MARSHALL DAY Acoustics

CHRISTCHURCH AIRPORT NOISE MONITORING 2018 NOISE MONITORING REPORT

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Project: **CHRISTCHURCH AIRPORT NOISE MONITORING**

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1.0 INTRODUCTION

Christchurch International Airport Limited (CIAL) are 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 2018 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 noise levels, if undertaken, to verify the compliance calculations
- Update of the Acoustic Treatment Programme (ATP) schedule of eligible dwellings

This Noise Monitoring Report has been prepared by Marshall Day Acoustics on behalf of Christchurch International Airport Limited.

A list of definitions and acronyms is provided in Appendix A.

2.0 STATUTORY REQUIREMENTS

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

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;
- 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-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 2017 to 31 December 2017.

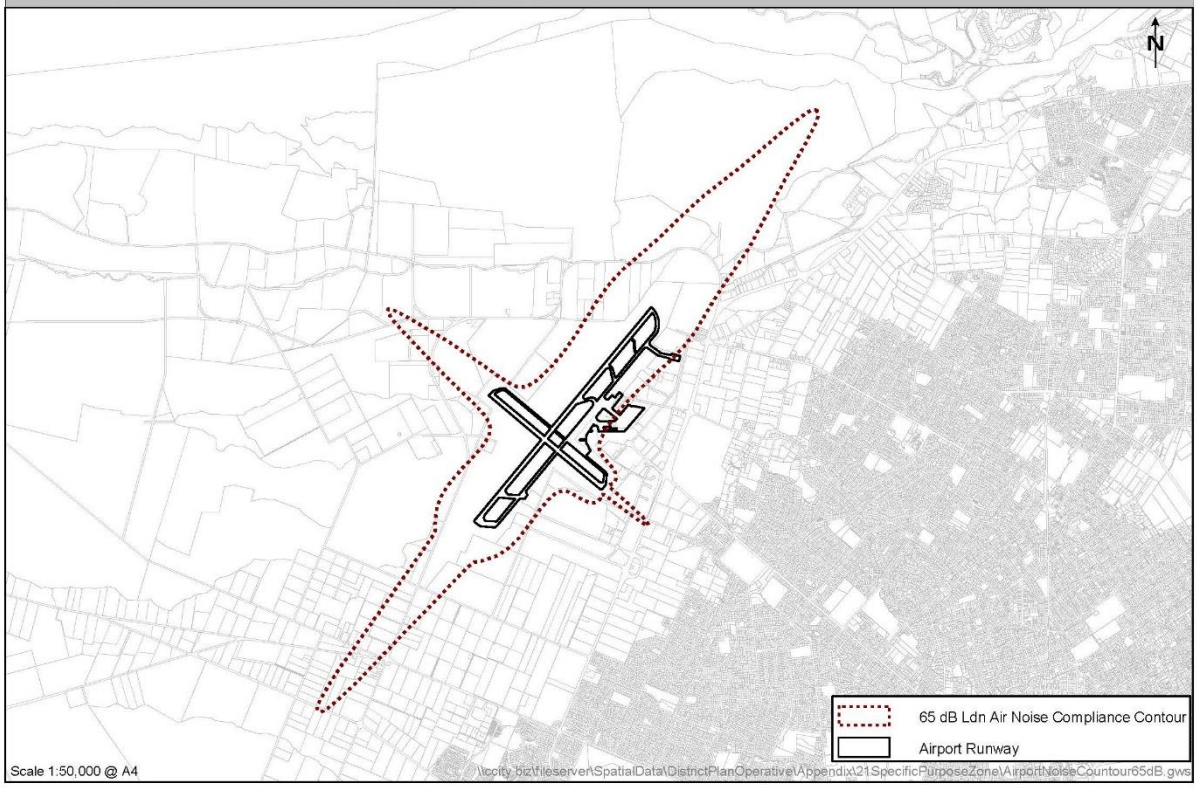
Full copies of rules 6.1.1.2.5 and 6.1.6.2.6 are included in appendix A.

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 monitoring required to determine compliance with rule 6.1.6.2.5 (a) (i).

2.2 Noise Limits - On Aircraft Engine Testing

Table 5 (refer to table 1 below) in rule 6.1.6.2.6 (a) of the District Plan outlines noise limits for on aircraft engine testing.

Table 1: 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

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 or 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

Christchurch International Airport (CIAL) is the main gateway to the South Island with current *total* aircraft movements of 95,000 to 105,000 per annum over the last 5 years.

Based on information provided by Airways Corporation NZ, for the year 2018 there were;

- 75,738 scheduled commercial aircraft movements, and
- 105,315 total aircraft movements.

Scheduled commercial movements over the last 5 years are as shown in Table 1 below

Table 2: Scheduled Commercial Aircraft Movements

Aircraft Movements	2018	2017	2016	2015	2014	2013	2012	2011
Scheduled Commercial Movements	75,738	76,585	74,130	74,144	75,072	71,715	73,184	75,529

The busiest three months for scheduled aircraft movements in 2018 were October, November and December. A summary of the movement data input into the Integrated Noise Model (INM) used to produce the 2018 Annual Aircraft Noise Contours (AANC) is provided in section 3.2 of this report.

3.2 Modelling Methodology

To ensure consistency with the 65 dB L_{dn} Air Noise Compliance Contour in the Christchurch District Plan, the 2018 AANC has been calculated using version 7 of the Integrated Noise Model (INM) developed by the US Federal Aviation Authority.

The INM software (like most software), has been upgraded regularly over the last 10 years. Each update to the INM program has resulted in slightly different calculation results. As the District Plan contour and AANC are both used for noise control purposes, and as the District Plan contours are used as the basis of determining appropriate land use planning controls and the selection of mitigation treatment, it is therefore considered that the same software version should be used to prepare the AANC.

The 2018 AANC is based on aircraft movements provided by Airways Corporation NZ. This data includes all movements of aircraft fitted with a transponder. Some general aviation (GA) aircraft do not have transponders and therefore data for these movements is unavailable.

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 busiest three months were determined by the scheduled commercial movements. GA movements were discounted when determining the busiest three months but included in the calculated AANC as GA aircraft do not influence the overall noise as much as scheduled aircraft.

The busiest consecutive three months for scheduled commercial movements in 2018 was October, November and December in accordance with rule 6.1.6.2.5 (iii) (b). The Performance Based

Navigation (PBN) trial concluded in early November 2018 (refer Section 6.0) therefore approximately half of the modelled three months includes PBN activity.

A diagram of the Christchurch Airport runway system is included in Appendix C for reference

The 65 dB $_{Ldn}$ Air Noise Compliance Contour in the Christchurch District Plan was developed without inclusion of GA operations. 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 2008 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. A review of the annual number of GA movements between 2008 and 2018 shows that GA activity is at its lowest level since 2008. MDA has calculated the effect of GA operations on the AANC and conclude that GA operations typically contribute less than 0.1 dB to the noise contours which is a negligible difference. Therefore GA movements have been excluded when identifying the busiest three months for the year but included in the AANC calculation.

The total 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 has an associated +10 decibel adjustment. A summary of the total aircraft movements by month is shown in Table D1, Appendix D, and a breakdown of the average daily aircraft movements by aircraft type and runway is included in Table D2, Appendix D.

