MARSHALL DAY Acoustics

CHRISTCHURCH AIRPORT NOISE MONITORING 2023 NOISE MONITORING REPORT

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Project: **CHRISTCHURCH AIRPORT NOISE MONITORING**

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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 2023 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;
- Analysis of measured engine testing noise levels to verify the compliance calculations;
- 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 2023. 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 6.1.6.2.5 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 6.1.6.2.5 a.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 6.1.6.2.6 vi 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 6.1.6.2.6 a.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.

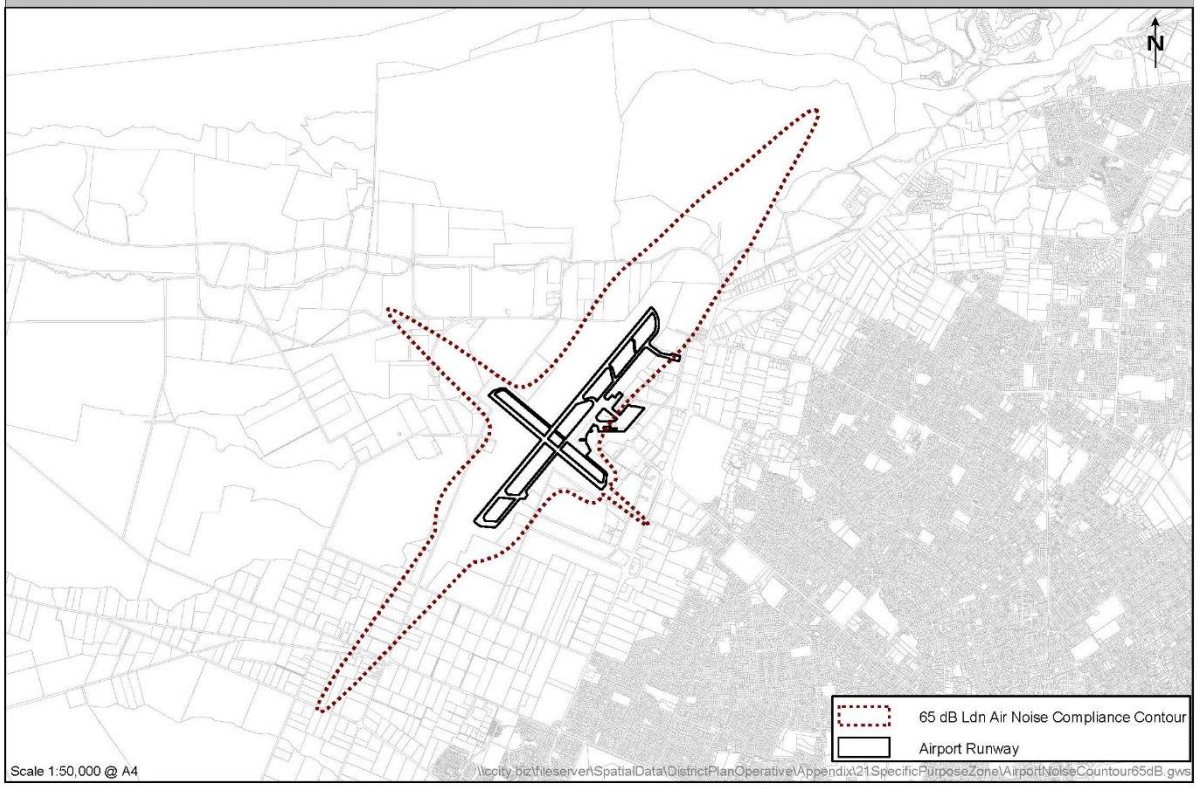
The following noise monitoring report details information required under both 6.1.6.2.5 (iv) (aircraft operations) and 6.1.6.2.6 (vi) (on aircraft engine testing) and provides an updated schedule of eligible dwellings for the ATP. The purpose of this report is to assess compliance of aircraft operations with rule 6.1.6.2.5 (a) and on-aircraft engine testing with rule 6.1.6.2.6 (a)(i) and (v) for the period of 1 January 2023 to 31 December 2023.

2.1 Noise Limits - Aircraft Operations

Aircraft operational noise limits are set in rule 6.1.6.2.5 (a) (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



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

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

2.2 Noise Limits - On Aircraft Engine Testing

Table 5 in rule 6.1.6.2.6 (a) 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 6.1.6.2.6 (a) (v) of the District Plan describes the monitoring required to determine compliance with rule 6.1.6.2.6 (a).

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 80,000 - 110,000 aircraft movements per year, of which around 75,000 to 80,000 were scheduled commercial movements.

The pandemic caused a sudden decrease in operations in 2020 and 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 2023 shows there were:

- 68,521 scheduled commercial aircraft movements, and
- 90,890 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	2023	2022	2021	2020	2019	2018	2017	2016
Scheduled Commercial Movements	68,521	62,143	56,813	49,084	75,663	75,738	76,585	74,130

The busiest three months for scheduled aircraft movements in 2023 were October, November and December. A summary of the aircraft movement data from this period used to calculate the 2023 Annual Aircraft Noise Contours (AANC) is provided in section 3.2 of this report.

3.2 Modelling Methodology

The 2023 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 for the 2023 AANC 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 2023 AANC is based on aircraft movements provided by Airways Corporation NZ. Rule 6.1.6.2.5 (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 months were determined by the scheduled commercial movements which in 2023 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 2023 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 2023)
Total Movements	18,360
Day Time Movements	16,224
Night-time Movements	2,136

A summary of the 2023 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 2023 scheduled and non-scheduled aircraft movements

Month (2023)	Monthly total	Consecutive 3 months total
Jan	5,865	
Feb	5,386	
Mar	6,218	17,469
Apr	5,801	17,405
May	5,957	17,976

Month (2023)	Monthly total	Consecutive 3 months total
Jun	5,650	17,408
Jul	6,003	17,610
Aug	6,059	17,712
Sep	5,842	17,904
Oct	5,984	17,885
Nov	6,136	17,962
Dec	6,240	18,360

Data provided by Airways includes actual runway usage data which has been used in the preparation of the 2023 AANC. For the busy three months the main runway was used 95% of the time and the crosswind runway used 5% of the time. The 12-month runway usage for 2023 was 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

The flight tracks used in the model are based on recent analysis of actual flown flight tracks at Christchurch Airport using radar data[1]. In the noise model, aircraft have been allocated to flight tracks based on aircraft type and destination/origin which was determined from the radar data analysis.

A representative of Airways NZ, CIAL and MDA discussed the proposed approach to use the results of the radar data analysis. Airways NZ advised that visual arrival tracks onto runways 29 and 20 for jets are rarely used. We adjusted the allocation of these tracks accordingly. Airways NZ advised there were no significant planned changes to flight paths for the coming year and supported the proposed approach. Airways NZ concluded the flight tracks in the 2023 noise model are a reasonable approximation of long-term average flight tracks flown.

