

**5. David Cohnney
Airport Noise and Ldn
50 – 55 Issue**

BEFORE THE CANTERBURY REGIONAL COUNCIL HEARING PANEL

UNDER

of the Resource Management Act
1991

AND

IN THE MATTER

of a hearing by the Canterbury
Regional Council Hearing Panel
on submissions on Proposed
Change No.1 to the Canterbury
Regional Policy Statement
Chapter 12A (Development of
Greater Christchurch) including
Variations 1, 2, 3 and 4.

**STATEMENT OF DAVID NORMAN COHNEY
AS PART OF THE OFFICER REPORT UNDER SECTION 42A OF THE RESOURCE
MANAGEMENT ACT 1991**

1 My full name is **DAVID NORMAN COHNEY**. I am an airport planning consultant.

Code of Conduct for Expert Witnesses

2 I acknowledge that I have read the code of conduct for expert witnesses contained in the Environment Court's Practice Note dated 31 March 2005. I have complied with it when preparing my written statement of evidence and I agree to comply with it when I give any oral evidence.

Qualifications and Experience

3 I am an aviation and airport planning specialist, and an Associate of the international specialist aviation and airport planning consultant Airbiz Aviation Strategies Pty Ltd (Airbiz). I am based in Melbourne, and have carried out projects in New Zealand, Australia, South-East and Northern Asia, the Middle-East, North America and Europe.

4 I have a Bachelor of Engineering, University of Western Australia and Graduate Diploma of Computing, Caulfield Institute of Technology. I have undertaken a short course in Airport Strategic Planning at the Massachusetts Institute of Technology. I have undertaken specialist training courses in airport models for airfield capacity, terminal capacity, aircraft noise impacts and financial and economic analysis.

5 I have 21 years experience in aviation and airport strategic planning. I am a specialist in aviation and airport demand and capacity, aircraft noise impacts, financial and technology feasibility studies for airport developments.

6 I have undertaken over 200 projects and studies for airports ranging in size from rural airfields, regional and domestic airports and large international airports such as Heathrow (London), Incheon (South Korea), Kuala Lumpur (Malaysia), Calgary (Canada) and Sydney (Australia). My responsibilities have ranged from Project Director to specialist technical consultant.

7 In New Zealand, since 1988, I have undertaken studies in relation to aircraft noise impacts in relation to the following airports – Auckland, Christchurch, Wellington, Palmerston North and Queenstown. In Australia I have undertaken projects at all primary international airports (Sydney, Melbourne, Brisbane, Adelaide, Perth), most secondary jet airports (Canberra, Darwin, Cairns, Coolangatta, Maroochydore, Hobart, Launceston, Alice Springs, Ayers Rock, Avalon, Essendon), major General Aviation Airports (with over 100,000 annual aircraft movements - such as Parafield

(Adelaide), Jandakot (Perth) and Moorabbin (Melbourne)) and many regional airports. I prepared noise exposure forecasts for the airports at Kuala Lumpur in Malaysia and Hong Kong.

- 8 Relevant project experience in airport noise impact studies include:
- a. Directing the preparation of noise exposure contours at 30 airports;
 - b. Expert evidence for the
 - Christchurch City Plan hearings and the subsequent Environment Court case Robinson Bay Trust v Christchurch City Council C60/04 (Env Ct 13/05/04),
 - for the Palmerston North City and Manawatu District Plans;
 - Queensland Environment Court in a matter related to the Sunshine Coast Airport (Maroochydore);
 - Commission hearing into impacts on Avalon Airport of the proposed East Coast Armaments Complex and the proposed Pt Lillias Chemical Complex; Environmental Assessments;
 - c. Environmental impact studies related to the Brisbane New Parallel Runway (NPR), Adelaide Runway Extension EIS, Sydney Airport proposed relocation of runway threshold 16L, Sydney Airport proposed relocation of threshold runway 25; Cairns Northern Taxiway Extension Environment Scoping; Mayoral Mediation Forum on the Auckland Northern Runway; the introduction of the Lead-in-Fighter (Hawk) at RAAF Williamtown; Busselton Aerodrome Site Selection
 - d. Advice in relation to and preparation of Airport Noise Management Plans for Sunshine Coast; Palmerston North; Albury and Sydney Airports.
 - e. On behalf of the Australian Government, led a review of the Performance of the Long Term Operation Plan (LTOP) for Sydney Airport and Associated Airspace.
 - f. On behalf of the Northern Territory Government, I acted as the technical representative overseeing studies by the Australian Department of Defence related to aircraft noise impacts from military exercises at Darwin Airport (joint user facility).

g. I have made presentations to conferences and noise management training programs for: Victorian State Government - Department of Planning and Development; Australian Mayoral Aviation Council and Australian Airport Owners Association; VicRoads, Melbourne and Road Traffic Authority, New South Wales; Sydney Airport - Noise Management Steering Committee; Australian Department of Transport, Canberra; Australian Acoustical Society, NSW Division, ACT Group; Darwin Airport and Northern Territory Planners; Mass Transit Railway Corporation, Hong Kong.

9 I have been an author of the following papers:

- "Presenting Noise Management Information using New Media Technologies". Wespac8, 2003
- "Airspace and Airport Simulation Models - Applications and Issues", Airports 95, Sydney, 1995
- "The Interactive Sound Information System as a Public Information Tool in Airport Environmental Planning", Airports 95, Sydney, 1995
- "Information About Noise Management - The Interactive Sound Information System (ISIS)", 7th World Conference on Transportation Research, Sydney, 1995.
- "Lifting the Avalon Curfew", Aircraft & Transportation Noise Seminar, Melbourne Airport, 1992.
- "INM - the Basics", Aircraft & Transportation Noise Seminar, Auckland Airport, 1992.

10 I have lectured on aviation and airport planning topics at Swinburne University.

11 I have also undertaken airfield and runway demand/capacity studies Airspace/Airport Demand/Capacity at Sydney, Auckland, Brisbane, Melbourne, Perth, Cairns, Alice Springs and Darwin Airports; and provided peer review of Capacity Studies by Airways Corporation at the New Zealand Trunk Airports.

12 I am a specialist industry advisory in airport planning to an international four year research study, headed by the Queensland University of Technology (QUT) - The Airport Metropolis: Managing the Interfaces'. This includes examination of the

complex relationships relating to airport and regional planning in the vicinity of major airports.