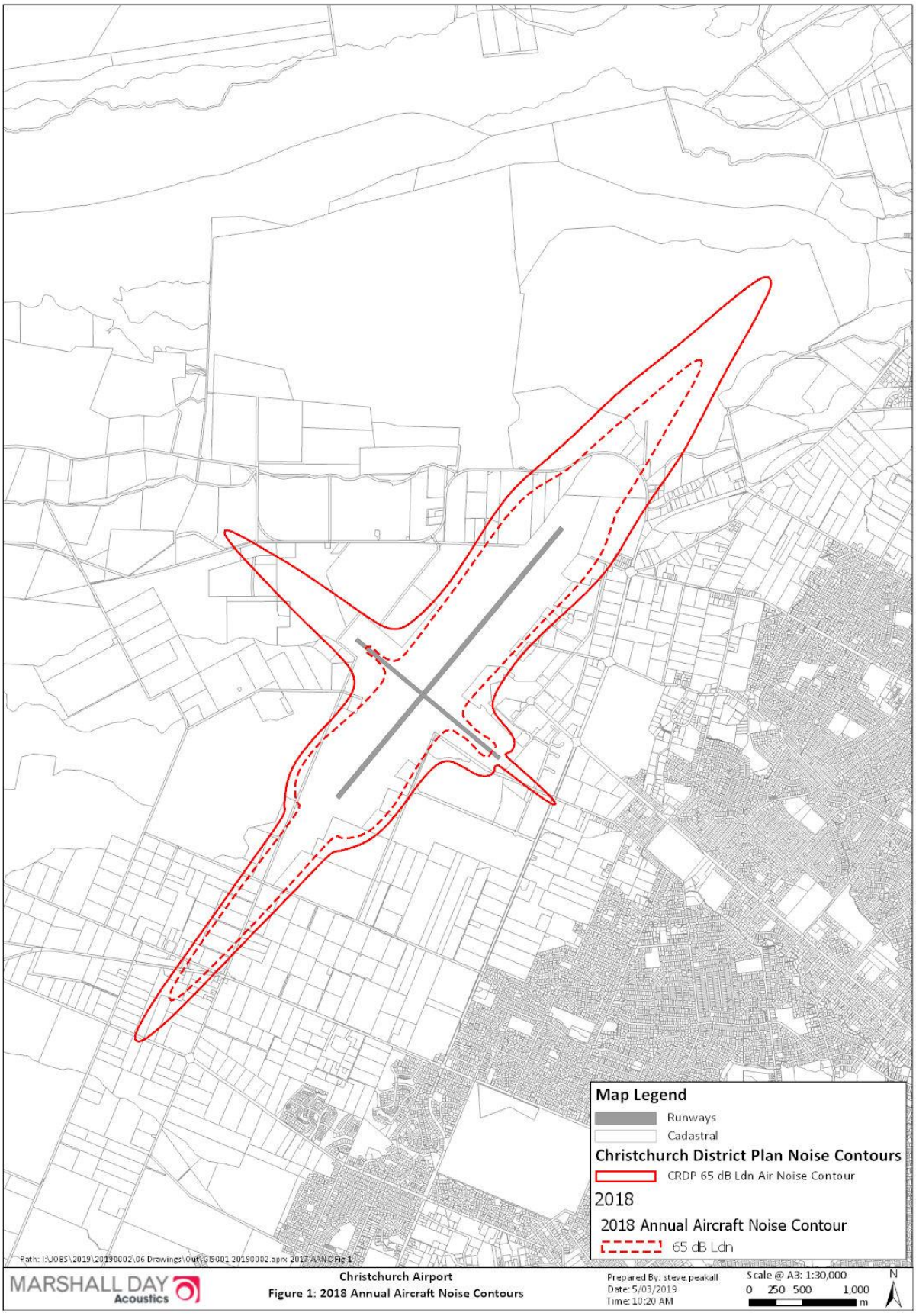
Table 3 Summary of Modelled Aircraft Movements

	Busiest 3 Months (Oct-Nov-Dec 2018)
Total Movements	26,968
Day Time Movements	23,956
Night Time Movements	3012

Data provided by Airways includes actual runway usage data which has been used in the preparation of the 2018 AANC. In 2018 the main runway was used 98% of the time compared with the crosswind runway. For the busy three months, the main runway was used 97% of the time which is representative of the annual average use.

The flight tracks used in the model include the trial PBN tracks used by aircraft during the PBN trial and the same regular flight tracks as were used for the development of the 65 dB L_{dn} Air Noise Compliance Contour. These flight tracks were reviewed by Airways in 2014 and 2017 and Airways advised they remain a reasonable approximation of long term average flight tracks flown.

The 2018 AANC demonstrates 2018 aircraft operations comply with the 65 dB L_{dn} Air Noise Compliance contour shown below and as Figure 1, Appendix E. In accordance with the rule contained in Appendix 6.11.4 a.ii.C of the CDP the 2018 AANC showing 1 dB increments from 55 dB to 70 dB L_{dn} is shown in Figure 2, Appendix F.



***2018 AANC and* 65 dB L_{dn} Air Noise Compliance contours**

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 2018 NMR is the author of this report, Steve Peakall of Marshall Day Acoustics.

3.3 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 on occasion but does not define a frequency that monitoring shall occur.

Noise measurements carried out in 2017 were used for the purpose of verifying the 2017 AANC and to understand changes in the noise environment as a result of the PBN trial. Details of these measurements and model verification are set out in the 2017 NMR. As verification measurements were completed as recently as last year and there were no outstanding issues, no further measurements were necessary in 2018. The same modelling techniques used in 2017 have been applied to the 2018 model and therefore it is appropriate to rely upon the model verification from 2017.

It is noted that the calculated 2018 AANC are at least 1 decibel below the 65 dB Air Noise Compliance Contour in all locations and therefore in accordance with the Noise Management Plan, noise measurements are not considered necessary.

4.0 ON AIRCRAFT ENGINE TESTING

As defined in the Christchurch District Plan on aircraft engine testing includes the testing of engines on aircraft.

4.1 Summary of On-Aircraft Engine Testing

Based on information obtained from the ETMS, for the year 2018 there were;

- 1369 total on-wing engine tests
- 872 ATR tests
- 362 A320 tests
- 135 other tests

The total number of recorded engine testing events over the last 5 years is as follows.

Table 4: Engine Testing Events by year

Engine Testing Events	2018	2017	2016	2015	2014	2013
Total number of events	1369	1384	1023	805	663	751

4.2 Engine Testing Management Software

The Engine Testing Management Software (ETMS) is used to calculate noise levels emitted from on aircraft engine testing and calculate the 7-day rolling average. CIAL have used the ETMS since 2010, in July 2017 this software was updated to meet new provisions in the District Plan including:

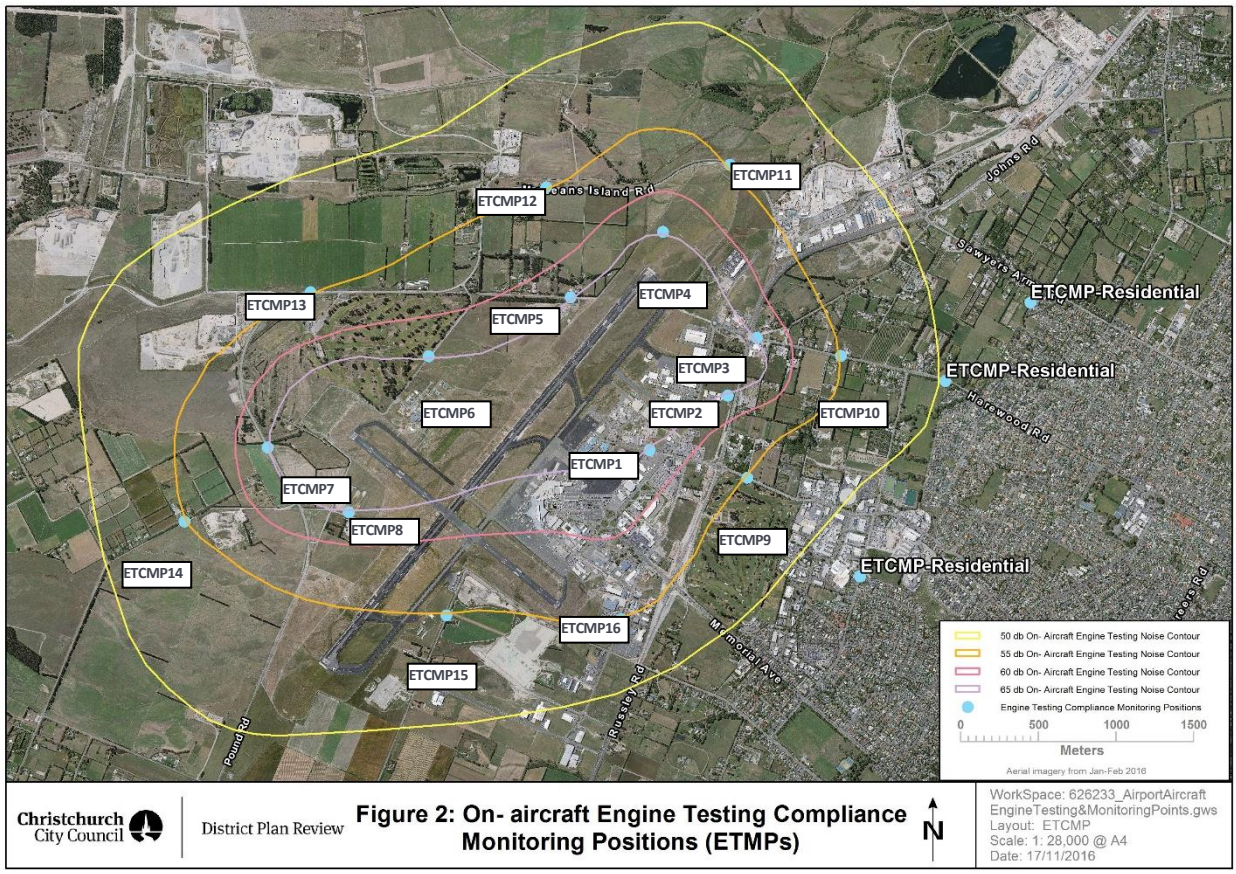
- The requirement to calculate the 7-day rolling average;
- Development of the ETMS on a web based platform and;

- Verification of the ETMS calculated noise levels at the Engine Testing Compliance Monitoring Positions (ETCMP) locations, which had only been confirmed in the District Plan on 6 March 2017.

Improvements to the ETMS software went live on 21 July 2017, and from that point onwards compliance could be readily assessed at the ETCMPs. 2018 compliance assessment using the updated version of the ETMS has been undertaken.

4.2.1 Compliance of Calculated Noise Levels (21 July onwards)

Calculated noise levels for 2018 generated from the ETMS at the ETCMPs are detailed in Table 5 (65 dB L_{dn} limit) and Table 6 (55 dB L_{dn} limit) below. The location of the ETCMPs is shown below.



Insert from CDP On-Aircraft Engine Testing Compliance Monitoring.

Table 5 and 6 identify calculated noise levels generated using the ETMS are compliant with noise limits detailed in rule 6.1.6.2.5 (a) (i).

Maximum noise levels at ETCMP 17, ETCMP 18 and ETCMP 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, 64, 59 dB L_{AFmax} respectively.

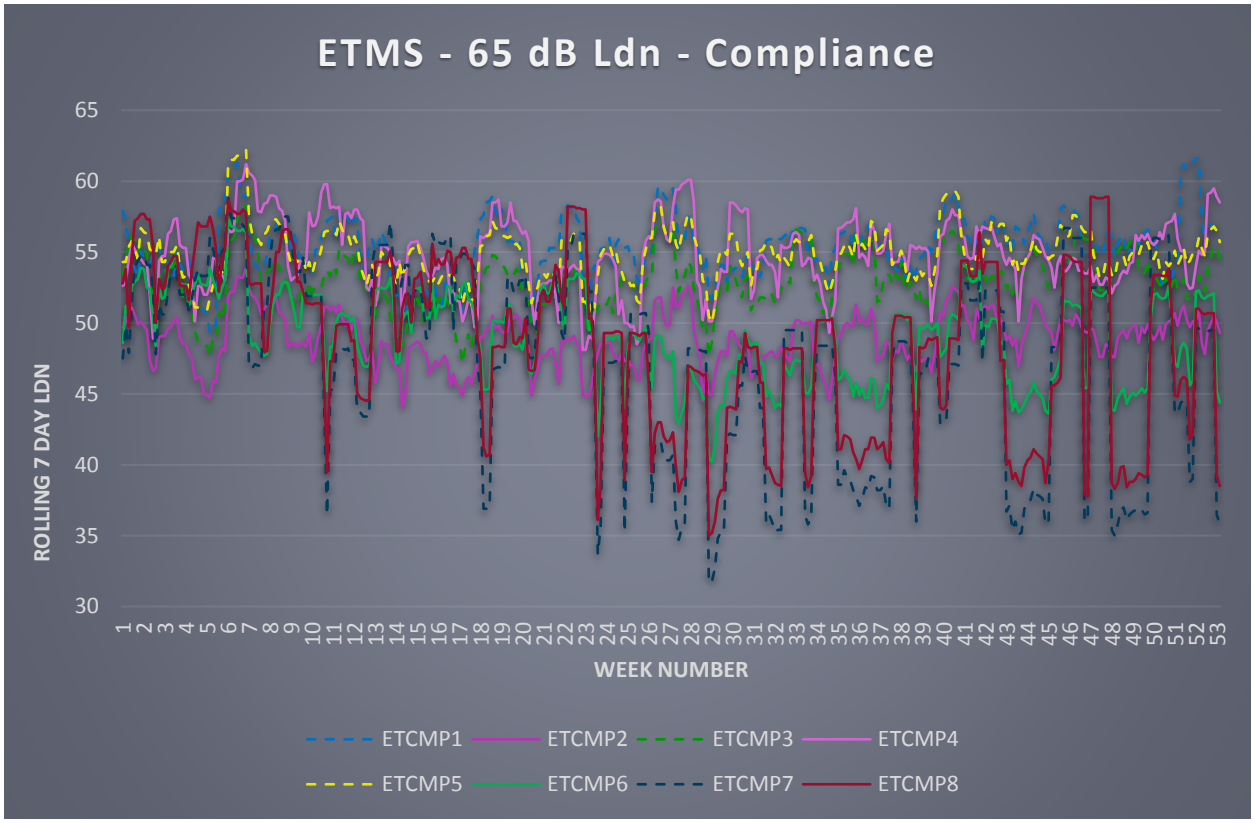
Table 5: ETMS Prediction Results - 65 dB L_{dn} limit – 7 Day L_{dn} Rolling Average

ETCMP Location	Min	Max	Median	Average
1	49	62	55	55
2	44	54	49	49
3	47	58	53	53
4	48	61	55	55
5	50	62	55	55
6	40	58	50	50
7	32	59	49	49
8	35	59	49	49