3.4 Verification Noise Measurements

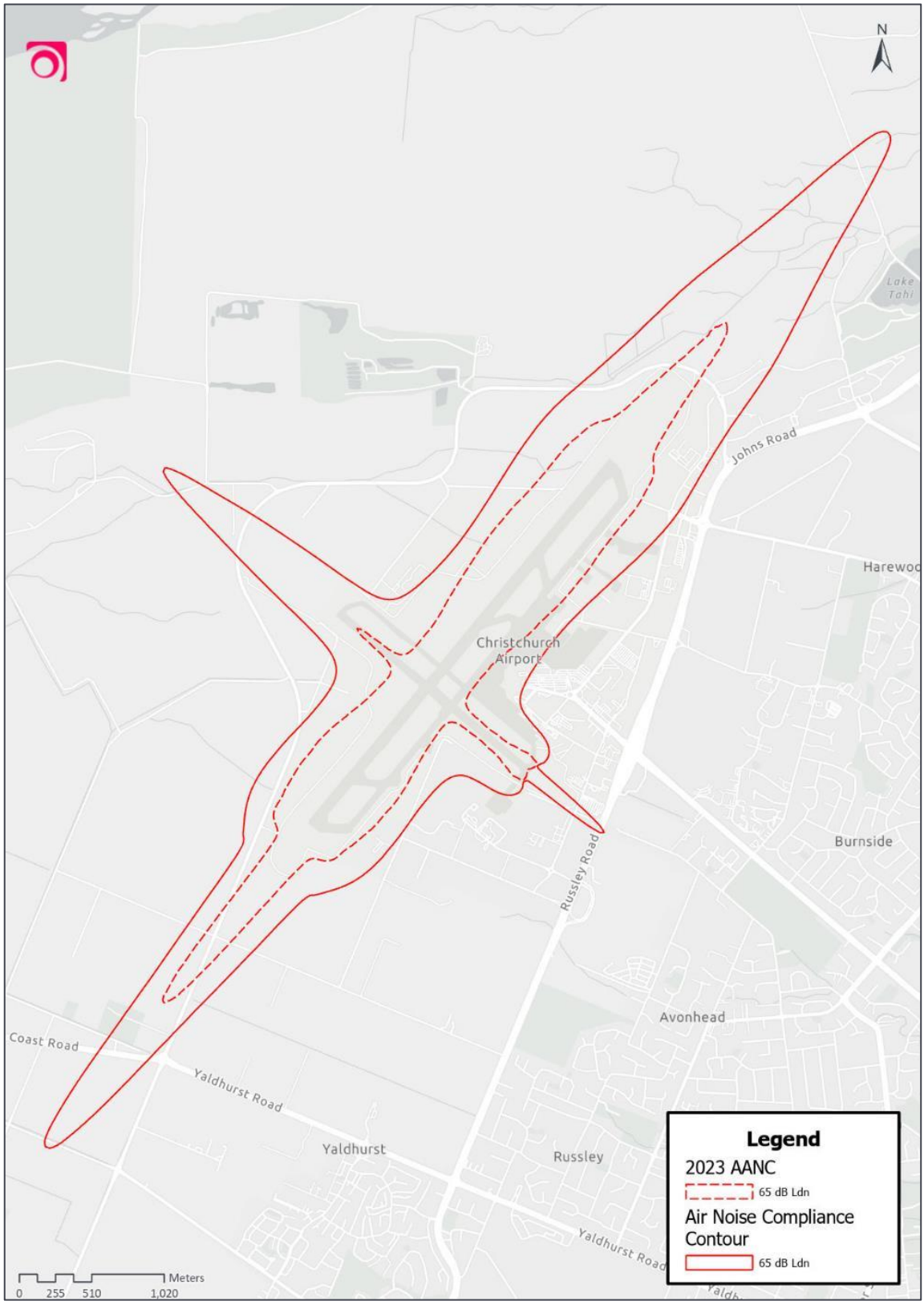
Rule 6.1.6.2.5a iii d of the Christchurch District Plan sets out that the calculated AANC shall be verified by noise measurements carried out in accordance with the Airport Noise Management Plan (NMP). Section 6.1.2 of the NMP states that verification measurements are to be carried out no less than every three years. Verification measurements were carried out in 2022 and detailed in the 2022 noise monitoring report. Therefore, measurements were not required for 2023 and are next due in 2025.

3.5 2023 Annual Aircraft Noise Contour

The calculated 2023 AANC is shown below in Figure 1. The 2023 AANC demonstrates that aircraft operations comply with the 65 dB L_{dn} Air Noise Compliance Contour.

[1] 12 months of radar data from 2022.

Figure 1: 2023 AANC



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 6.1.6.2.5 (iii) (c). The person who undertook the airport noise modelling, acoustical assessment and preparation of the technical content of this 2023 NMR is the author of this report, Laurel Smith of Marshall Day Acoustics.

The closest point of the 2023 AANC to the Air Noise Compliance Contour, is near the end of runway 29. In this location the 2023 AANC is one to two decibels below the Air Noise Compliance Contour which is a small enough margin to trigger further investigation under CIAL's Noise Management Plan. This is discussed in Section 3.6.

In all other locations around the Compliance Contour, the 2023 AANC is at least three decibels below the limit.

When compared to the 2022 AANC, the 2023 AANC is generally larger in extent. The 2023 AANC is approximately one decibel louder than the 2022 AANC, except around the runway 29 end point where the 2023 AANC is between 5 to 6 decibels louder than the 2022 AANC.

Overall, the 2023 AANC is considered an accurate representation of aircraft noise exposure around the airport for the busiest three months in 2023 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 6.11.4 (a)(ii).C of the CDP, the 2023 AANC showing one decibel increments from 55 dB to 70 dB L_{dn} is shown in Appendix D.

3.6 2023 AANC Within 1 - 2dB Margin of Air Noise Compliance Contour

The 2023 AANC 65 dB L_{dn} is one to two decibels from the Air Noise Compliance Contour in two locations at the end of runway 29. Figure 2 shows the 2023 AANC alongside the Air Noise Compliance Contour with the one and two decibel margin contours shown as dashed lines. At two points the 2023 AANC is 1.0 dB and 1.1 dB from the Compliance Contour.

CIAL's Noise Management Plan (Rev F, dated October 2022) 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.*"

"Where the AANC are calculated to be within 1 decibel of the CDP compliance contour, CIAL will undertake more detailed analysis including noise measurements to verify the AANC. The Environment and Planning Manager and Acoustic Engineer will be responsible for making the decision to undertake a more detailed analysis."

An initial summary will be undertaken to determine the cause of the contour falling within the two decibel margin of the CDP Air Noise Compliance Contour. The outcome of this summary will be reported to the ANLC and made available to the CCC on request. The summary will identify whether a further detailed assessment is appropriate.

Figure 2: 2023 AANC and CDP Air Noise Compliance Contour

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 2023 there were:

- 865 scheduled on-wing engine tests (856 successfully completed)
- 627 turboprop tests (ATR72-600 and Q300)
- 178 jet tests
- 51 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	2023	2022	2021	2020	2019	2018	2017	2016
Number of completed tests	856	623	843	1045	1114	1369	1384	1023

4.2 Verification Noise Measurements

Rule 6.1.6.2.6 (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*". As the last engine testing measurements were conducted in 2021, it was necessary to carry out measurements in 2023.