Ambit of My Evidence

- 13 This evidence:
 - a) includes my view on whether the noise modelling exercise carried out by the Expert Panel was performed in an appropriate, credible and professional manner
 - b) includes my comments on whether, in the Christchurch situation, the Ldn 50 dBA noise contour is a more appropriate control on urban growth than the 55 dBA;
- 14 My evidence addresses the recognition of impacts of aircraft noise beyond the 55 Ldn contour from a number of contemporary sources.
- 15 My evidence examines in some detail the noise thresholds in the New Zealand Standard NZS 6805:1992, the concepts and approach advocated by the Standard in protection of populations from adverse aircraft noise impacts and as a mechanism for establishing compatible land use planning.
- 16 This evidence reviews the reasonableness of the aircraft movements forecasts used as the basis for preparation of noise exposure contours on which the proposed Proposed Change No.1 to the Canterbury Regional Policy Statement Chapter 12A (Development of Greater Christchurch) including Variations 1, 2, 3 and 4. (PC1) is based, and the need for a conservative approach when projections are used for long-term planning of significant community resources such as Christchurch International Airport.
- 17 The evidence brings examples of how current practice in many international airports in the region is to prepare noise exposure forecasts used to ensure appropriate and compatible land use in the vicinity of airports based on the annual capacity of the runway system, rather than projected annual movements for a fixed forecast horizon (such as 5, 10 or 20 years).
- 18 Such evidence is within my area of expertise.

Facts Relied Upon and Formation of Opinions

- 19 I have read the following documents, or relevant parts thereof as they pertain to the existing and proposed noise contours and associated land use zonings in the Regional Policy Statement and individual City and District Plans:
- a. Canterbury Regional Policy Statement – Variation No. 4 to Proposed Change No. 1.
 - b. Environment Canterbury - Officer Report under Section 42A of the Resource Management Act 1991 on Submissions to Proposed Change No 1 to the Canterbury Regional Policy Statement. In particular sections of Volume 3 of 4 Part 6; Volume 4 of 4, Appendix 1 and 2.
 - c. Expert Panel Report in the Matter of Several appeals against the proposed Selwyn District Plan under Clause 14 of the First Schedule of the Resource Management Act 1991 – signed on 31 January 2008 by: Mr Kevin Bethwaite, Mr William Bourke, Dr John-Paul Clarke, Mr Christopher Day, Mr Barrie Malloch, Mr Vince Mestre, Ms Laurel Smith.
 - d. Presentation material used by Dr Robert Bullen of Wilkinson Murray “Christchurch Airport: Aircraft Noise Impacts and Implications for Property Development” dated 24 July 2008.
 - e. Memorandum by James Baines of Taylor Baines of 15 August 2008, regarding noise survey data.
 - f. The New Zealand Standard NZS 6805:1992 – Airport Noise Management and Land Use Planning.
 - g. The “parallel” Australian Standard AS2021-2000 – Acoustics – Aircraft noise intrusion – Building siting and construction (which despite having a different title to the New Zealand standard, covers Building Site Acceptability base on noise exposure zones, (Table 2.1) which mirrors Tables 1 and 2 in the New Zealand standard).

Summary and Conclusions

- 20 The New Zealand Standard NZS 6805:1992 does not mandate 55 Ldn as the Outer Control Boundary. It specifically makes provision for a greater level of protection, where the local authority deems this appropriate. The New Zealand Standard specifically states that the standard is not to be used to downgrade the level of protection. PC1 maintains and is consistent with the planning regime which has effectively protected the rural land around the airport.
- 21 The Australian Standard – “Acoustics – Aircraft Noise Intrusion – Building Siting and Construction” (AS2021-2000) recognises that aircraft noise impacts do not “disappear” at the Ldn 55 boundary. The Standard, prepared by the Joint Standards Australia/Standards New Zealand Committee EV/11 *“is concerned with land use planning and building treatments in the vicinity of an airport”*. In Section 1.2 - Objective it states that *“the effects of noise from aircraft are not confined to areas where the noise exposure exceeds 20 ANEF and may occur at or below 20 ANEF”* (equivalent to the 55 Ldn).
- 22 The Australian Standard, as well as planning in the vicinity of Canberra Airport, and the Australian Government in consideration of planning for a second Sydney Airport, have all identified that people newly exposed to aircraft noise are more likely to be annoyed at a lower threshold than for established populations around established airports with a “steady state” in terms of flight paths and aircraft activity.
- 23 It is my considered opinion that it is entirely appropriate to adopt a level of 50 Ldn as an Outer Control Boundary excluding new residential developments, where there are adequate and suitable alternative areas available for expansion of residential areas, not under the flight paths of an international airport with regular wide-body jet aircraft operations. This particularly applies in a relatively low-density urban setting, where the more relaxed and quieter lifestyle is valued (compared to say large European and North American cities).
- 24 Planning for airports and their environs must take a long term perspective. Notwithstanding short-term fluctuations, there is a consistent long-term growth potential for aviation globally, regionally and locally which can translate to expectation of average annual growth rates in passenger numbers of up to 4% per annum. There is strong justification to be “conservative” with regard to long-term annual aircraft movements and fleet mix, as it is difficult (and expensive), if not impossible, to resume land (through compulsory acquisition) which has been released for

residential use, if the noise contours were underestimated. The New Zealand Standard requires the airport to “live within the boundary” once it has been established. Urban encroachment within the airport environs, usually through poor long-term planning, is identified as one of the key issues for airports today. It creates tensions between resident groups, local authorities and the aviation industry, which result in a “lose-lose” outcome. Populations are adversely affected, while mitigation measures impact on airport operations.

- 25 In the 1970’s and 1980’s noise exposure contour forecasts were often prepared for a short term planning horizon (about 10 years). In recent decades it has become accepted practice for aircraft noise exposure contours used for long-term planning to be based on runway capacity. I would suggest that this reflects an understanding of the mistakes of the past that have allowed urban encroachment near airports, with negative effects for the adjacent suburbs and the airport itself, with pressure for operational restrictions. In relation to Auckland International Airport, plans for development of a second runway have been the subject of a Mayoral Mediation process completed in 2001. The aircraft noise contours were based on a nominal year 2030. Examples of recently prepared noise contours (the year contours were prepared is shown in brackets) based on airport capacity rather than a specific timeframe include Perth (2004), Brisbane (2003), Melbourne (2008), Canberra (2008), Moorabbin (2008). Other Australian Airports have used a 20 year horizon (for example Sydney (2008)).
- 26 Christchurch Airport is the international gateway to the South Island. The area has potential for continued expansion as a world wide tourism destination. There are currently direct services from Australia and major Asian destinations, where wide-body jets are operated. The international airline fleet mix will likely continue to include a proportion of large jet aircraft suitable for long-haul operations.
- 27 I prepared my evidence on the understanding that the location of the proposed Plan contours is not being challenged, and the issue in question is whether the 50 Ldn based on these contours, should be used as the Outer Control boundary. However, I was also asked to comment on certain aspects of the “new” contours prepared by the Expert Panel.
- 28 It is my considered opinion that the 50 Ldn contour based on nominal ultimate capacity of Christchurch Airport by the Expert Panel is the most appropriate basis for development of regional planning decisions that consider the impacts of aircraft noise.

APPROPRIATENESS OF 50 dBA Ldn AT CHRISTCHURCH

Land Use Planning in the Vicinity of Airports

- 29 Aircraft noise is consistently identified as one of the most significant environmental impacts associated with airport operations. According to the World Health Organisation's Guidelines for Community Noise, aircraft noise is more annoying than road traffic, which in turn is more annoying than rail¹.