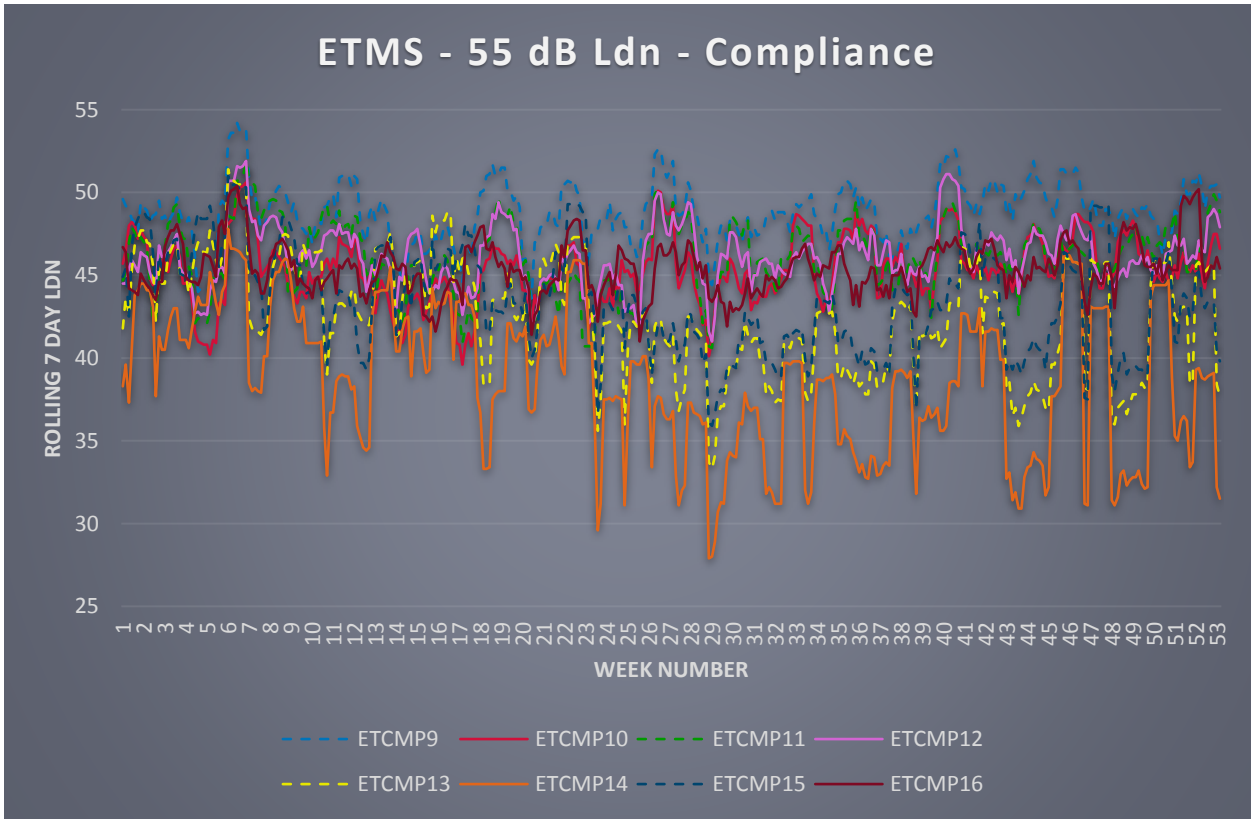
Table 6: ETMS Prediction Results - 55 dB L_{dn} limit – 7 Day Rolling Average

ETCMP Location	Min	Max	Median	Average
9	44	54	49	49
10	40	51	45	45
11	41	52	46	46
12	41	52	46	46
13	33	51	43	43
14	28	48	39	39
15	36	51	44	44
16	41	50	45	45

Graphs 5.1 and 5.2 below display the 7-day rolling average calculated noise levels at each of the ETCMPs for 2018. As shown in the two graphs, compliance was predicted to be achieved at all Engine Testing Compliance Monitoring Positions (ETCMPs) during the engine testing events in that period.



ETMS predicted 2018 noise levels for ETCMP 1 to ETCMP 8, located on the 65 dB L_{dn} engine testing contour



ETMS predicted 2018 noise levels for ETCMP 9 to ETCMP 16, located on the 55 dB L_{dn} engine testing contour.

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

4.3 Verification Noise Measurements

In accordance with rule 6.1.6.2.6 a (V) (B) in the CDP, noise verification measurements referenced to four ETCMP for at least two on-aircraft engine test configurations were undertaken in 2017. Results concluded that measured noise levels sufficiently verified calculated noise levels generated from the ETMS. In accordance with rule 6.1.6.2.6 a (V) (B), noise verification measurements will be undertaken once every two years and will be carried out in 2019.

5.0 COMPLAINTS

5.1 Complaints Summary

In accordance with 6.1.6.2.5 a.iv.D & 6.1.6.2.6 a.vii.C the noise complaints summary below details:

- Complaints received over the previous year in respect to aircraft operations and on-aircraft engine testing
- Any actions taken in response to these complaints

All names and addresses have been omitted for privacy purposes. Community feedback in relation to the performance based navigation trial is detailed in section 6.1 below.

5.1.1 Aircraft Operations and On-Aircraft Engine Testing

Complaints have been grouped by the type of operation and description of noise; actions taken as a result of the complaints are also listed. In summary, 38 complaints were received from 20 individuals from the period 1 January to 31 December 2018, excluding complaints relating to the PBN Trial (refer to section 6.1 below for a summary of feedback from the PBN trial).

Type of Operation	Type of Aircraft	Number of Complaints	Actions Taken
Low Flying Aircraft	Jet	13	2 complaints were received from one individual concerned by low flying jets on one night. CIAL went to Airways to evaluate the evening of concern. It was found that due to unusual poor weather on that evening freight aircraft had to fly over the complainant's area, when they wouldn't normally, to safely land at the airport. Complainant was appreciative of the detailed feedback.
			2 complaints were received from one individual concerned that aircraft are not flying in accordance with the Noise Management Plan. CIAL worked with Airways to provide as much information possible to address his concerns. After many emails between CIAL and the complainant, he decided that he was unhappy at the speed of response and did not want any further communication. CIAL explained that gathering information from multiple sources, Airways and several aircraft operators, inevitably takes time and that the Airport has done its best to respond as quickly as possible. CIAL encouraged the complaint to continue to register his feedback but as he no longer

			wished to receive an explanation this was our final correspondence. CIAL has not has received any further complainants from this individual.
			3 complaints were received from one individual who was concerned about low flying military aircraft. CIAL rang this complainant to talk through his concerns and his feedback was passed on to Airways.
			Complainant concerned by large aircraft flying low especially late at night and early in the morning over the past month. CIAL went to Airways who analysed months' worth of aircraft movements and found that, in 1 month, 4 flights (all jets) over flew her area due to westerly winds. Airways found that there has been no increase or change in flight schedules or types of aircraft flying into Christchurch. This information was given to the complainant whom was satisfied with the response.
			2 complaints were received from 2 individuals at the same residence concerned about the high volume of low flying aircraft and believed the noise contours were being breached. CIAL called to address both their concerns, where they explained they were long term residents of their area and have noticed the noise and volume of the aircraft steadily increasing so had purchased a noise logger to monitor noise levels to determine whether noise levels breach the noise contours. CIAL contacted their acoustic engineer consultants to provide advice and a leaflet to help explain the noise limits at Christchurch Airport and the way aircraft noise is monitored. Airways were also contacted to provide feedback and found that there was nothing out of the ordinary about the approaches noted as particularly noisy. Airways put the increase in noise, on these days down to aircraft flying instrument approaches in low cloud weather conditions to allow for safe flying in these conditions.
			3 complaints were received from one individual. This complainant has continued to lodge noise complaints regarding aircraft noise which he believes is related to the flight paths trial. CIAL has provided him with as much information as possible including details of the trial and specific information about flight paths, contextual and technical information from Airways via CIAL. CIAL has asked for him to provide more specific information including times and types of aircraft as his complaints are general and difficult to provide feedback on. The complainant has been provided with flight path maps showing a comparison between pre-trial and during trial flights showing that traffic patterns have remained the same with some streamlining of flight paths which have mainly directed flights away from his home. The complainant also was invited and agreed to attend a meeting with Airways and CIAL, however decided not to attend once the meeting was scheduled. CIAL explained that he could also raise his concerns at the next ANLC meeting if he preferred but the complainant has not responded.
		6	3 complaints were received from one individual.