4.2.1 Measurement Methodology

Noise Monitoring Terminals (NMTs) were deployed at four monitoring positions (ETCMPs). The terminal deployments are detailed in Table 6. An additional NMT was placed adjacent to the Ground Run Up Pad (GRUP) as a reference over the survey duration.

Table 6: ETCMP noise monitoring dates

ETCMP	Start Date	End Date	Number of Tests
4 – Threshold Runway 20 8 – Near fire training area	1 November 2023	15 November 2023	42
6 – Aviation Drive 16 – Threshold Runway 29	15 November 2023	6 December 2023	69

Each NMT consisted of a 01dB 'Cube' noise logging monitor. Data was recorded in one second intervals. Each NMT is equipped with audio recording capability to enable an analysis of individual engine testing events.

4.2.2 ETMS Verification Assessed Configurations

Measured noise levels for two different engine testing configurations at each deployment location have been compared with the corresponding noise level used in ETMS calculations. High-power test events were generally chosen as these provide the strongest signal for analysis. The following summarises the selected configurations.

Engine Testing Configurations

The engine testing configurations used for the verification are:

- Configuration 1 – ATR 72/Q300, high power, ground run-up pad
- Configuration 2 - A320/321neo, high power, ground run-up pad (two separate events, one for each NMT pair)

The rationale for these choices is given below:

Configuration 1 – ATR 72/Q300 high power, ground run-up pad

High power ATR and Q300 engine testing is the highest noise level engine testing event that occurs frequently at night. Several representative high power events were analysed due to varying meteorological conditions and to minimise the influence of background sounds. This included two daytime runs where the background noise level was sufficiently low and some medium power runs (with appropriate adjustment to the results).

In previous years, the turbo-prop verification measurements have compared individual measured events with the ETMS predicted levels for that event. This time, the measurement data showed an

appreciable amount of variation when comparing similar tests due to varying meteorological and background noise conditions (i.e. some events measured higher than the predicted level and some measured lower). Since the engine testing noise limit is assessed over a seven day period, it is reasonable to expect a degree of variation due to wind direction to occur over the assessment period. Therefore, it is appropriate the ETMS predictions represent the average noise level. As such, for the purpose of verification, the average of a sample of measured turbo-prop engine testing events has been compared with the average predicted level for those events. An average of the following tests in Table 7 was used for our analysis. Both the ATR and Q300 were analysed.

Table 7: Turboprop engine test events used for Configuration 1 analysis

ETMS Ref	Date/Time	Duration, minutes	Aircraft Type	Max Power
6517	02/11/2023 02:17	3	ATR72-600	High
6518	02/11/2023 02:59	7	ATR72-600	High
6531	09/11/2023 05:40	5	Q300	High
6542	10/11/2023 17:00	25	ATR72-600	High
6544	11/11/2023 00:27	7	ATR72-600	Med
6547	12/11/2023 08:45	75	Q300	High
6550	14/11/2023 03:25	5	Q300	Med
6552	15/11/2023 01:15	5	Q300	Med
6578	19/11/2023 03:45	5	Q300	High
6584	21/11/2023 02:22	12	Q300	High
6583	21/11/2023 03:55	25	ATR72-600	Med
6587	22/11/2023 04:00	60	ATR72-600	High
6597	28/11/2023 02:55	6	ATR72-600	High
6603	30/11/2023 01:30	40	Q300	High
6609	01/12/2023 22:06	15	ATR72-600	High
6611	02/12/2023 04:23	5	ATR72-600	High

Configuration 2 – A320/321neo, high power, ground run-up pad

A320neo family aircraft were first assessed in the annual noise monitoring in our 2021 report, so have only been assessed against the ETMS once. Therefore the 2023 verification measurements have been used to obtain further data on the 'neo' engine variants. Because the two NMTs were deployed in pairs, it was necessary to capture two different engine test events:

a. 9 November at 1930 hrs, A320neo (registration ZK-NHC), 4 minutes at high power.

b. 18 November at 1330 hrs, A321neo (registration ZK-OYC), 1 minute at high power.

For reference, we understand that both aircraft had the Pratt & Whitney PW1100G engine options.

4.2.3 ETMS Verification Results

Configuration 1 – ATR 72/Q300 high power, ground run-up pad

The table below shows the predicted noise level from the ETMS model at each ETCMP (average of all relevant aircraft headings shown) and the average difference in the measured noise level to that calculated for each configuration (i.e. power setting and heading) at each ETCMP.

Table 8: ETMS model correlation for ATR/Q300 at full power at the run-up pad

ETCMP Number	Mean Measured dB L_{Aeq}	Mean Predicted dB L_{Aeq}	Mean difference to calculated level, dB
4	63.1	64.3	-1.2
6	61.0	59.0	+2.1
8	52.3	50.6	+1.8
16	55.3	55.7	-0.4

The predicted noise levels show good correlation with the measurements for ETCMP4 and ETCMP16. However, measurement results at ETCMP6 and ETCMP8 were on average around 2 dB higher than the predicted levels.

Noise levels at ETCMP8 varied significantly across the different tests analysed and were both above and below the predicted values at different times. This is primarily thought to be due to changes in meteorological conditions, noting the reasonable distance from the run up pad to the measurement location. Some tests were excluded from the analysis that were as much as 14 dB below the predicted levels. Including these in the averaging above would make the calculated difference approximately 0 dB. This position was analysed in previous years and showed good correlation with the model.

At ETCMP6, measured noise levels were consistently higher than the predicted levels by between 1 and 3 dB, or 2.1 dB on average. The reason for this is not known at this stage. The source events analysed in detail for this position included equal numbers of each aircraft type, all at high power and at a variety of headings. A similar configuration was last assessed in 2019 and, on that occasion, was found to be 3 dB below the predicted values. Therefore, the available data at this stage does not warrant an adjustment to the ETMS model. It is recommended that verification measurements are repeated at ETCMP6 when they are next due in 2025.

Configuration 2 – A320/321neo, high power, ground run-up pad

The table below shows the measured noise levels at the ETCMPs for Configuration 2 and the corresponding noise level used in ETMS calculations.

Table 9: Comparison of measured and predicted noise levels for A320neo high power engine tests

ETCMP	Measured, dB L_{Aeq}	Predicted, dB L_{Aeq}	Difference, dB
4	49.6	62.1	-12.5
8	52.7	52.8	-0.1
6	52.9	59.7	-6.8
16	57.5	59.3	-1.8

The measured noise levels are lower than the predicted values at all positions. There is a large difference of -12.5 dB at ETCMP4. The analysis at this position was compromised by the presence of other noise sources, including wind-induced microphone noise and light aircraft movements due to

its position on the flight path for the grass runway. While the assessed measured level of 50 dB L_{Aeq} may slightly overestimate the actual engine testing noise level, it is a clear indication that noise emissions were comfortably below the 62 dB L_{Aeq} prediction in this instance.

4.2.4 Summary

Engine testing noise verification measurements have been carried out in accordance with rule 6.1.6.2.6(v)(B). The measurements demonstrate a degree of variability in actual noise for the same aircraft and test configuration. Nonetheless the results verify the ETMS is still an appropriate tool to use for engine testing noise compliance analysis at Christchurch Airport.

4.3 Engine Testing Management Software 2023 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 used the ETMS 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.