Noise is defined as unwanted sounds. Noise impacts can be controlled by a number of means:

- a. At the source - through regulation of noise output and certification requirements for civil aircraft.
 - b. Noise abatement - including restrictions on aircraft operations at an airport, by aircraft type, or time of operation, flight paths and runways used.
 - c. Land use planning - limiting land use in the vicinity of airports to those least sensitive to aircraft noise including industrial, rural and recreational, and by limiting housing density in these areas.
- 30 Appropriate land use planning is, in the first instance, the most effective means of mitigation. This necessarily places restrictions on land use in the vicinity of the airport. The ability to put in place and enforce land use restrictions (primarily on residential and other noise sensitive uses) depends on, in part, the availability of appropriate land not in the vicinity of the airport to satisfy community needs.
- 31 Regulations and guidelines controlling land use planning generally include tables of "acceptable" land use within certain zones around an airport. In areas immediately around an airport, and particularly under the flight paths on the extended centrelines of the runways, aircraft noise impacts are greatest. Industrial land use is recommended, while residential and other noise sensitive usages are excluded. As one moves further away from the airport operational areas, land use controls become less stringent.

¹ Quoted in the United Kingdom Environment Agency - Environment Facts and Figures page on Transportation noise
http://www.environment-agency.gov.uk/yourenv/eff/pollution/399148/399164/?version=1&lang=_e

32 This evidence primarily deals with the application of appropriate Land Use Planning as a means to limit adverse noise impacts associated with airport operations at Christchurch Airport.

Conflicts between airports and their environs

33 A major aspect of maintaining an airport resource is an accepted development strategy which includes the protection of land for future airport development and operations, and provision of a noise buffer for the surrounding community.

34 Reservation of land is particularly important around airports because of:

- potential significant issues with respect to compatible land uses
- rapid development in a recognised long term growth industry
- increased and notorious community intolerance of aircraft noise in residential areas.

35 Most of the world's major airports and many significant airports in this region suffer from the lack of adequate reservation of surrounding land and appropriate land use planning. This results in constraints on development, operational flexibility, capacity and in some cases significant environmental problems.

36 This potential land use conflict between an airport and its surrounding community is exacerbated by the requirement to be as close as practical to the urban area being served. Older established airports were likely originally some distance from urban areas, which themselves have expanded into formerly vacant areas adjacent to the airport. At this point it is very difficult and expensive to relocate an airport (if any suitable site could be found within a reasonable distance). Major airports in Asia which have been relocated at great expense when they outgrew their original sites include Kuala Lumpur (opened 1998 at a cost of around USD4 billion), Hong Kong (opened 1998 at a cost of around USD20 billion), Seoul (opened 2001 at a cost of around USD6 billion) and Bangkok (opened 2006 at a cost of around USD4 billion) There is constant (and unresolved) debate at the community and highest political levels about the siting and long term development of a second Sydney Airport, primarily driven by the noise impacts on the surrounding community².

² Refer p17, 31, 164, 177 of the Australian Government's National Aviation Policy Green Paper: "*Flightpath to the Future*", December 2008

- 37 Controls on land use in the vicinity of airports, and the associated standards and legislative controls have the complementary goals of:
- protecting residents from the negative noise impacts of airport aircraft operations
 - protecting the airport as a community transport and economic asset from noise complaints and pressures to restrict aircraft operations (“reverse sensitivity”).
- 38 The relevant sections of the Canterbury Regional Policy Statement and PC1 are designed to ensure any noise impacts on the community from aircraft arrivals and departures are within appropriate and tolerable limits, and have been developed with reference to the New Zealand Standard.
- 39 Tolerable noise levels have been established from international studies relating measures of noise events and human response (annoyance). The choice of relating noise levels to “annoyance”, rather than “number of complaints” is discussed later on in this evidence.

Noise Standards

- 40 The New Zealand Standard (NZS 6805:1992) provides guidelines and noise values that are considered appropriate for noise control in the vicinity of airports.
- 41 The Ldn metric is used to quantify aircraft noise impacts and relate them to community reaction. It is defined as the cumulative sum of individual aircraft noise events over an “average” day. It includes a night weighting applied for aircraft movements (landings and take-offs) between the hours of 10pm and 7am.
- 42 There are three main types of noise descriptors, all mentioned in the New Zealand Standard which are briefly outlined below:
- Single event maximum sound level metrics
 - Single event energy dose metrics
 - Cumulative energy average metrics.
- 43 The fundamental sound metric is the A-weighted Sound Level or dBA. The single event dose or energy metric is the Sound Exposure Level or SEL.
- 44 The airport average noise exposure measure is the Day Night Level or Ldn (also referred to as DNL). This metric, or variations such as the Noise Exposure Forecast

(NEF), are used in most countries to measure the exposure of individuals to noise resulting from the operation of an airport.

- 45 The Single Event Maximum Sound Level Metric is the most basic noise metric. It represents a maximum sound level. Expressed in decibels (dBA), the A-weighted Sound Level is the single event maximum sound level metric. It is the sound pressure level which has been filtered or weighted to reduce the influence of the low and high frequency extremes. Because unweighted sound pressure levels do not correlate well with the human perception of loudness, various weightings are added to sound level meters to attenuate low and high frequency noise in accordance with accepted equal loudness contours. The weighting network designated "A", has been found to correlate well with people's subjective judgement of loudness. It has been widely accepted because of its simplicity and superiority over unweighted sound pressure levels in correlating human responses to noise.
- 46 Another group of metrics represent "noise energy dose", and reflect both the maximum sound level and the duration of a noise event. The Sound Exposure Level (SEL), expressed in dB, is a measure of the effect of duration and magnitude for a single event measured in A-weighted sound level above a specified threshold which is at least 10 dB below the maximum value. In typical aircraft noise model calculations, SEL is used in computing aircraft acoustical contribution to the Equivalent Sound Level (Leq) and the Day-Night Sound Level (DNL). It is also used in measurement of sleep disturbance.
- 47 As discussed later in this report, the New Zealand standard recommends the use of the SEL as a supplement to cumulative energy metrics (discussed below), in cases where there is intermittent use of an airport (or runway).
- 48 The cumulative energy average noise metrics are usually derived from single event energy dose metrics. Cumulative metrics can be computed from continuous noise measurement data and correlate well with aggregate community annoyance response. They do not necessarily correlate well with sleep disturbance or speech interference. For these issues the SEL metric is preferred.
- 49 The Equivalent Sound Level (Leq) is expressed in dB and is the energy average noise level (usually A-weighted) summed over a specified time. The term "equivalent" reflects the fact that the total acoustical energy associated with the fluctuating sound (during the prescribed time period) is equal to the total acoustical energy associated with a steady sound level of Leq for the same period of time. The Leq provides a

single number measure of noise averaged over a specified time period. This allows comparison of noise events of differing durations.

