 11 (i.e. the north-western end of the cross-runway).

iv. The following exclusions apply:

A. The testing of engines on an aircraft used for Antarctic operations, is excluded from activity standards i.-iii..

B. The testing of engines on any aircraft is excluded from activity standards i.-iii., where such work is necessary to satisfy an airworthiness direction or other like safety requirement issued by the Minister of Transport, the Director of Civil Aviation or the Civil Aviation Authority, as is any other unplanned engine testing arising from an aircraft operator's identification of a safety issue relating to an aircraft fleet, or required as a result of a natural disaster including volcanic eruption.

C. The testing of turbo prop engines on an aircraft is exempted from activity standard iii. When Runway 11/29 is in use.

v. Monitoring and determining compliance with activity standard a.i. above shall be as follows:

D. Compliance or otherwise with activity standard a.i. shall be demonstrated by calculations of on-aircraft engine testing noise emissions based on the actual on-aircraft engine testing events and calculations of noise emissions for the engine testing events and configurations in question. The noise level (Ldn, 7 days) shall be calculated as a 7 day rolling average.

E. The calculations in activity standard a.v.A. shall be verified by measurements undertaken with reference to at least four ETCMPs for a sample of at least two different on-aircraft engine test configurations. Verification measurements shall be carried out for an initial period of 6 months from 6 March 2017 and subsequently be undertaken at least once every two years.

vi. An On-aircraft Engine Testing Report shall be provided quarterly by the airport operator to the Council, with the first covering the period ending the 30 June 2017 and provided to the Council by the 15 July 2017. The report shall include:

F. *a summary of all on-aircraft engine testing activities undertaken in the quarter; and*

G. *identification of all tests undertaken both in accordance with activity standard a.i. and those excluded by activity standard a.iv., including reasons for the tests excluded an any measures taken to manage noise effects during those excluded tests.*

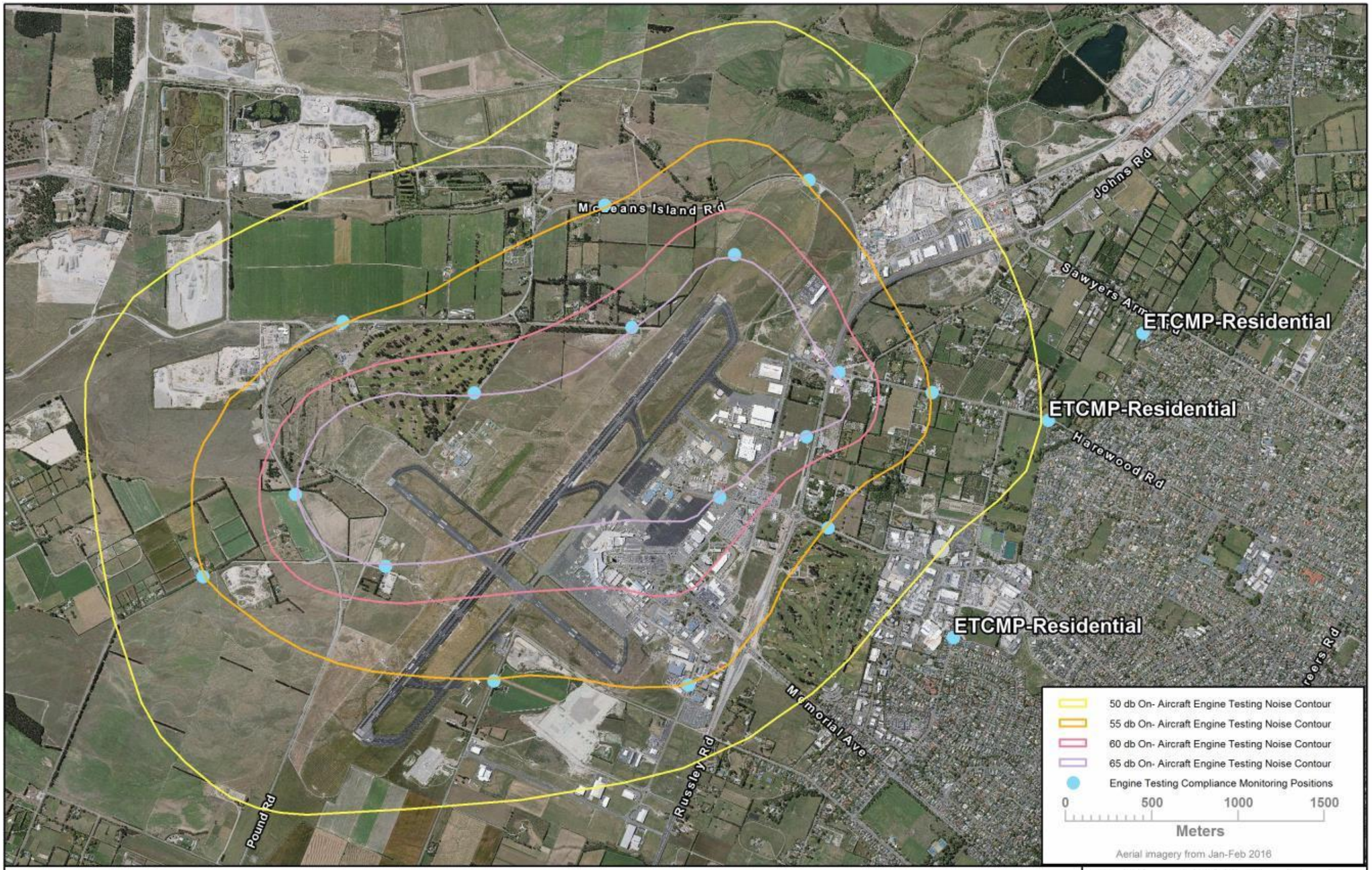
vii. *An On-aircraft Engine Testing Noise Monitoring Report shall be provided annually by the airport operator to the Council by 6 March 2018, and annually thereafter. The report shall include:*