In 2023 an independent audit of the ETMS was completed and this is summarised in Section 4.3.2.

4.3.1 Calculated Engine Testing Noise Levels

Calculated noise levels for 2023 generated from the ETMS at the ETCMPs are detailed in Table 10 (65 dB L_{dn} limit) and Table 11 (55 dB L_{dn} limit) below. The location of the ETCMPs is shown in Figure 3 below.

Figure 3: Insert from Christchurch District Plan On-Aircraft Engine Testing Compliance Monitoring

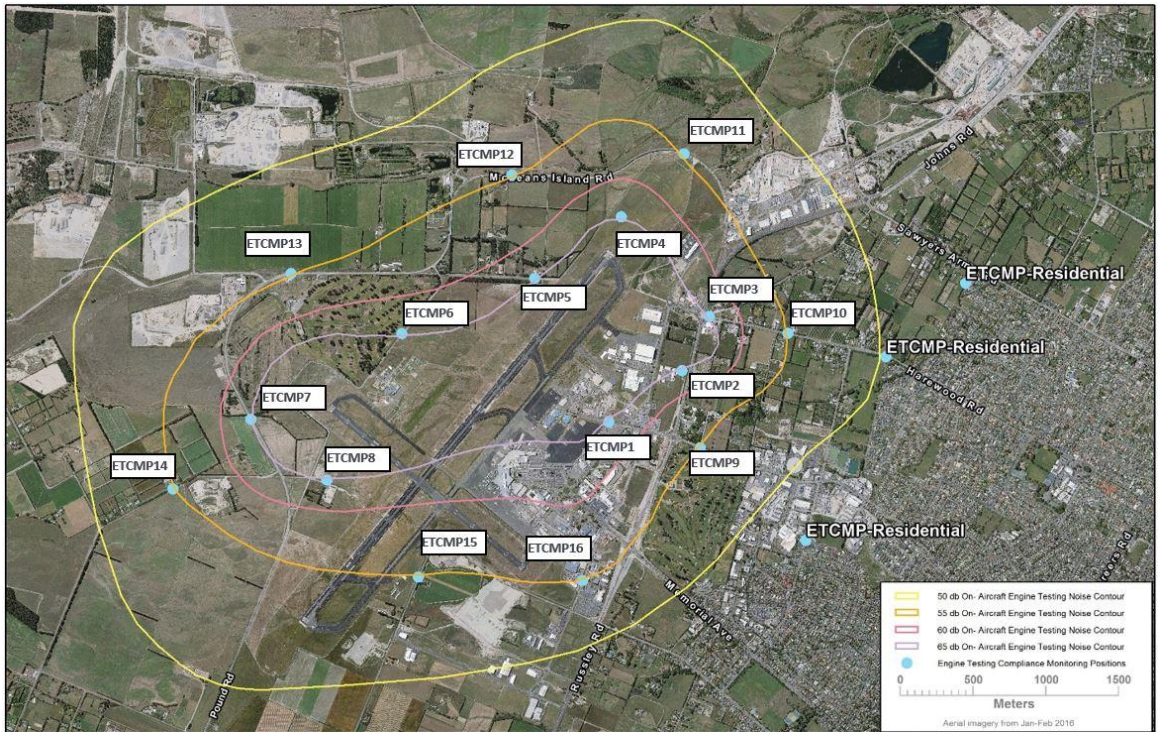


Table 10 and Table 11 below show calculated noise levels generated using the ETMS are compliant with noise limits detailed in rule 6.1.6.2.5 (a) (i).

Table 10: ETMS calculation results: 65 dB L_{dn} limit – highest 7 day L_{dn} rolling average

ETCMP Location	Min	Max	Median	Average
1	35	62	52	52
2	33	55	46	46
3	37	60	50	50
4	33	58	51	51
5	37	60	53	52
6	26	58	43	44
7	18	59	35	37
8	20	62	38	39

Table 11: ETMS calculation results: 55 dB L_{dn} limit – highest 7 day rolling average

ETCMP Location	Min	Max	Median	Average
9	27	54	46	46
10	30	53	43	43
11	28	50	43	43
12	29	52	43	43
13	22	47	36	36
14	15	48	30	31
15	20	52	39	39
16	23	50	43	42

Maximum noise levels at ETCMP 17-19 were all below the noise limit of 75 dB L_{AFmax} contained in rule 6.1.6.2.5 (a) (i). The maximum noise level for each of these was 63, 66 and 63 dB L_{AFmax}, respectively.

Figure 4 and Figure 5 below display the 7-day rolling average calculated noise levels at each of the ETCMPs for 2023. 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 4: ETMS predicted noise levels for ETCMP 1 to 8 located on the 65 dB L_{dn} engine testing contour