- 50 The Day-Night Sound Level (DNL or Ldn), is expressed in dB, and developed as a single number measure of community noise exposure. It was introduced as a simple method for predicting the effects on a population of the average long-term exposure to environmental noise. A 10 dB correction is applied to night-time (10 p.m. to 7 a.m.) sound levels to account for increased night-time annoyance.. With a correction for night-time noise intrusions, it is an enhancement of the Equivalent Sound Level (Leq). The Ldn uses the same energy equivalent concept as Leq, but the specified time integration period is 24 hours.
- 51 Many countries (including New Zealand and the USA) have selected the Ldn as the cumulative average energy metric to be used in airport noise exposure studies. Over a period of decades the Ldn has emerged as the basic scientific measure for use in relating aircraft noise to community reaction and in land use planning guidelines in the vicinity of airports.
- 52 The Ldn metric takes into account the following factors of aircraft noise:
- a. The intensity, duration, tonal content and spectrum of audible frequencies of the noise of aircraft take offs, approaches to landing, and reverse thrust after landing (for practical reasons, noise generated on the aerodrome from aircraft taxiing and engine running during ground maintenance is not included)
 - b. The forecast frequency of aircraft types and movements on the various flight paths, including flight paths used for circuit training
 - c. The average daily distribution of aircraft arrivals and departures in both day-time and night-time (day-time defined as between 07:00am and 10:00pm and night-time defined as between 10:00pm and 07:00am).
- 53 Ldn charts are provided for most airports in New Zealand. These are plans of the airport and surrounding localities on which noise exposure contours of 55, 60, 65 Ldn units have been plotted (and in the case of Christchurch the 50 Ldn is also plotted). These contours indicate land areas around an airport exposed to aircraft noise; the higher the Ldn value, the greater the noise exposure. In the areas outside 50 Ldn contour, noise from sources other than aircraft tends to predominate over aircraft noise. Within the area from 50 to 60 Ldn, aircraft noise exposure starts to emerge as

an environmental problem, while above 60 Ldn the noise exposure becomes progressively more severe.

54 An FAA publication³ substantiates and summarises the basis for the Ldn as:

“Pragmatically speaking, it works. Engineers and planners have acquired over 30 years working experience with a nominal 10 dB night-time weighting function. This experience has been successful, contributing to wise zoning and planning decisions. The nominal 10 dB decrease in ambient noise levels in many residential areas at night-time provides a sensible basis for the weighting factor.”

55 Noise contours or footprints are the accepted technique for displaying airport cumulative noise exposure. Noise contours are also employed in comparing the noise footprints of individual aircraft. Contours are developed for the Ldn metric for cumulative noise, while for individual aircraft SEL contours are plotted. Contours are used as the tool to assess land use compatibility, and to indicate the noise exposure of single operations of various aircraft types. The contours are based on assumptions. Some of the key assumptions relate to number of aircraft movements, proportion of day-time and night-time movements, the aircraft types, runways in use and flight paths. A different set of contours will be generated if any of these assumptions are varied.

56 The land use planning should be based on a pragmatic view considering the full range of circumstances that may come about during the planning horizon. Consideration should be given to possible future levels of traffic, aircraft types and operational procedures. There is not necessarily one “correct” contour. The planning zones are often based on the contours generated for one or more operational scenarios at a particular time horizon based on an aviation forecast (for example 20 or 50 years) or traffic level (for example at 100,000 or 200,000 annual movements or the nominal runway capacity).

57 The NZ standard – NZS 6805: 1992 - is based on accepted world practice in providing land use planning guidelines in the vicinity of airports.

58 While the standard has some unique terminology, such as the Airnoise Boundary (ANB) and the Outer Control Boundary (OCB), they are based on cumulative noise energy and single event metrics used throughout the world.

³ Paragraph 2.6, Publication Reference ADA-154319, “Aviation Noise Effects”, Federal Aviation Administration, Washington DC, March 1985

- 59 In common with similar standards in other countries, the New Zealand Standard defines land use controls (refer Table 1 of NZS 6805) which relate to a defined noise exposure measure – the “Day-Night Level” or Ldn.
- 60 The correlation between noise exposure and land-use is made on the basis of the noise sensitivity of land-use. Heavy industrial use being the least noise sensitive and residential, schools, hospitals etc. being the most noise sensitive.
- 61 The Airnoise Boundary (ANB) is defined in Section 1.4.1 of the Standard, and the sound exposure at the boundary shall not exceed 65 Ldn (24 hour average, generally based on worst 3 months) The Outer Control Boundary (OCB) defined in section 1.4.2, as “*an area outside the airnoise boundary within which there shall be no incompatible land uses.*” The standard says that at the OCB the sound exposure shall not exceed 55 Ldn. Canterbury Regional Council, for the reasons outlined in this evidence, believes that a level of 50 Ldn is appropriate and justified in setting the OCB around Christchurch International Airport.
- 62 The 95 SEL is another component used for definition of the airnoise boundary (ANB), as defined in the New Zealand Standard.
- 63 The 95 SEL contour, in particular with reference to the cross-runway is the controlling criteria as prescribed in the methodology of NZS 6805:1992 Section 1.4.3.6 for airports (or runways) where there is an infrequent or irregular daily usage pattern. The Standard requires the SEL “to ensure adequate protection area around the airport to avoid sleep disturbance.”
- 64 The Airnoise Boundary (ANB) suggested by the Expert Panel is a combination of the calculated Ldn 65 dBA contour and calculated SEL 95 dBA contours for the noisiest, regular night-time event – being the Boeing B767-300 movements on runways 02, 20 and 29. The noisiest regular event on runway 11 is an A320 arrival. Appendix G of the Expert Panel Report determined that in the 11/29 runway direction, the B767-300 SEL contour was larger than the Ldn 65 dBA contour and should therefore be superimposed on the Ldn contours when setting the Airnoise Boundary. This is considered to be appropriate in meeting the approach outlined in NZS 6805. The maximum sound levels are those measured externally. This recognises that indoor levels will be reduced by building attenuation.
- 65 The 55 Ldn for the OCB is a minimum standard. Section 1.1.4 of NZS 6805 refers to the provision of a minimum standard, and suggests that a “*local authority may*

determine that a higher level of protection is required in a particular locality, either through use of the Airnoise Boundary concept or any another control mechanism...".

The basis is that from a community resource perspective this restriction, while placing some development limitations on individual landowners, is unlikely to restrict the community's ability to meet housing needs, because adequate banks of suitable land are assumed available for residential development outside the Ldn 50 contour.

66 The "stricter" standard adopted in the Christchurch City Plan, and confirmed in PC1 protects the community in an environment where amenity in Christchurch is assumed to be an important value. This is reflected in the Christchurch City Council vision for Christchurch⁴ as "...a world – class boutique city, where people enjoy a sustainable lifestyle, a healthy environment, a strong economic base ..." and the communities vision for Waimakariri District, "Vision 2020" where key themes are "Quality not Quantity" and "Prevention is Better than Cure". It is assumed that general ambient noise levels are lower than say in larger densely populated urban areas elsewhere (e.g. Sydney, London, Hong Kong, the US etc.) and so are community expectations of the levels of noise exposure from all sources, including an airport. It should be noted that if trends over the past 30 years continue, as the standard of living and community awareness and involvement increases, community expectations of amenity values will also increase.