	Turbo-Prop		1. First and second complaint were in relation to low flying aircraft. CIAL explained this was a Sounds Air single engine turbo-prop which over-flew his home when landing in north easterly conditions on Runway 02 which occurs around 30% of the time. This flight arrives to Christchurch Airport during the day. 2. Third complaint was in relation to a light twin turboprop involved in the flight calibration of Christchurch Airport navigation aids. CIAL explained that these flights are infrequent (once every 1-2 years), but necessary to ensure that current flight procedures are safe and accurate.
			2 complaints were received from one complainant concerned that aircraft are flying in non-permitted areas. CIAL explained the variability of approaches due to instrument landing systems, visual approaches and weather conditions causing aircraft to fly over many parts of the city. It was explained that this is permitted providing aircraft follow Civil Aviation Authority (CAA) rules.
			Complainant concerned by a low flying aircraft. Contact was attempted via phone and email but incorrect contact information was provided.
	Light Aircraft	2	2 complaints were received from one complainant in relation to constant low flying aircraft over the course of 2 ½ hours on one night. CIAL explained that Canterbury Aero Club (CAC) had 4 staff in training (being the maximum allowed on one night) completing circuits at the same time on the night in question. Air Traffic Control (ATC) had to instruct the use of non-standard right hand circuits from runway 02 due to aircraft traffic. At the same time, there was a laser strike at New Brighton, so ATC had to direct traffic to circle in the same area until the situation was resolved. CIAL explained that this was an abnormal occurrence. Complaint understood and was pleased with the investigation and response.
	Helicopter	4	3 complaints were received from one individual. 1. The first complaint was in relation to the large number of helicopters flying over her area. Complainant is on the Garden City Aviation (GCA) helicopters flight path and is bothered by scenic trips. CIAL worked with Airways to see if it was viable to incorporate more variation to helicopter flight paths overall. It is not always appropriate to request changes to flight patterns based on an individual complaint. As a result, Airways and GCA are hesitant to make changes due to operational challenges at this time. 2. Second complaint was in relation to a Military helicopters flight path. A map showing the flight path was given. It was explained that the New Zealand Defence Force are not required to follow civil rules, but they will conform to at least the minimum requirement.

			3. Third complaint in relation to GCA Annual Open Day. Complaint asked if helicopters could fly over farmland avoiding residential properties and that the neighbourhood be informed before future events. CIAL have passed on this advice to the GCA.
			Complainant was concerned by low flying military helicopter and aircraft traffic in the area. A map showing the flight path was given. It was explained that the New Zealand Defence Force are not required to follow civil rules, but they will conform to at least the minimum requirement. Complainant is located close to the Westpac Rescue Helicopter pad near the hospital and is on the approach to Runway 29. Consequently, CIAL explained the nature of aircraft operations in his area.
	Multiple	3	2 complaints were received from one complainant requesting specific information in relation to the Flight Path Trial. Airways and CIAL worked together to provide this information. After some time, complainant contacted the Airport again to complain about noise in his area due to a change in aircraft operations. Airways and CIAL met with the complainant to explain that the flight path changes were likely to have little to no effect to his area and to explain the reasons for implementing the trial, why planes overfly the city and other aircraft noise related issues. Complainant was comforted that the proposed changes to the flight paths would have minimal effect to his area and has gained an understanding of aircraft operations at the airport.
			Complainant concerned by low flying aircraft in general. CIAL worked with Airways to explain that many different types of aircraft transit over this area uncontrolled and typically flying visual flight rules. It was suggested that the complainant address queries with the CAA.
Engine Testing	Turbo-Prop	10	Complainant did not wish to be contacted, however CIAL encouraged him to register more feedback or contact us directly if he wishes to discuss his concerns.
			Complainant concerned by engine testing at night. No engine testing occurred at the exact time of the complaint but details of the engine testing occurring that night were provided.
			Complaint received via CCC regarding two engine tests believed to be exceeding the contour limits. Details of the engine testing, an explanation of how the location of engine tests is selected, an explanation of how noise is measured and the rules as per the District Plan were provided.
			Complainant concerned by engine testing at night and early morning. Details of the engine test and an explanation of the restrictions on engine testing as per the District plan were provided.

			6 complaints were received from one complainant concerned with early morning engine testing. 1. The first 4 complaints were addressed by providing details of: engine testing, information on CIAL's engine testing management software, the restrictions on engine testing as per the District plan and a link to the noise website where the public can see all the engine tests undertaken in the past week. 2. On the last two complaints, the complainant asked not to be contacted however on the 2nd occasion, CIAL provided more specific information regarding the engine test. The complainant was invited to contact us directly should he wish to discuss his concerns.

6.0 PERFORMANCE BASED NAVIGATION TRIAL

On 9 November 2017, Airways New Zealand, Christchurch Airport and the Board of Airline Representatives New Zealand (BARNZ) commenced a trial of Performance Based Navigation (PBN) flightpaths in Christchurch. PBN is a global air navigation standard, being introduced in accordance with international guidance and New Zealand government policy. The 12-month flight paths trial is for arrivals to Christchurch only and is part of New Southern Sky (NSS), a 10-year programme led by New Zealand Civil Aviation Authority, which is introducing major changes to New Zealand's aviation system to make air travel smarter, quicker, safer and more sustainable.

The Christchurch Flight Paths Trial website was launched providing information to the public and giving residents the opportunity to lodge feedback or complaints specifically related to the trial.

MDA has investigated whether noise from aircraft using the PBN tracks could cause a localised exceedance of the noise boundaries. Investigations include:

- **Pre- trial calculated noise contours:**

  Pre- trial calculated noise contours showed that although there may be a slight change in the shape of the annual compliance contours, exceedance of the noise boundaries was unlikely.

- **Noise measurements:**

  Noise measurements were conducted allowing for a comparative assessment of noise levels before and during the trial. The measurement results aligned reasonably well with the modelled predictions and confirmed there was no exceedance of the noise boundaries.

- **Mid trial calculated noise contours:**

  Noise contours using actual aircraft movements including the PBN flights during the first few months of the trial were calculated. The results showed that mid-trial calculated noise contours were well within the 50, 55 and 65 dB L_{dn} Air Noise Compliance Contours.

The trial concluded on 9 November 2018 and the trial partners are currently compiling a summary report on the outcomes of the trial. The completed report will be published on the Christchurch Flight Paths Trial website.

6.1 Community Feedback

Over the course of the 12-month trial, 134 flight path feedback responses were received from the community. Some were found not to be PBN related, however they provided an opportunity to engage with community members to address their concerns and these responses have been included in the noise complaint summary. This leaves 81 complaints from 46 separate complainants, as well as 17 neutral/undecided and 18 positive responses at the end of the trial. Bespoke responses, including location specific information and maps, were provided by CIAL in conjunction with Airways and the remaining trial partners, to every individual via email, phone and in person. The feedback will be incorporated into the final report.

7.0 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 at 6 March 2017 within Rural Urban Fringe and Rural Waimakariri Zones become eligible for acoustic treatment when the dwelling falls within the 65 dB L_{dn} AANC.

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 are eligible for treatment.

The 2018 AANC does not incorporate any additional Existing Dwellings that were not included in the 2017 AANC (65 dB L_{dn}). Therefore, no additional dwellings become eligible for acoustic treatment.

8.0 CONCLUSION

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

- The 2018 AANC demonstrates compliance with the 65dB L_{dn} Air Noise Compliance Contour contained in the CDP
- The AANC calculations have been verified as accurate using noise measurements undertaken at Christchurch Airport in 2017.
- Predictions using the ETMS software shows compliance with noise limits detailed in the CDP
- The ETMS calculations have been verified as accurate using noise measurements undertaken at Christchurch Airport in 2017.
- No additional dwellings have become eligible for acoustic treatment under the 2018 AANC

APPENDIX A 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.
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

APPENDIX B 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.