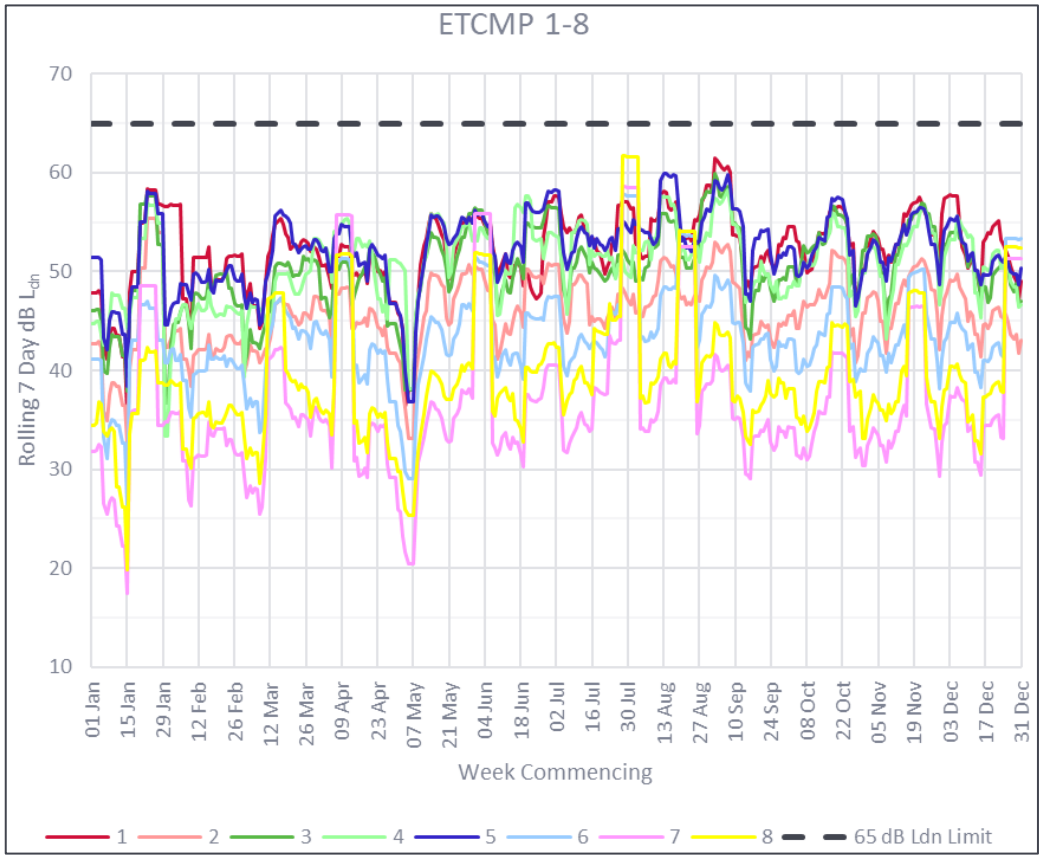
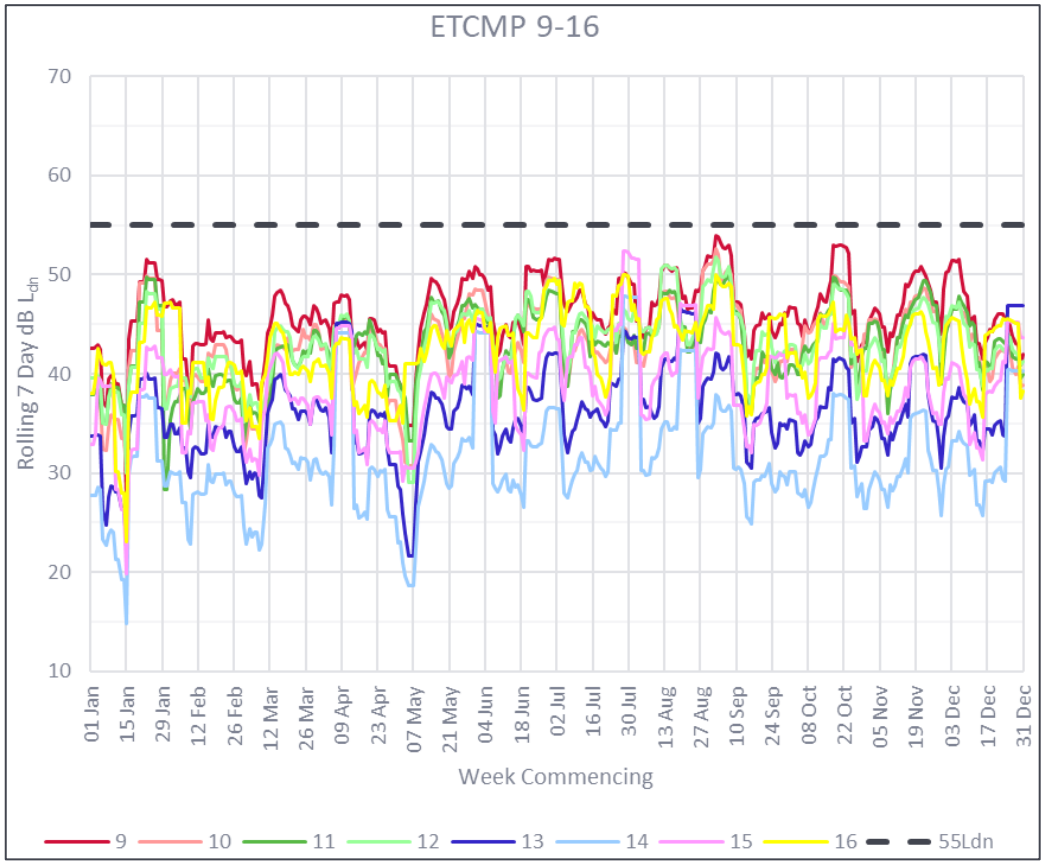


Figure 5: ETMS predicted noise levels for ETCMP 9 to 16 located on the 55 dB L_{dn} engine testing contour



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.

4.3.2 Independent Audit of ETMS

In 2023, an independent review of the ETMS was undertaken by airport noise consultant Xavier Oh on behalf of CIAL. This review was undertaken to fulfil the requirements of District Plan Appendix 6.11.14 a.ii.D, as follows:

> *"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."*

This first quinquennial review report found that the ETMS system is working well and there was good correlation between noise levels calculated by the ETMS and by verification checks.

No changes were recommended to the calculation or analysis system as a part of this review. Some recommendations were made regarding improvements to the ETMS user interface to minimise the potential for data errors and make the system more user-friendly.

5.0 COMPLAINTS

5.1 Complaints Summary

In accordance with Rule 6.1.6.2.5 a.iv.D and Rule 6.1.6.2.6 a.vii.C of the CDP, the noise complaints summary below details complaints received in 2023 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, 60 complaints were received from 22 individuals during the period 1 January to 31 December 2023. One complaint was made about aircraft movements outside of Christchurch Airport's airspace and has not been included in this summary.

There are also two unresolved complaints raised prior to 2023:

- one relating to helicopter movements and arrivals into Garden City Helicopters near the complainant's home, first raised in 2022 and
- one relating to the noise generated from aircraft departing the southern runway following the DMAPs flight paths, first raised in 2021.

CIAL continues to work with and the complainants and the related organisations to provide information and work towards resolution.

Type of Operation	Type of aircraft	No of complaints	Actions Taken
Low Flying Aircraft	Jet	5	Five complaints were made regarding low flying jets. Two of these complainants did not wish to be contacted for follow up. The first complainant experienced aircraft noise relating to the usage of the cross runway on summer evening. They were also generally concerned about low flying aircraft in their area. The cross runway was in use due to strong NW winds. One particularly noisy aircraft was found to be a freight aircraft. An explanation of Civil Aviation Authority (CAA) flying height rules, the types of flight paths flown and information on freighter jets was provided. There has been no further communication. The second complainant was concerned by one aircraft movement that was noisier than the other aircraft transiting near their home one early morning. This related to a jet aircraft arriving on runway 02. The aircraft had descended slightly lower than the required height to enter the Instrument landing system (ILS) approach path. This required the pilot to increase thrust to climb and maintain level flight to meet Air Traffic Control instructions and enter the path. The spooling up of the engines is noisier than the usual continuous descent. This information was provided to the complainant. The complainant replied to enquire about noise breaches and follow up with ATC and/or the pilot. CIAL provided information on the noise rules it must abide by and how these are measured. CIAL explained how the occurrence is not in breach of the district plan rules. Further explanation of the difference between stepped and continuous approaches was provided and explanation that both are commonly used and permitted approaches. There has been no further communication. The third complainant was concerned about an aircraft movement at night. The flight was delayed by an hour and was using a less commonly used path which is closer to the complainant's home. This information was relayed to the complainant including an explanation of typical flight paths near their home. There has been no further communication. Of the two complainants who did not wish to be contacted, both related to jet arrivals. As contact details were provided, CIAL acknowledged their complaint and encouraged them to get in contact if they would like a response. • One was a freight aircraft departing early in the morning transiting over the city and • one an A380 arrival in the afternoon arriving west of the airport.
	Helicopter	3	Three complainants received related to helicopter movements. One of these complainants did not wish to be contacted. • Two complaints related to emergency helicopter operations transiting between the airport and the hospital at night/ early morning. Emergency helicopter movements and the visual flight rules they use were explained to both complainants. There has been no further communication with either complainant. • The complaint from the complainant who did not wish to be contacted related to a helicopter transiting over their area.