67 Section 1.14 of the Standard states that *"This Standard shall not be used as a mechanism for downgrading existing or future noise controls designed to ensure a high standard of environmental health and amenity values."* An attempt to redraw the OCB at the Ldn 55, could be interpreted as a "downgrading" of the noise controls which have effectively regulated residential development in the vicinity of the airport, potentially violating the spirit of the Standard. The need for varying criteria depending on local circumstances and issues is acknowledged. For example, the United States Federal Interagency Committee on Aviation Noise (FICAN), published position and findings on Supplemental Noise Metrics (February 2002) notes that:

- Metrics should be related to the effect of concern
- Identification of threshold levels of impact should be left to agency discretion.

68 It is useful to draw comparisons with practices in other countries with similar cultural values and transport requirements. The Australian experience is probably the closest

⁴ CCC Annual Report Summary 2008 and Waimakariri District Council, Vision 2020 Revised 2001

match to New Zealand in terms of aviation practice and development, population densities, town planning and general cultural and lifestyle expectations. Land use planning in the vicinity of airports generally relies on the Australian Standard (referred to as AS2021-2000), which is based on the Australian Noise Exposure Forecast (ANEF) Metric. This is similar to the international NEF (Noise Exposure Forecast) metric with some minor differences in terms of night weighting criteria. The NEF metric, as a “Cumulative Average Energy Metric” is in the same “family” of metrics as the Ldn and serves the same purpose. The NEF (and ANEF) correlate well with Ldn and the equivalence $Ldn = (A)NEF + 35$ is often used. The comparison of the different units is in simple terms ANEF 15 equates to the Ldn 50 and the ANEF 20 equates to the Ldn 55. Australian contour maps are referred to as either ANEF, ANEI or ANEC maps. The “ANEF map” (Australian Noise Exposure Forecast) is the “endorsed” map for use in land use planning (based on a forecast traffic, or runway at capacity). The ANEI (Australian Noise Exposure Index) is a contour representing the “current” noise levels derived from actual aircraft movements over a 12 month period. The ANECs (Australian Noise Exposure Contour) are “scenarios” which are developed and can become the basis for the “endorsed” ANEF map. Another type of map, the ANER, has been proposed and is discussed in a later section. All maps (ANEF, ANEI, ANEC and ANER) use the cumulative noise metric which is referred to as the “ANEF metric”.

Christchurch Airport Environs

- 69 The specifics of appropriate land use planning controls in the vicinity of an airport will depend on the size and nature of operations at the specific airport and the nature of development in the area surrounding the airport.
- 70 The airport at Christchurch can be categorised as being of national as well as local significance. It is stating the obvious that air transport is of great importance to countries such as New Zealand. The country comprises two main islands, and is also separated by vast distances from neighbours.
- 71 Christchurch Airport provides links through regular air services to all domestic ports on both the South and the North Islands. There are services to nine international destinations including Sydney, Melbourne, Brisbane, Coolangatta, Singapore, Narita, Kansai, Rarotonga and Nadi, with seven international airlines represented. Actual traffic in the year 2007 comprised 70,601 domestic and 11,383 international aircraft

movements⁵. The airport is operationally available 24 hours a day, seven days a week.

- 72 Christchurch International Airport is a nominated "alternative" to Auckland International Airport, if aircraft bound for Auckland are not able to land there. This may be due to poor weather, an accident blocking the runway or other operational reasons.
- 73 As the gateway to the south island, it serves as a regional hub. Air New Zealand has a significant aircraft maintenance facility. It is also the base for the international (trans-Tasman) airline Pacific Blue.
- 74 Christchurch International Airport is New Zealand's gateway to Antarctica, with a well established International Antarctic Centre. This includes a dedicated Antarctic aircraft apron from which to airlift cargo and its own airport departure terminal for personnel travelling to and from Antarctica during the summer season. It serves as a base for the United States, New Zealand and Italian Antarctic Programs.
- 75 Aviation world-wide has a long and sustained history of growth of the order of 4% per annum. There remains long term potential for sustained increases in air travel for business and leisure with growth in GDP and general increases in the standard of living. The nature and role of the airport at Christchurch serving the main city of the South Island, as an international gateway, domestic and regional hub infers growth in airport activity over the long term.
- 76 The main runway, designated 02/20, is 3288 metres long and is used by aircraft up to and including long range widebody aircraft such as the B777. The cross-runway, designated 11/29, is 1741 metres long. It is used when weather conditions (including wind direction and speed) require. Aircraft up to and including the medium widebody aircraft such as the B767 can use the runway (although the B767 will be replaced in the short to medium term in the fleets of many airlines by newer generation aircraft such as the B787).
- 77 While aircraft movement activity will be concentrated during periods of peak demand, as an international and domestic trunk airport, there can be late night arrivals and departures, and early morning arrivals and departures from the airport.

⁵ Christchurch International Airport website accessed 2 December 2008.

- 78 Jet aircraft typically using the airport include the narrowbody B737 and A320 aircraft on domestic trunk and trans-Tasman routes and the widebody B777 and B767 aircraft on international routes. Airlines serving international and domestic routes include Air New Zealand, Qantas, Singapore Airlines, Emirates, Jetstar, Pacific Blue and Air Pacific.
- 79 The overall noise exposure in the vicinity of the airport has the potential to increase as growth in travel demand results in more aircraft movements, finally limited by the airport's runway capacity.
- 80 The local government authorities in the Greater Christchurch Region and Christchurch International Airport, through sound planning or good fortune, are currently in a position where the urban encroachment within areas affected by aircraft noise and those projected to fall in such areas in the future is very limited. Compared with the other primary New Zealand airports of Auckland and Wellington, there is very little conflicting land-use. The number of people within current and projected noise impacted areas in Christchurch is low when compared to these and other similar airports overseas. As noted this is due to sound planning. As a point of comparison the population within the 20 ANEF (equivalent to Ldn 55 around Sydney Airport is quoted as about 90,000 persons)⁶.
- 81 Assuming that the airport is perceived as an important economic and community asset and that the amenity of the residents of Christchurch is to be preserved, it is vital that long-term land use planning in the vicinity does not compromise the airport or the community. Any loosening of land-use controls will be irreversible and will result in either, populations living in areas affected by noise from aircraft operations, or pressure for and potential restrictions on airport operations.
- 82 New Zealand's primary international gateway, Auckland Airport, has not been as fortunate in terms of conflicting residential land use. The resolution of these conflicts has involved a compromise in which houses in affected areas will require insulation. This is despite having had airport master plans since the 1970's which include a second runway. Urban encroachment has resulted in approximately 2,000 existing houses and seven schools (five state and two private) being offered an acoustic

⁶ Expanding Ways to Describe and Assess Aircraft Noise (2000), Australian Government, Department of Infrastructure, Transport, Regional Development and Local Government.

treatment package, subject to airport activities reaching a noise threshold⁷. The operative Manukau District Plan (2002) has a section 17.6.15 which described the rules related to the operation of an Aircraft Noise Mitigation Fund (to finance noise insulation of existing residences in areas to be affected by aircraft noise) being established by the airport as part of the consent for development of its parallel runway.