H. *the results of verification measurements in accordance with activity standard v.B.; and*

I. *analysis of compliance with reference to Rule 6.1.6.2.6 a.i.; and*

J. *a summary of complaints received over the previous year in relation to noise from on-aircraft engine testing, an any actions taken in response.*

viii. *The additional activity standards in Rule 6.1.6.2.7 for on-aircraft engine testing at Christchurch International Airport shall be met.*



6.1.6.2.7 Additional activity standards for aircraft operations and on-aircraft engine testing at Christchurch International Airport

a. The following additional activity standards apply to aircraft operations and to the testing of engines on aircraft at Christchurch International Airport.

6.1.6.2.7.1 Airport Noise Management Plan

a. Within 12 months of 6 March 2017, noise from aircraft operations and on-aircraft engine testing at Christchurch International Airport shall be managed in accordance with an Airport Noise Management Plan prepared by a suitably qualified and experienced person on behalf of the airport operator and in consultation with the Airport Noise Liaison Committee, in accordance with the requirements set out in Appendix 6.11.14. The Airport Noise Management Plan shall be reviewed, and updated if required, at least once every two years.

b. The Airport Noise Management Plan shall:

i. demonstrate how compliance with the following noise limits will be achieved:

A. for aircraft operations – Rule 6.1.6.2.5; and

B. for on-aircraft engine testing – Rule 6.1.6.2.6.

ii. provide the details of the noise monitoring programme;

iii. incorporate a procedure for transparently and expediently responding to any compliance received in relation to noise from aircraft operations and on-aircraft engine testing; and

iv. incorporate a procedure for transparently and expediently presenting, in a publicly accessible forum, the following:

A. the Aircraft Operations Noise Monitoring Report, On-aircraft Engine Testing Report, and On-aircraft Engine Testing Noise Monitoring Report required by Rules 6.1.6.2.5 and 6.1.6.2.6;

B. a 7-day rolling report of noise from on-aircraft engine testing against the requirements of Rule 6.1.6.2.6 a.; and

C. a daily LAmax report of noise from on-aircraft engine testing against the requirements of Rule 6.1.6.2.6 a. at the edge of the residential zone.

Appendix 6.11.14 Airport Noise Management Plan

a. The Airport Noise Management Plan required by Rule 6.1.6.2.7.1 shall:

i. document noise management actions including ongoing investigations, methods, processes and resources to provide for:

A. the management of aircraft operations and on-aircraft engine testing to ensure comp liance with Rules 6.1.6.2.5 a.i. and ii. and 6.1.6.2.6 a.i.-iv.; and

B. consideration of alternative methods of noise management and mitigation to achieve the reduction of noise effects from all aspects of aircraft operations including on-aircraft engine testing; and

C. engine maintenance ground run procedures to be implemented in conjunctionwith all aircraft operators or their agents, including:

i. compliance with Rule 6.1.6.2.6 a.i.-iv., including documentation required by Rule 6.1.6.2.6 a.v.-vii.; and

ii. procedures which will encourage Antarctic and NZDF engine testing on the win g to occur between the hours of 07:00 to 19:00.

ii. provide the details of a noise monitoring programme to maintain compliance with Rules 6.1.6.2. 5 a.iii.-iv. and 6.1.6.2.6 a.v.-vii. and, in particular, the following:

A. the monitoring, recording, verification and calculation of aircraft operation and On-aircraft Engine Testing noise levels;