	Light aircraft	6	Six complainants were received from South Christchurch concerned about light aircraft movements. All were related to movements occurring between February and April 2023. All six complainants all did not wish to be contacted. Where contact details were provided, CIAL acknowledged their complaint and encouraged them to get in contact if they would like a response. • Two related to Canterbury Aero Club (CAC) piper aircraft transiting over/near the complainants' homes. • Two related to CAC training flight completing loops over South Christchurch in the afternoon/night. • One related to a Landpro survey commissioned by CCC and ECAN to map powerline main network lines. • One related to two passes of an ex-WWII fighter aircraft completing scenic tours.
	All aircraft	7	Seven complaints related to several different low flying aircraft. One complaint related to cross runway movements (Runway 29) at night/early morning during Christchurch Airports Airfield Pavement Maintenance Works (APMW). APMW necessitated the temporarily reduction of runway 02 and aircraft were directed onto runway 29 approach. This information was passed on to the complainant. There has been no further communication. A Kaiapoi resident was concerned by movements between 8pm and 5am on one evening/morning and asked specific questions about Christchurch Airport operations. CIAL investigated and found there were 17 flights overflying Kaiapoi to land at Christchurch airport onto Runway 20 between these times. Most of the aircraft movements were scheduled domestic and international passenger planes. The remainder were 2 freighter planes and 1 flying doctors' plane. An explanation on wind patterns and runway usage, 24/7 operations, and flying heights was provided. There has been no further communication. Four complaints were made by one individual relating to one evening of aircraft movements in their area. 12 separate times were noted and investigated by CIAL. 3 of these flights were found to be transiting the complainant's area at the times noted. CIAL provided an explanation of flight path types and routes taken, and other aircraft operations at the airport including engine testing and taxiing which potentially contributed to the noise experienced. There has been no further communication. A Sockburn resident complained about an increasing number of aircraft overflying their area and noted a specific noise event at night. The complainant then added that they had noticed more helicopters and smaller planes and provided an additional date and time. CIAL investigated and found that there were two freighter movements on first night noted but were some distance from the Sockburn area. One the second night there was one emergency helicopter movement on route to the hospital. CIAL explained the most recent flight path changes in 2020 and provided information on GA movements, helicopters and weather conditions that may be contributing to the noise experienced. There has been no further communication.

Type of Operation	Type of aircraft	No of complaints	Actions Taken
Flight Path Change	All aircraft	2	Two complaints were received relating to flight path changes. A West Melton resident contacted CIAL as they had noticed more planes in their area. CIAL provided information on the flight paths transiting near or over the West Melton area and specifically 2 approach paths near their home. An explanation of RNP AR (PBN flight paths) and aircrafts usage of those paths was provided. There has been no further communication. One complainant contacted CIAL once in 2023 but has lodged multiple complaints since 2021 regarding the DMAPS southern departure flight path from the main runway. CIAL provided a summary of past correspondence and extended the invitation for the complainant to again meet with CIAL to discuss their concerns. An explanation of how the airport is required to measure aircraft and details of a specific aircraft movement mentioned in the complaint were provided. Following this, CIAL have not received any further correspondence from this complainant.
Engine Testing	Turboprop	2	Two complaints were received relating to turboprop engine testing. Both complainants did not wish to be contacted for follow up. • One complaint related to 10 min of high power engine testing at night. There was also a passenger jet and freighter arrival onto runway 20 occurring at the same time. • One complaint related to 70 min of medium power engine testing in the early morning.
	Jet & Turboprop	1	One complaint was made regarding jet and turboprop engine testing in the evening and night/early morning over three consecutive days. This complainant did not wish to be contacted. • On the first day there was 1 jet engine test for 10 mins at high power in the evening. There was also a CAC piper plane completing night training in the evening. • On the second day there was 1 turboprop engine test for 20 mins at idle power in the early morning. • On the third day there was 1 turboprop engine test for 20 mins at idle power in the early morning. There was also a freighter jet that departed on runway 02 in the early morning.
Taxiing/ Departure Noise	Jet	33	One complainant made 34 separate complaints between July and August. 33 of these related to jet taxiing/ departure noise between 5:45 and 7am and at night. One complaint related to emergency helicopter movements which is detailed above. The complainant also outlined their expectations that CIAL provide an appropriate solution to resolve the noise issues experienced and was critical of the operations and management of the airport. On investigation the majority of the complaints related to aircraft taxiing to or preparing to depart from runway 02. As this is some distance from the complainants home further investigation was undertaken. No recent changes to the flight schedules in the periods identified were found and movements were consistent with typical runway use. The most likely contributing factor appears to be weather conditions in the colder months.

			These details were shared with the complainant. CIAL also explained the role of the airport in the region and its 24/7 operations. Similarly, the complainant's criticisms of the airport were addressed including an explanation of noise management, noise controls and monitoring. Lastly the future of aircraft movements was detailed explaining post Covid-19 recovery and operations within operational constraints. Following this one complaint was received relating to emergency helicopter movements as detailed above. There has been no further communication.
	All aircraft	1	One complaint was made aircraft noise in the morning. CIAL found that no engine tests occurred at the times noted. On further investigation the mostly likely source of the aircraft noise experienced was related to aircraft taxing, landing, and take-off. This was coupled with high W/SW winds blowing noise towards the city. This was explained to the complainant, who responded to acknowledge and thank CIAL for the investigation.

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 Contour has been fixed by the District Plan. Therefore, there is no change to the number of eligible dwellings inside these noise contours. For engine testing 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 2023 AANC incorporates no additional dwellings compared with the 2021 and 2022 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 2023 AANC demonstrates compliance with the 65 dB L_{dn} Air Noise Compliance Contour contained in the CDP and is larger in its extent than the 2022 AANC.
- The 2023 AANC falls within one to two decibels of the Air Noise Compliance Contour in a localised area at the end of runway 29. In accordance with CIAL's Noise Management Plan Section 6.1.1, an initial summary review as to the cause and extent of this margin will be undertaken.
- In all other areas the 2023 AANC is three 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 2023.
- 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 to verify that the calculations taken from the ETMS software is representative of the actual noise levels.
- The 2023 AANC is larger in its extent than the 2022 AANC. However, 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.