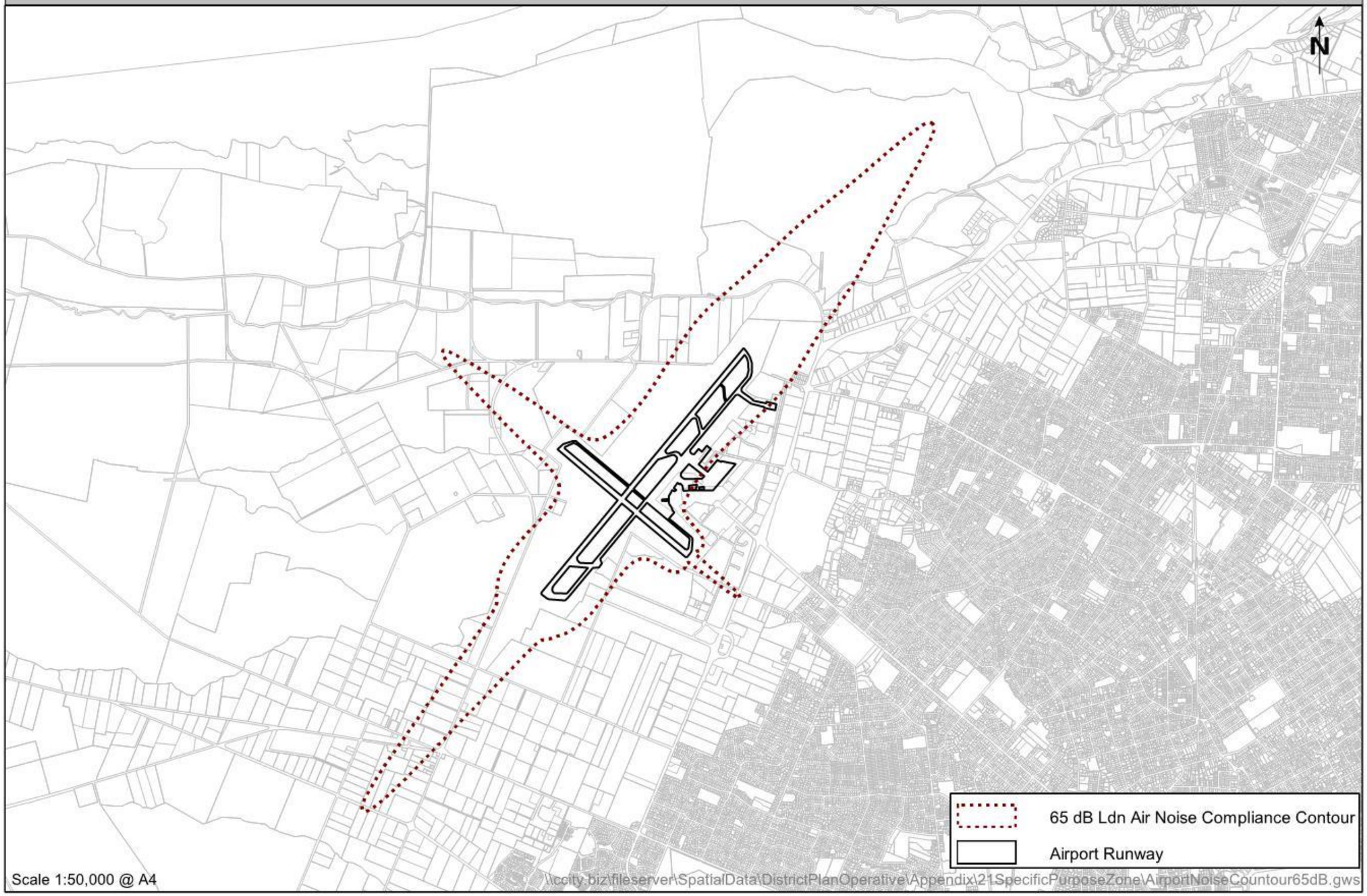
The relevant rules relating to aircraft operation and engine testing noise are given in 6.1.6.2.5 – 6.1.6.2.7.1 and Appendix 6.11.14. They state:

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.*

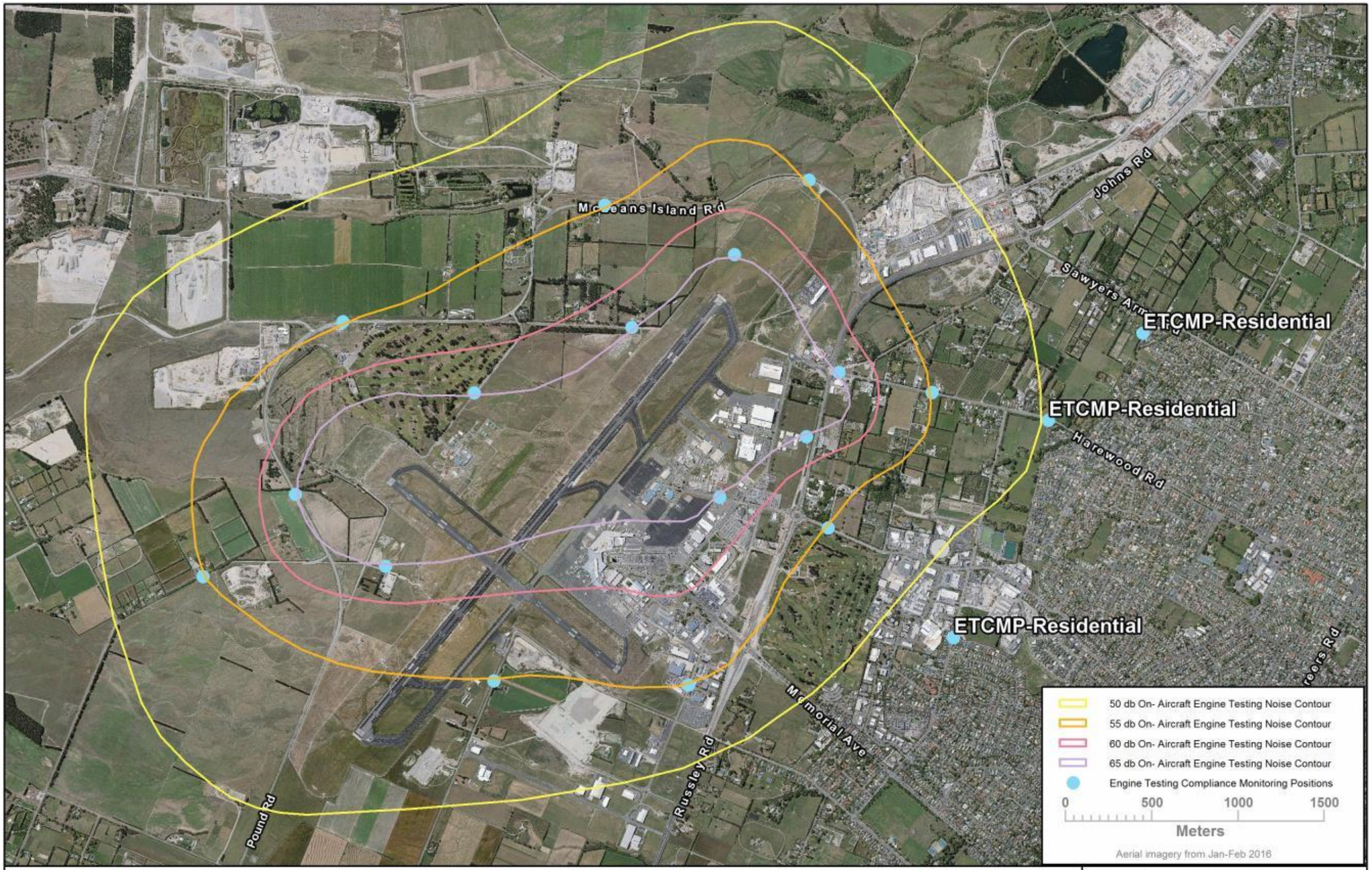
6.1.6.2.6 On-aircraft engine testing at Christchurch International Airport