Why 55 Ldn has been a de facto standard elsewhere

83 Most large airports have existing problems, with large existing populations in 55 Ldn, and insulation programs for populations within the 65 Ldn.

84 The European Environment Agency quoted the following populations within the 55 Ldn at selected European Airports⁸.

Airport	Number of people
Heathrow; London	440 000
Fuhlsbüttel, Hamburg	123 000
Charles de Gaulle, France	120 000
Schiphol, Amsterdam	69 000
Kastrup, Copenhagen	54 000
Barajas, Madrid	33 000

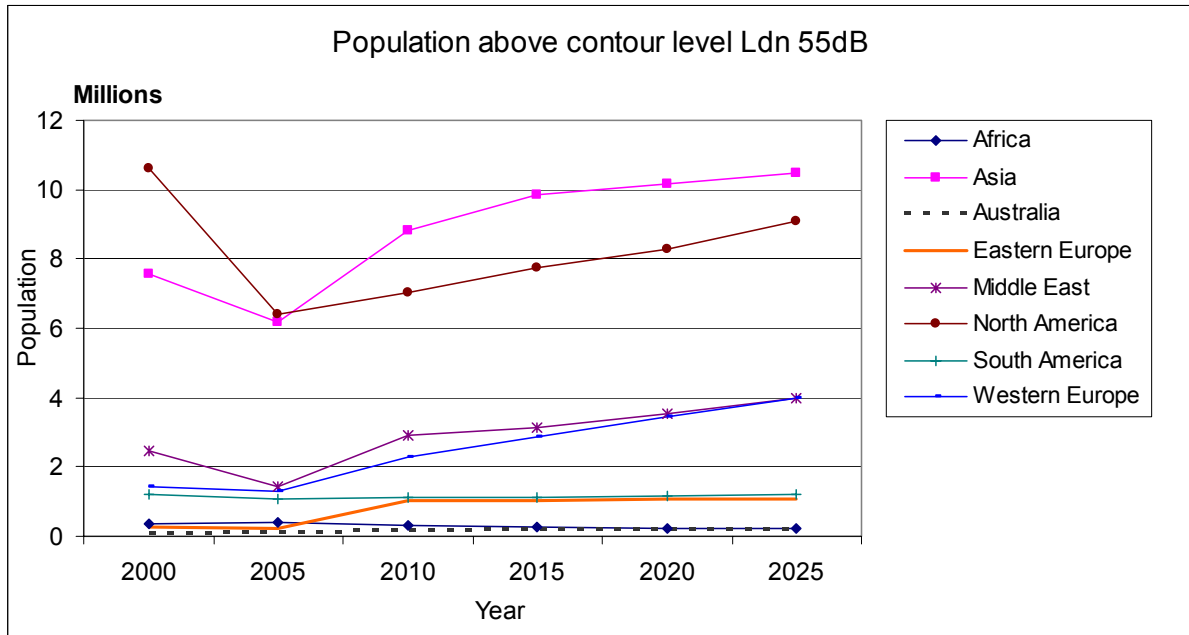
85 A more recent study of trends in global noise from commercial aviation⁹ tabulates trends and projections of populations in 55, 60 and 65 db Ldn contours by continent. It is graphed below and shows a drop in populations affected on most continents (except for Australia) in the period 2000 and 2005, as noisier aircraft in the airline fleets were replaced by new generation quieter aircraft. In Australia (and New Zealand) the year 2000 fleet was already dominated by modern new generation quieter aircraft and the gains from phase out of noisy aircraft was not available. However, the long term trend is projected increases in populations affected from the

⁷ Details and six months progress reports by the airport company on the noise mitigation can be found at <http://www.auckland-airport.co.nz/Community/Noise.aspx> (accessed 1 December 2008)

⁸ *Are we moving in the right direction? Indicators on transport and environment integration in the EU - TERM2000 - Executive summary*. Environmental issue report No 12, EEA, Prepared in collaboration with a large number of individuals in EEA, EIONET and other institutions Publish date: 2000/07/20, Published by: OPOCE (Office for official publications of the European communities) found at <http://reports.eea.eu.int/ENVISSUENo12/en/page009.html> last accessed 1 December 2008

⁹ "Trends in Global Noise and Emissions from Commercial Aviation for 2000 through 2025, Fleming, Malwitz et al, paper presented at the 7th USA/Europe Air Traffic Management R&D Seminar Barcelona, 2007

current levels, as traffic increases and/or urban encroachment increases population densities in affected areas.



86 Christchurch City has population of about 382,200¹⁰ and the airport capacity with the existing two runway system is estimated at between 175,000 and 225,000 annual movements¹¹. The existing intersecting runways are 3,288 and 1,741 metres long respectively¹². The city population density is about 21 people per hectare.

87 Population densities in Amsterdam, Frankfurt, Stockholm, London and Paris are all about 50 persons per hectare. Scottish cities compare more closely, with Copenhagen and some American and Australian cities at between 15-30 persons per hectare.¹³ The Inner London Boroughs have a population density of between 80 to

¹⁰ NZ population estimates for 2008, Statistics New Zealand, accessed 1 December 2008 at <http://www2.stats.govt.nz>

¹¹ Page F-4 of the Expert Panel Report in the Matter of Several appeals against the proposed Selwyn District Plan under Clause 14 of the First Schedule of the Resource Management Act 1991 (January 2008)

¹² Aeronautical Information Publication (AIP), NZ Civil Aviation Authority, accessed online 1 December 2008

¹³ <http://www.scotland.gov.uk/library5/society/rsca-22.asp>

130 residents per hectare.¹⁴ Urban population densities in the Asian cities can range between about 140 persons per hectare (pph) and over 250 pph¹⁵.

88 To further put the Christchurch situation in perspective the table below compares some major international airport with some in this regional (and some well known airports in Europe and North America), the number of aircraft movements and the city populations.

Airport	Annual Passengers ^a	Annual Aircraft Movements ^a	Number of Runways	City Population
Auckland	12,222,096	155,662	1	1,313,200 ^d
Cairns	3,997,476	98,538	2	131,564 ^e
Canberra	1,841,302 ^c	136,327 ^c	2	324,100 ^c
Christchurch	5,635,166	134,058	2	382,200^d
Heathrow	68,068,304	481,479	2	7,556,600 ^h
Manchester	22,363,106	222,778	2	2,562,200 ^f
Schiphol	47,794,994	454,360	5	1,000,307 ^e
Sydney	32,323,380	286,101	3	4,225,100 ^c

Sources:

- a) Unless noted passenger movement statistics are from the ACI Monthly worldwide Traffic Report (July 2006) for the 12 months ending July 2006
- b) Master planning demand analysis
- c) Australian population statistics from "2008 Year Book Australia" (<http://www.ausstats.abs.gov.au>)
- d) New Zealand population estimates for 2008 <http://www2.stats.govt.nz>
- e) Amsterdam population statistics from <http://unstats.un.org/unsd/citydata>
- f) English population from <http://www.statistics.gov.uk/>

89 Many studies and precedents are brought from European and North American airport environs. However, comparisons may not be valid where cities are larger, noisier, airports are busier, there is a shortage of suitable land, and people's expectations in terms of amenity are lower.