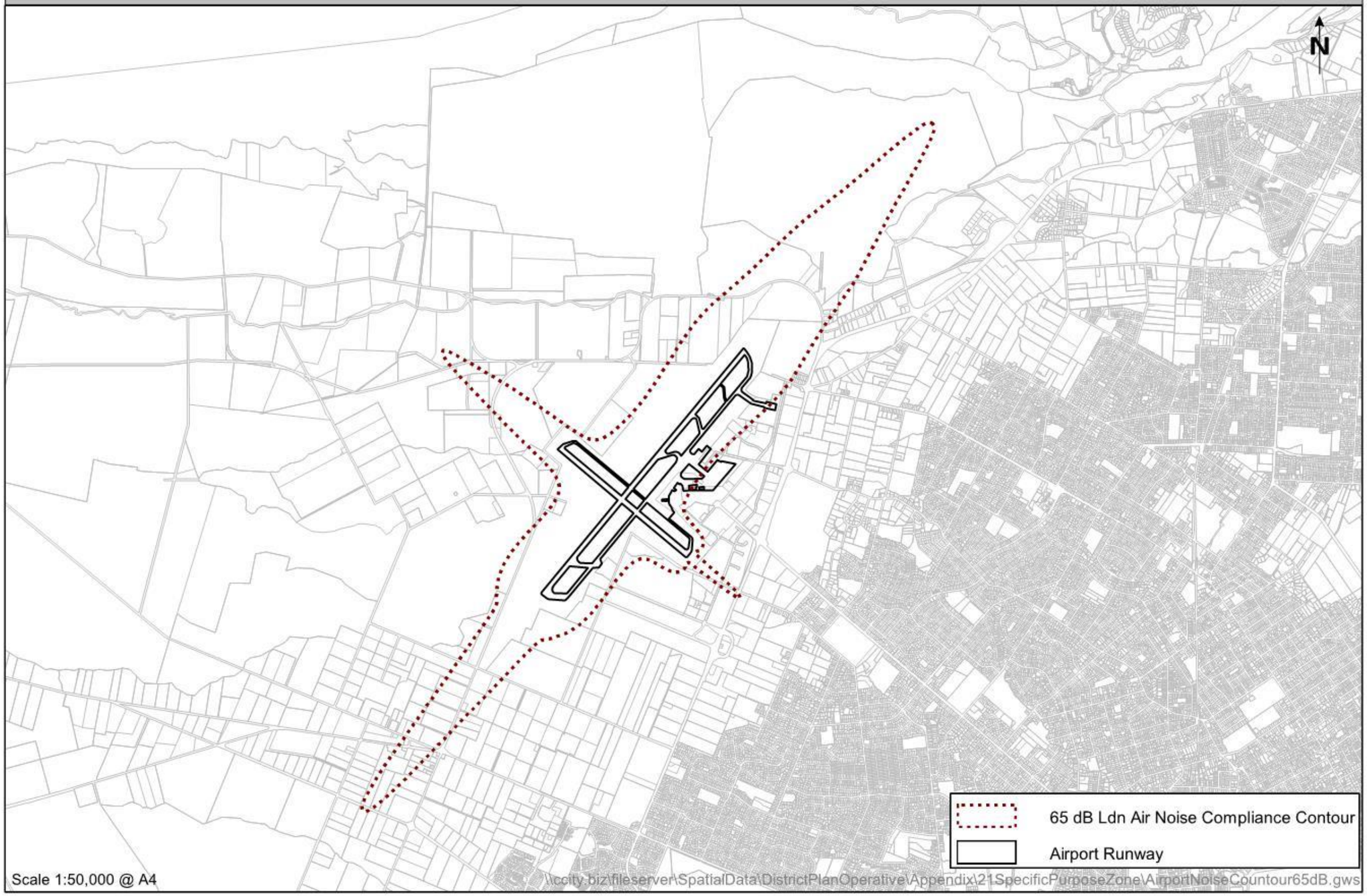
The relevant rules relating to aircraft operation and engine testing noise are given in 6.1.6.2.5 – 6.1.6.2.7.1 and Appendix 6.11.14. They state:

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.*

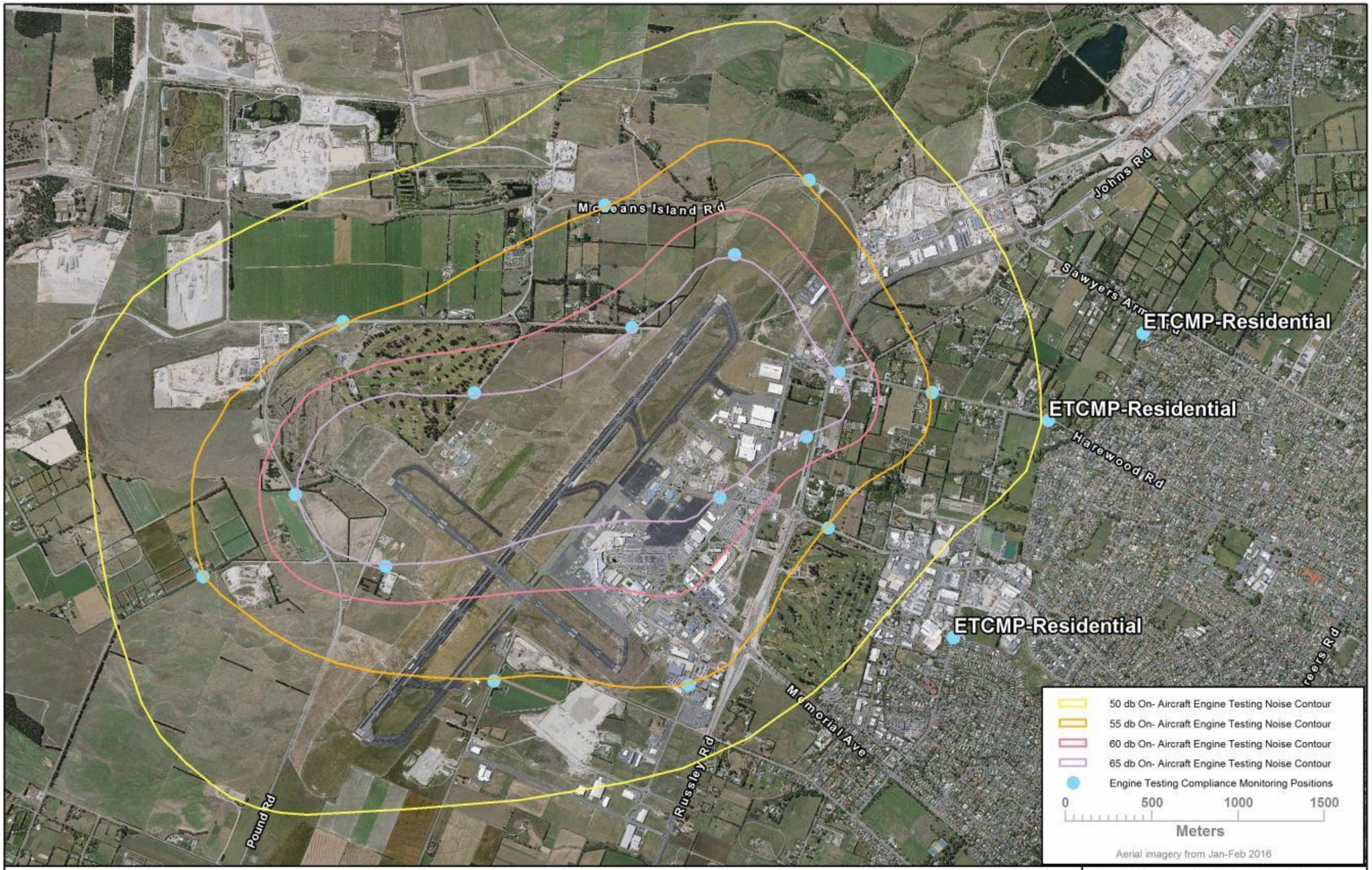
vii. *An On-aircraft Engine Testing Noise Monitoring Report shall be provided annually by the airport operator to the Council by 6 March 2018, and annually thereafter. The report shall include:*

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 addr ess 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