B. the preparation of the annual Aircraft Operations and On-aircraft Engine Testing Nois e Monitoring Reports and quarterly On-aircraft Engine Testing Report;

C. the preparation of the AANC maps, showing actual noise contours in 1 dB increments from 55 dB to 70 dB Ldn; and

D. the review of the software used for predicting aircraft operation noise and the software used for predicting engine testing noise, at least once every five years to determine whether the models and/or software require updating.

iii. establish dispute resolution procedures.

iv. establish a procedure for transparently and expediently responding to any complaints received in relation to noise from aircraft operations and on-aircraft engine testing.

v. require the maintenance of a website that provides for the transparent and accessible display of

A. the current version of the Airport Noise Management Plan as required by Rule 6.1.6.2. 7.1;

B. the Aircraft Operations Noise Monitoring Report, On-Aircraft Engine Testing Report, a nd On--Aircraft Engine Testing Noise Monitoring Report for the previous year, required by Rules 6.1.6.2.5 and 6.1.6.2.6, including a summary of noise monitoring conducted, and the AANC;

C. A 7-d-ay rolling report of noise from On-Aircraft aircraft engine testing over the previous seven days updated daily and identifying all tests undertaken both within the Ldn limits and those exempted, including reasons for the tests exempted;

D. a summary of complaints received annually and a description of actions taken to address complaints.

vi. document schedules of:

A. acoustic treatment implemented over the past calendar year as required by Rule 6.1.6.2.7.2; and

B. *acoustic treatment offered, where the conditions of the offer required by section b. of Appendix 6.11.15 have not yet been met.* ETCMPs positions

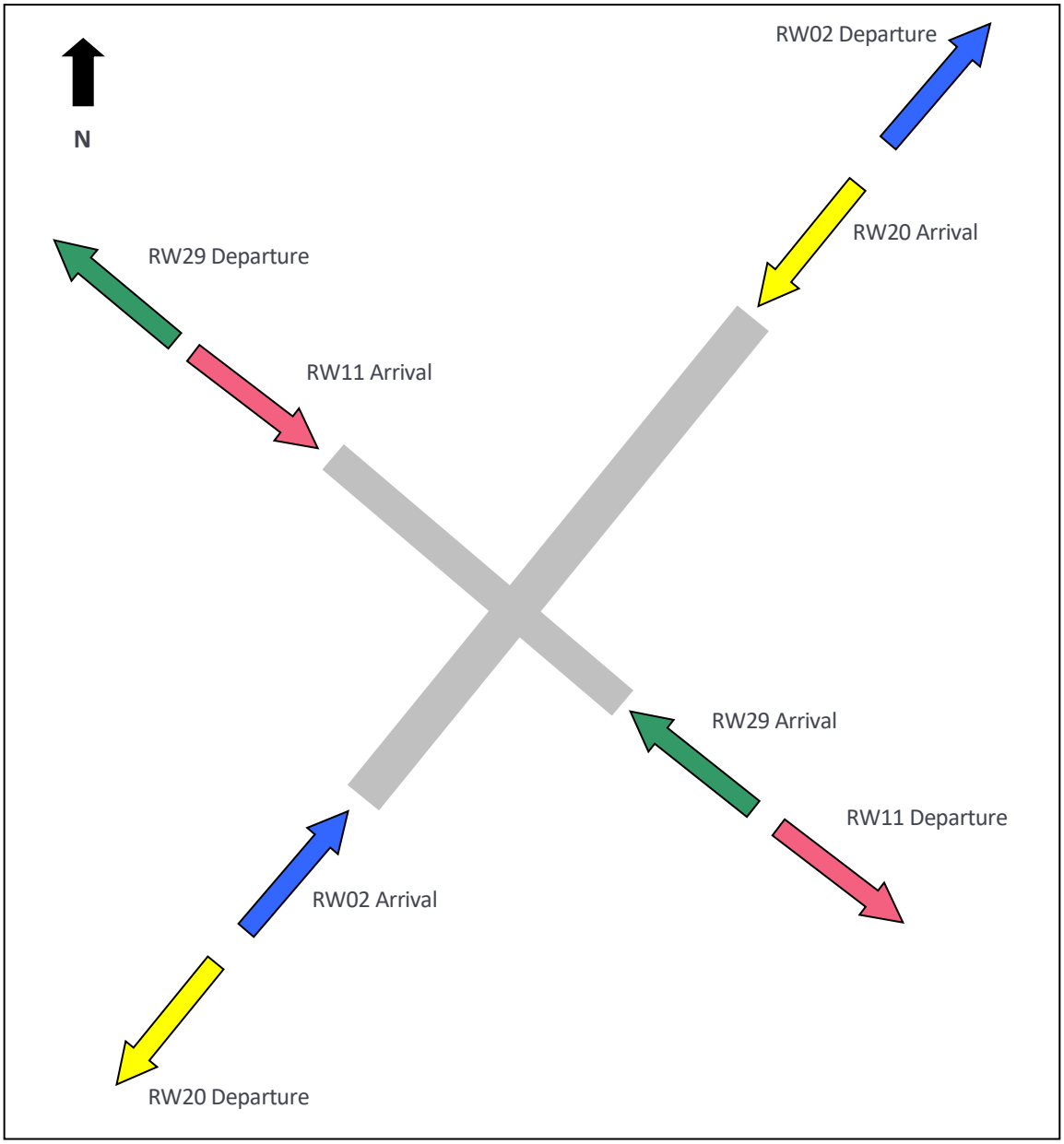
APPENDIX B CHRISTCHURCH AIRPORT RUNWAY VECTORS