90 Community reaction will vary depending on:

- climate (windows open, closed, double and triple insulation)
- lifestyle – indoor, outdoor, time of day
- relative impacts of other noises.

¹⁴ http://www.lbwf.gov.uk/demography/census/london/london_boroughs_census2001.rtf

¹⁵ An International Comparative Perspective On Urban Transport And Urban Form In Pacific Asia: <http://www.wistp.murdoch.edu.au/publications/projects/pbarter/pdfs/PBprelim.pdf>

- 91 While there are some general global trends in the reaction to transportation noise, including aircraft noise, there are also variations between regions, due to a variety of environmental and cultural factors.
- 92 I suggest that it is unreasonable and inappropriate to uncritically apply standards from large European or North American cities to New Zealand or Christchurch.
- 93 This is clearly illustrated in a 2000 - 2001 "State of the Art" Review of Traffic and Noise Pollution undertaken in Europe¹⁶.

The study goal was to identify different patterns of reaction to noise in northern, central and southern European regions. The "partners" in the study were Berliner Zentrum Public Health (Technical University of Berlin), Centro Universitario De Salud Pública (CUSP) (Madrid), Strateco Utveckling AB (Sweden) and MVV Consultants and Engineers GmbH.

The conclusions from the study were:

"..that sleeping hours vary in two aspects. Differing expectations of noise as well as different light conditions contribute to the major results in the northern and southern regions.

The different expectations, or habits, create a lower annoyance reaction from people surveyed in southern Europe in comparison to parts of central Europe and the majority of northern Europe. The results revealed a greater sensitivity to noise in the north European countries for five main reasons. 1)The lower density of population in the north that designate different space for recreational areas, industrial areas and traffic apart from each other more than in areas with higher density of population. 2) The climate, which demands more insulation in the north which also limits disturbance indoors from outside activities. 3) The very different light conditions which do not vary as much in the south as in the north. Consequently, it keeps the population active during later hours in the summer and less active during the winter period when parts of the population do not see daylight for weeks. 4) The cold climate creates a need to sleep with closed windows even during summer time. During this time when the days can be hot, the nights can be as cold as in the high rise mountain areas in central Europe. 5)The special siesta-culture in the south, taken advantage of by some 25 % of the population, where less noise is expected but rarely occurs due to the increase in economic activity. 'The south is somewhat spoiled with heat and the north is sometimes somewhat spoiled with silence'.

The conclusions is that the process of standardisation needs to take the physical and cultural differences inside the EU into consideration."

- 94 The five factors found to influence annoyance from (transportation) noise were:
1. Population density and city zoning

¹⁶ The home page for the report is found at
http://www.tu-berlin.de/bzph/www_fremd/www_TrafficNP/pages/intro.htm

2. Climate influencing design of houses and levels of insulation for climate (but also affecting noise)
3. Hours of daylight which influence human activity patterns
4. Climate influencing the opening or closing of windows (open windows negating any noise insulation)
5. Cultural expectations in terms of noise levels and amenity.

95 I would suggest that if these site specific factors are considered in the Christchurch regional context and aircraft noise impacts associated with Christchurch International Airport, a conservative approach to land use planning is justified. Standards which may be applied in large European cities with very busy airports, such as Heathrow, Manchester and Schiphol have less relevance. Precedents should be sought from situations with parallels in lifestyle (Australia and New Zealand), population density and airport activity levels.

96 In this evidence, parallels will be drawn from reports relating to Sydney and Canberra, which consider these issues.

50 Ldn does have some basis - Noise does not stop at the 55 Ldn boundary

97 The Australian Standard – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction (AS2021-2000), recognises that aircraft noise impacts do not “disappear” at the Ldn 55 boundary. The Standard, prepared by the Joint Standards Australia/Standards New Zealand Committee EV/11, *“is concerned with land use planning and building treatments in the vicinity of an airport”*.

98 As well as Australian stakeholder grounds, organizations represented on the Committee that prepared the Standard included:

- Acoustics Consulting Interests, New Zealand
- Australian and New Zealand Environment and Conservation Council
- Building Industry Authority, New Zealand
- Environmental Noise Analysis and Advice Service, New Zealand..

99 In Section 1.2 – Objective – AS2021-2000 states that *“the effects of noise from aircraft are not confined to areas where the noise exposure exceeds 20 ANEF and may occur at or below 20 ANEF”* (equivalent to the 55 Ldn).

- 100 The Foreword to the Standard notes the distinction, based on experience, that communities which are newly-exposed to aircraft noise are more sensitive than communities which are accustomed to it.
- 101 While acknowledging this distinction, the Australian Standard uses the ANEF 20 (equivalent to the Ldn 55) threshold for residential development because the Standard is *“based on the reactions of noise-accustomed communities”*. However *“Regulatory authorities are cautioned that a transient heightened reaction could result from substantial new noise exposure.”*
- 102 Like the New Zealand Standard, AS 2021-200 provides *“guidelines”* for planning authorities, and would **not** preclude a more stringent approach, if deemed appropriate by the relevant planning authorities. Note (3) to Table 3.3 of the Standard states *“Land use planning authorities may have their own internal noise level requirement which may be used in place of the levels (in Table 3.3)”*. The acceptability of outdoor spaces is not covered, and recommendations for building construction are based on the assumption that external windows and doors are shut.
- 103 The Standard (in the notes to Table 2.1) makes a distinction between *“development (which) may be necessary within existing built-up areas”* where a pragmatic approach may be adopted, compared to the uncompromising position in *“greenfield sites”*.
- 104 Additionally the Standard makes the point that the human reaction to aircraft noise is *“known to depend not only on the amount of noise, but also on psychosocial factors such as personal sensitivity to noise, fear of aircraft crashing and attitudes towards aviation”*.
- 105 Subsequent to the opening of the Sydney Third Runway in November 1994, and the public reaction to noise impacts, the Australian Parliament initiated an inquiry. The results were published in November 1995 under the title *“Falling on Deaf Ears?”*¹⁷. Among the findings of the parliamentary committee were that there are aircraft noise impacts on populations **outside** the 20 ANEF (55 Ldn), which had been traditionally used as the boundary for noise impact assessment.
- 106 The report notes that community awareness of aircraft noise and expectations have risen in the period since 1980 when the ANEF system was developed in Australia. Originally contours out to the ANEF 20 (Ldn 55) were plotted. The ANEF 15 (Ldn 50), which was not originally plotted on noise exposure maps, was suggested for inclusion among the

¹⁷ *“Falling on Deaf Ears?”, Report of the Senate Select Committee on Aircraft Noise in Sydney, Department of the Senate, Commonwealth of Australia, 1995.*

information to be provided by an airport to stakeholders in the urban environs around airports. As the report notes:

"Using NAL (National Acoustic Laboratory) determined dose/response relationships for Sydney, the Draft EIS (for the Sydney Third Runway) also estimated numbers of people seriously and moderately affected by aircraft noise at levels greater than 15 ANEF. What these relationships showed was that more than half (55%) of those living between the 15 and 20 ANEF contours were moderately affected by aircraft noise, including 10% who were seriously affected." (page 201 para. 8.102)

107 The Auditor's Report on the Supplement to the Draft Environment Impact Statement - Second Sydney Airport Proposal¹⁸ notes *"It is well known and reported that there are significant noise impacts below a level of 20 ANEC (55 Ldn). Noise contours in the Draft EIS should be shown for levels below 20 ANEC (say for 15 ANEC (50 Ldn))."*

108 Since (and mostly as a result of) the issues associated the very strong negative community reaction to aircraft noise associated with the opening of an additional runway at Sydney Airport, a significant body of work has been undertaken by the Australian Government (through the departments responsible for aviation and environment).