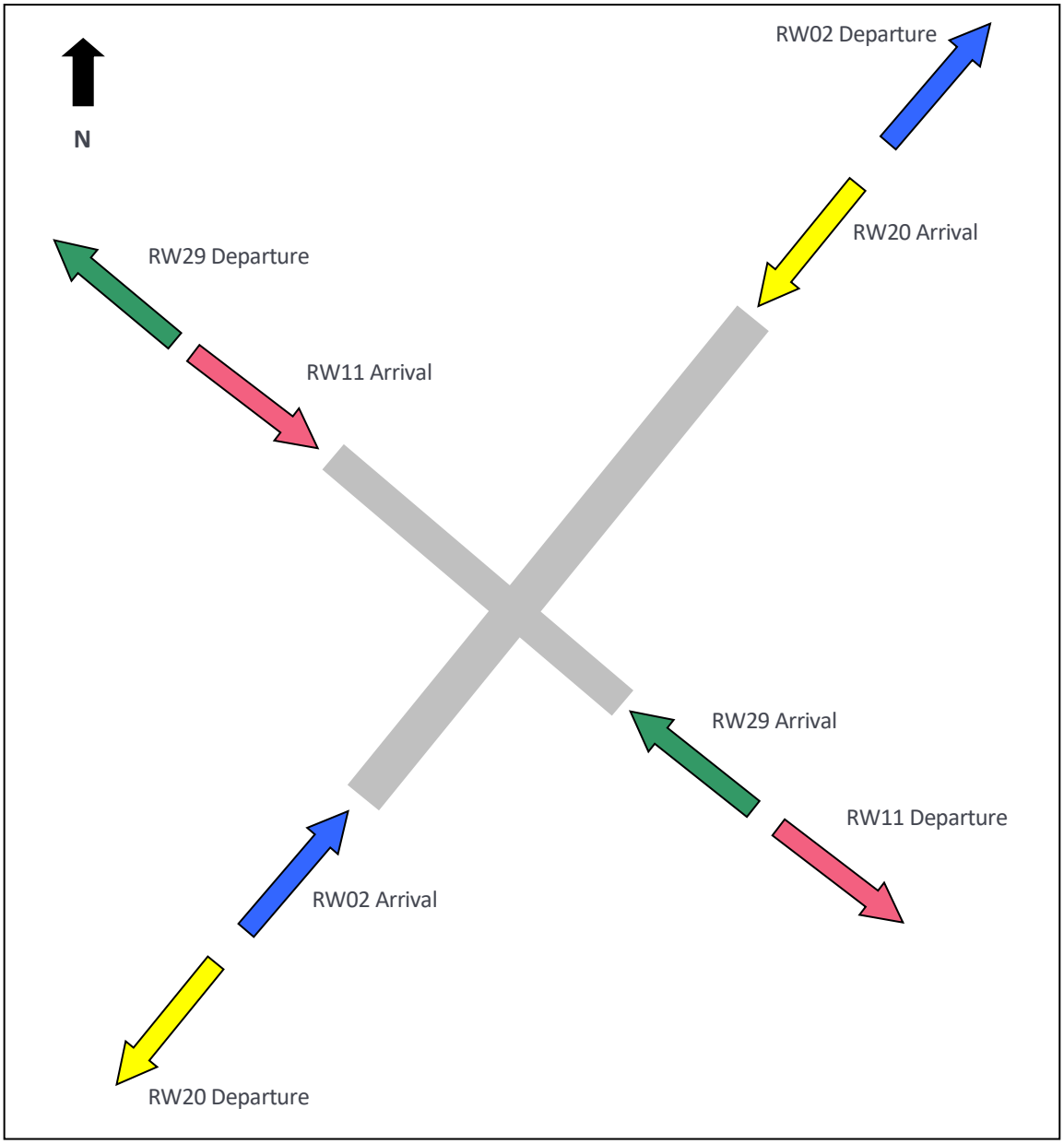
APPENDIX B CHRISTCHURCH AIRPORT RUNWAY VECTORS

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: 2023 AANC Modelled Aircraft Movements by Runway

Aircraft type	Aircraft	RW02		RW11	RW20		RW29	
		Day	Night	Day	Day	Night	Day	Night
Scheduled jet	A20N	1.58	2.37	0.00	0.74	1.15	0.23	0.00
	A21N	0.86	0.72	0.00	0.38	0.42	0.08	0.00
	A320	34.20	3.29	0.00	15.83	1.77	3.01	0.05
	A332	0.28	0.02	0.00	0.16	0.05	0.00	0.00
	A333	0.00	0.04	0.00	0.00	0.00	0.00	0.00
	A359	1.60	0.00	0.00	0.85	0.00	0.01	0.00
	A35K	0.09	0.00	0.00	0.04	0.00	0.00	0.00
	A388	1.40	0.00	0.00	0.57	0.00	0.01	0.00
	B38M	0.38	0.01	0.00	0.07	0.00	0.00	0.00
	B733	0.08	0.00	0.00	0.03	0.00	0.03	0.00
	B734	2.18	2.50	0.00	0.62	1.29	0.10	0.01
	B738	3.02	2.43	0.00	1.25	1.35	0.18	0.00
	B763	0.85	0.29	0.00	0.43	0.18	0.00	0.00
	B788	0.14	0.01	0.00	0.04	0.00	0.00	0.00
	B789	0.26	0.26	0.00	0.11	0.07	0.00	0.00
	E190	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Scheduled turboprop	AT75	2.00	0.09	0.00	0.90	0.03	0.27	0.00
	AT76	43.57	1.45	0.00	18.64	0.78	4.33	0.03
	DH8C	12.60	0.12	0.01	5.64	0.12	1.00	0.00
	JS32	0.02	0.00	0.00	0.00	0.00	0.02	0.00
	PC12	6.24	0.00	0.01	2.72	0.01	0.68	0.00
	SF34	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Non-Scheduled jet	A21N	0.02	0.00	0.00	0.03	0.00	0.00	0.00
	B738	0.80	1.20	0.00	0.34	0.59	0.09	0.11
	BE40	0.05	0.00	0.00	0.01	0.00	0.00	0.00
	C25B	0.01	0.00	0.00	0.01	0.00	0.00	0.00
	C25C	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	C510	0.10	0.00	0.00	0.04	0.00	0.01	0.00
	C680	0.03	0.00	0.00	0.01	0.00	0.02	0.00
	CL60	0.34	0.02	0.00	0.12	0.00	0.03	0.00
	E55P	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	GL7T	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	GLF6	0.01	0.01	0.00	0.00	0.00	0.00	0.00
	LJ60	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Non-Scheduled piston	PA34	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Non-Scheduled turboprop	AT75	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	B350	0.17	0.07	0.00	0.11	0.04	0.04	0.02
	BE20	1.84	0.08	0.00	0.88	0.03	0.12	0.00
	BE30	0.21	0.01	0.00	0.10	0.02	0.01	0.01
	BE9L	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	C441	0.02	0.00	0.00	0.00	0.00	0.00	0.00
	JS32	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	PC12	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	SF34	0.02	0.00	0.00	0.09	0.00	0.00	0.00

APPENDIX D 2023 AANC (55 – 70 DB L_{DN} IN ONE DECIBEL INCREMENTS)