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:*

   A. *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.*

   B. *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:*

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

   B. *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:*

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

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

   C. *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-air craft 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-day rolling report of noise from on-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 last 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

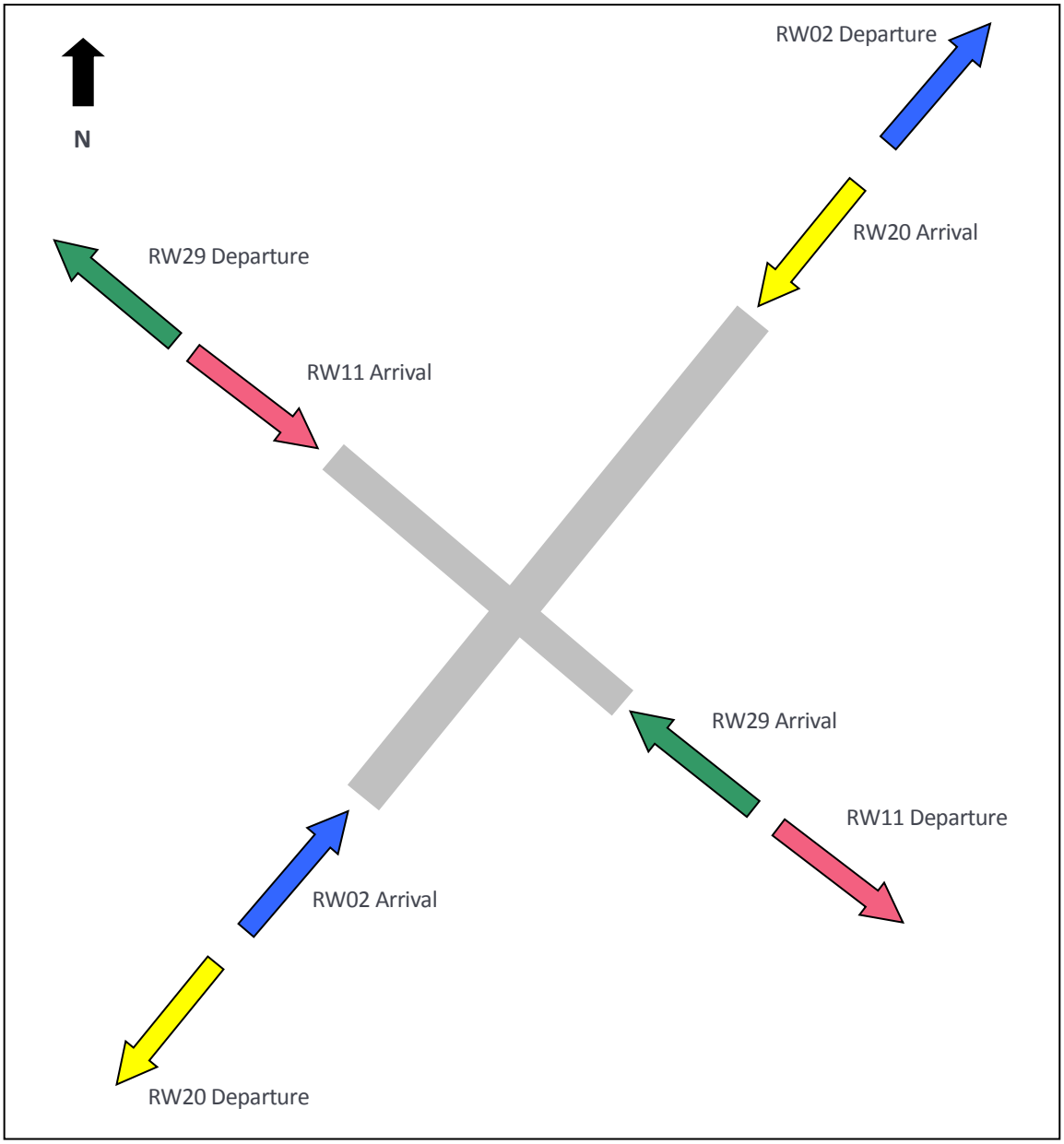
APPENDIX C CHRISTCHURCH AIRPORT RUNWAY VECTORS

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 D MODELLED AIRCRAFT MOVEMENTS

Table D1: Summary of 2018 scheduled aircraft movements

Month (2018)	Monthly total	Consecutive 3 months total
Jan	6406	
Feb	6090	
Mar	6765	19261
Apr	5925	18780
May	5838	18528
Jun	5569	17332
Jul	6552	17959
Aug	6376	18497
Sep	6119	19047
Oct	6578	19073
Nov	6726	19423
Dec	6794	20098

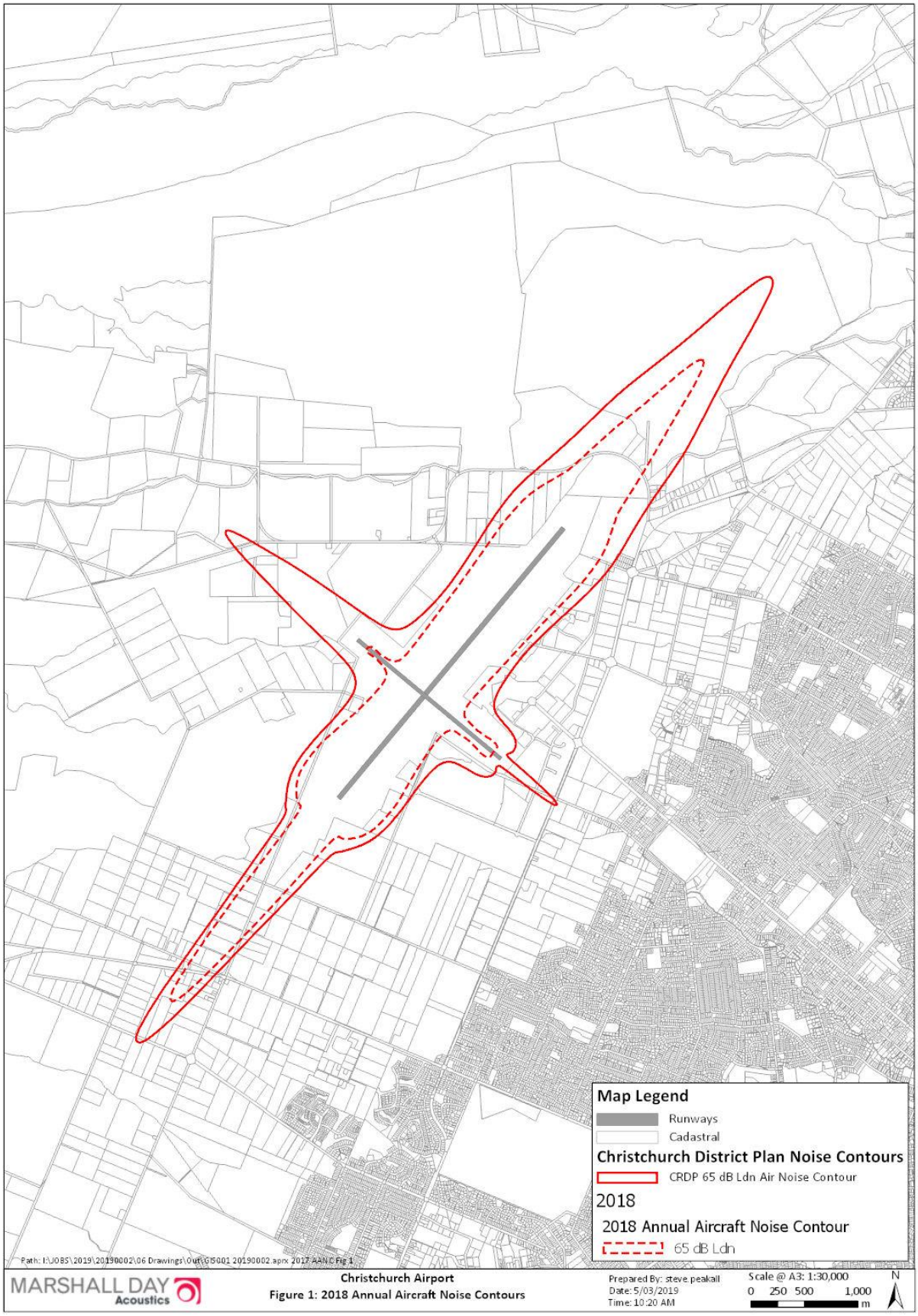
Table D2: Modelled Aircraft Movements by Runway