Runway 02 refers to operations using the main runway with a heading of 20 degrees from true north i.e. arrivals from the south west landing in a north easterly direction and departures towards the north east.

Runway 20 refers to operations using the main runway with a heading of 200 degrees from true north i.e. arrivals from the north-east landing in a south westerly direction and departures towards the south west.

Runway 11 refers to operations using the crosswind runway with a heading of 110 degrees from true north i.e. arrivals from the north-west landing in a south easterly direction and departures towards the south east.

Runway 29 refers to operations using the crosswind runway with a heading of 290 degrees from true north i.e. arrivals from the south-east landing in a north westerly direction and departures towards the north west.



APPENDIX C MODELLED AIRCRAFT MOVEMENTS

Table C1: 2024 AANC Modelled Aircraft Movements by Runway

Aircraft type	Aircraft	RW02		RW11	RW20		RW29	
		Day	Night	Day	Day	Night	Day	Night
Scheduled jet	A20N	1.02	2.09	0.00	0.61	1.43	0.09	0.02
	A21N	0.48	0.89	0.00	0.25	0.68	0.00	0.02
	A320	31.64	3.20	0.00	18.09	2.41	1.43	0.03
	A321	0.20	0.41	0.00	0.16	0.27	0.00	0.00
	A332	0.21	0.01	0.00	0.11	0.02	0.00	0.00
	A359	1.20	0.18	0.00	0.85	0.18	0.00	0.00
	A35K	0.17	0.00	0.00	0.15	0.00	0.00	0.00
	A388	1.35	0.00	0.00	0.65	0.00	0.00	0.00
	B38M	0.32	0.00	0.00	0.14	0.00	0.04	0.00
	B734	2.05	2.10	0.00	1.14	1.57	0.13	0.03
	B738	3.87	2.60	0.00	1.73	1.92	0.20	0.05
	B763	0.68	0.00	0.00	0.38	0.00	0.00	0.00
	B77L	0.00	0.02	0.00	0.00	0.00	0.00	0.00
	B788	0.12	0.01	0.00	0.13	0.00	0.00	0.00
	B789	0.35	0.30	0.00	0.09	0.14	0.00	0.00
	E190	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Scheduled turboprop	AT75	0.20	0.00	0.00	0.07	0.00	0.02	0.00
	AT76	47.91	1.63	0.01	26.79	1.23	2.36	0.03
	DH8C	12.58	0.20	0.00	7.22	0.15	0.59	0.00
	PC12	7.74	0.03	0.00	4.48	0.03	0.42	0.01
Non-Scheduled jet	B738	0.39	1.21	0.00	0.23	0.73	0.07	0.08
	BE40	0.09	0.03	0.00	0.01	0.00	0.00	0.00
	C25B	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	C510	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	C680	0.02	0.00	0.00	0.02	0.00	0.00	0.00
	CL60	0.20	0.02	0.00	0.10	0.00	0.01	0.00
	E55P	0.03	0.00	0.00	0.01	0.00	0.00	0.00
	F2TH	0.00	0.00	0.00	0.04	0.00	0.00	0.00
	FA7X	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Non-Scheduled piston	PA34	0.01	0.00	0.00	0.03	0.00	0.00	0.00
Non-Scheduled turboprop	AN12	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	B350	0.09	0.01	0.00	0.05	0.00	0.02	0.00
	BE20	2.09	0.20	0.00	1.12	0.09	0.05	0.00
	BE30	0.05	0.00	0.00	0.03	0.00	0.00	0.00
	BE9L	0.18	0.00	0.00	0.09	0.00	0.03	0.00
	SF34	0.09	0.00	0.00	0.02	0.00	0.00	0.00

APPENDIX D 2024 AANC (55 – 70 DB L_{DN} IN ONE DECIBEL INCREMENTS)