		Total per day (92 days)							
		Runway 02		Runway 11		Runway 20		Runway 29	
Aircraft Type	**Aircraft**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
Scheduled jets	A21N	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	A320	41.89	6.23	0.00	0.07	19.03	3.07	1.30	0.07
	A359	0.21	0.02	0.00	0.00	0.08	0.00	0.00	0.00
	A388	1.41	0.00	0.00	0.00	0.59	0.00	0.00	0.00
	B38M	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B734	1.22	2.99	0.00	0.02	0.62	2.42	0.03	0.11
	B737	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B738	4.33	3.16	0.00	0.03	2.12	1.60	0.14	0.05
	B752	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	B763	0.30	0.45	0.00	0.00	0.10	0.58	0.00	0.00
	B772	1.58	0.00	0.00	0.00	0.84	0.00	0.00	0.00
	B77W	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	B788	0.08	0.07	0.00	0.00	0.04	0.05	0.00	0.00
	B789	0.58	0.53	0.00	0.00	0.15	0.17	0.00	0.00
Scheduled TPs	AT75	11.59	0.43	0.08	0.00	5.52	0.20	0.42	0.00
	AT76	46.78	1.62	0.18	0.00	22.25	1.01	1.52	0.00
	C130	0.08	0.04	0.00	0.00	0.05	0.03	0.00	0.00
	CVLT	0.17	0.05	0.00	0.00	0.11	0.08	0.00	0.00

	DH8C	14.68	0.14	0.28	0.00	7.19	0.02	0.39	0.00
	PC12	3.15	0.00	0.00	0.00	1.57	0.00	0.18	0.00
Scheduled Piston	PA31	0.11	0.00	0.00	0.00	0.04	0.00	0.01	0.00
	PA34	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Non scheduled + other	A319	0.02	0.02	0.00	0.00	0.02	0.00	0.00	0.00
	A332	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	AT75	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT76	0.04	0.00	0.00	0.00	0.03	0.00	0.00	0.00
	B738	0.03	0.05	0.00	0.00	0.01	0.02	0.01	0.00
	B752	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	B763	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	BE20	0.38	0.01	0.00	0.00	0.18	0.01	0.00	0.00
	BE30	0.16	0.02	0.00	0.00	0.01	0.01	0.00	0.00
	BE40	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	BE9L	0.22	0.00	0.00	0.00	0.04	0.00	0.02	0.00
	C208	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	C421	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	C441	0.53	0.03	0.00	0.00	0.21	0.01	0.03	0.00
	C510	0.13	0.00	0.00	0.00	0.11	0.00	0.00	0.00
	CL60	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00
	CVLT	0.03	0.07	0.00	0.00	0.00	0.03	0.00	0.00
	DC3	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	FA7X	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
	IL76	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	JS32	0.12	0.02	0.00	0.00	0.07	0.02	0.03	0.00
	LJ35	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	P28A	0.10	0.00	0.00	0.00	0.08	0.00	0.00	0.00
	P68	0.10	0.00	0.00	0.00	0.13	0.00	0.00	0.00
	PA31	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	PA34	0.01	0.00	0.00	0.00	0.05	0.00	0.00	0.00
	PA34	0.06	0.00	0.00	0.00	0.04	0.00	0.00	0.00
	PAY4	0.14	0.08	0.00	0.00	0.09	0.00	0.00	0.00
	PAY4	0.27	0.00	0.00	0.00	0.17	0.00	0.01	0.00
	PC12	0.05	0.00	0.00	0.00	0.04	0.00	0.01	0.00
	SW4B	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.00
GA	AEST	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	AT76	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
	B737	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	BE20	0.51	0.04	0.00	0.00	0.25	0.00	0.03	0.00
	BE30	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BE36	0.10	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	BE40	0.01	0.00	0.00	0.00	0.03	0.00	0.01	0.00
	BE9L	0.20	0.01	0.00	0.00	0.08	0.00	0.00	0.00
	BEAR	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	BN2P	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00

C130	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
C152	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C172	3.59	0.32	0.01	0.00	2.30	0.21	0.12	0.01
C177	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C180	0.30	0.01	0.00	0.00	0.19	0.01	0.01	0.00
C182	0.16	0.00	0.00	0.00	0.10	0.00	0.01	0.00
C185	0.64	0.01	0.00	0.00	0.41	0.01	0.02	0.00
C206	0.08	0.00	0.00	0.00	0.05	0.00	0.00	0.00
C210	0.06	0.00	0.00	0.00	0.04	0.00	0.00	0.00
C402	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C441	0.76	0.12	0.00	0.01	0.43	0.05	0.04	0.00
C650	0.17	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C680	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
C82R	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
CL30	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
DA40	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DA42	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ECHO	0.10	0.00	0.00	0.00	0.06	0.00	0.00	0.00
F2TH	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FA7X	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00
GA8	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.00
GLEX	0.04	0.00	0.00	0.00	0.04	0.00	0.00	0.00
GLF5	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00
GLF6	0.05	0.00	0.00	0.00	0.00	0.01	0.00	0.00
JPRO	0.05	0.00	0.00	0.00	0.03	0.00	0.00	0.00
JS32	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00
LJ60	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
M5	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00
MU2	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00
P28A	9.68	3.59	0.02	0.01	5.56	2.27	0.32	0.12
P28B	0.08	0.00	0.00	0.00	0.05	0.00	0.00	0.00
P28R	0.16	0.00	0.00	0.00	0.10	0.00	0.01	0.00
P28T	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00
P68	3.71	0.02	0.00	0.00	2.21	0.02	0.05	0.00
PA18	0.21	0.00	0.00	0.00	0.13	0.00	0.01	0.00
PA31	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
PA32	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
PA34	0.07	0.05	0.00	0.00	0.01	0.01	0.00	0.00
PA38	10.91	0.00	0.03	0.00	6.98	0.00	0.36	0.00
PA46	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00
PC12	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00
PIVI	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00
PNR2	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00
R200	5.97	0.01	0.02	0.00	3.82	0.01	0.20	0.00
RV7	0.04	0.00	0.00	0.00	0.02	0.00	0.00	0.00
SR22	0.07	0.00	0.00	0.00	0.02	0.00	0.00	0.00
WT9	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00

APPENDIX E NOISE COMPLIANCE CONTOURS



APPENDIX F: 2018 AANC (1 DECIBEL BANDS)