109 In March 2000 a Discussion Paper was issued under the title "Expanding Ways to Describe and Assess Aircraft Noise"¹⁹. The synopsis notes that *"Some people living outside the 20 ANEF contour (Ldn 55) have been given an expectation of receiving little or indeed no aircraft noise and, as a consequence, find the levels of noise actually experienced to be 'unacceptable'."*

110 As a response to feedback on the Discussion Paper, in March 2003 a publication was released under the title "Guidance Material for Selecting and Providing Aircraft Noise Information"²⁰. Page 4 of the publication notes:

"The Australian Noise Exposure Forecast (ANEF) land use compatibility advice states that areas outside the 20 ANEF (55 Ldn) are "acceptable" for any development. Since the only aircraft noise information generally presented to (land use) planners has been a

¹⁸ "Supplement to Draft Environmental Impact Statement Second Sydney Airport Proposal, Auditor's Report, SMEC for the Commonwealth of Australia, June 1999 p25

¹⁹ "Discussion Paper: Expanding Ways to Describe and Assess Aircraft Noise", Department of Transport and Regional Services, Commonwealth of Australia, March 2000 (copies were available on the Web at www.dotrs.gov.au)

²⁰ "Guidance Material for Selecting and Providing Aircraft Noise Information", Department of Transport and Regional Services and Department of the Environment and Heritage, Commonwealth of Australia, 2003

set of ANEF (Ldn) contours, with the 20 ANEF contour being the outer one, it has probably not been unreasonable for the planner in the past to have treated areas outside the 20 ANEF as being free of aircraft noise. However, it is now generally recognised that basing planning decisions solely on ANEF contours, without reference to other information (particularly on the location of flight paths), is likely to lead to less than optimal outcomes. For example, if there is a proposal to site a school in an area with an aircraft noise exposure of 19 ANEF (54 Ldn) it would be prudent, if the proposed school site is under a major flight path, to look for alternative locations.”

111 Clearly attitudes to aircraft noise have changed during the past 25 years, and what may once have been “acceptable” either because of changing standards or ignorance, are no longer necessarily appropriate and a more sophisticated approach is advocated.

112 Although the USA generally uses the 55 Ldn contour as the threshold for permitting residential development, this does not mean that a lower threshold (say 50 Ldn) would not be used, if feasible. There is a clear recognition of the impacts of aircraft noise beyond the 55 Ldn contour in the August 2000 report by the US Federal Government Accounting Office (GAO), as quoted below²¹ (my emphasis):

*“Perceptions of noise can vary from individual to individual. For instance, Denver International Airport receives one of the highest numbers of noise complaints in the country, although it is not close to any residential communities. However, in many cases, individuals submitting complaints were not exposed to aircraft noise before the Denver International Airport opened in 1995. Similarly, FAA reports that in recent years, **complaints have come from populations exposed to comparatively low levels of noise, sometimes miles from an airport. Our survey results were consistent with these reports, with officials from 35 airports reporting that over half of their noise complaints during the last year came from people living in areas where aircraft noise falls below the level FAA considers incompatible with residential uses. However, officials from 47 airports reported that increasing populations in nearby areas pose a concern.***

Strong pressure exists to develop residential areas around heavily used airports, particularly in metropolitan areas with more than 50,000 people— areas where all of the 50 busiest commercial service airports are located. Officials from 22 of the 50 airports that we surveyed cited airports’ limited control over local zoning as a major concern. A representative of a leading environmental organization told us that better dialogue is

²¹ Report reference GAO/RCED-00-153, US Government Accounting Office, August 2000, Aviation and the Environment - Airport Operations and Future Growth Present Environmental Challenges (Report to the Ranking Democratic Member, Committee on Transportation and Infrastructure, House of Representatives)

needed with communities to improve land-use choices and reduce the potential for incompatible land uses in the future. EPA agrees that noise problems at the local level are the result of incompatible land-use planning around airports. Although FAA has no control over zoning, the agency has undertaken an initiative to provide information to state and local governments for their use in controlling and preventing incompatible land uses near airports. Officials from airports, EPA, and FAA agree that a compatible land-use policy is one of the best noise mitigation techniques that can be used to minimize the impact of aircraft noise on surrounding communities. This is particularly important for future airport expansions, because land-use decisions that conflict with aviation activity and airport facilities can make it difficult for airports to grow to meet the increasing demand for air travel....

A representative for state aviation officials expressed concern that as quieter aircraft have been phased in, the boundaries of airport noise contours have shrunk and people have moved into these areas that were previously impacted by noise. However, in the future, as the number of aircraft operations increases, the areas impacted by noise may expand again at some airports, despite quieter aircraft—making this new residential development incompatible with airport operations. These increasing populations pose challenges for airports in their relations with surrounding communities.”

113 The report acknowledges:

- Appropriate land use is one of the best forms of mitigation
- Poor land use planning will create future conflicts
- While contours may shrink in the short term, they may expand with traffic growth
- There are impacts beyond the FAA / EPA mandated guidelines (the 55 Ldn)
- Newly exposed populations are more sensitive to aircraft noise than those that have been subject to previous (long term) exposure.

114 While considering the standards in the USA it is useful to note that *“nearly half of the urban population live in areas exposed to traffic sounds that range over only 5 dB (Ldn = 55 to 60 dB). Rural populations enjoy average outdoor sound levels generally lower than Ldn = 50 dB”*²².

115 The same EPA report also notes that *“Social surveys most often have been used to assess community reaction to noise exposure around airports... Aircraft noise may also*

²² Condensed Version of EPA Levels Document, found at http://www.avlelec.com/epa_noise.html (accessed 3/12/08)

be found annoying because it may startle people, cause houses to shake, or elicit fear of a crash.”

116 The International Civil Aviation Organisation (a United Nations body responsible for international coordination of civil aviation) published an Environment Report in 2007²³. The overview contains the following background about ICAO and the environment – *“ICAO is a specialized agency of the United Nations created in 1944, with the signing of the Convention on International Civil Aviation, to promote the safe and orderly development of global air transport. ICAO has been in the forefront of aviation environmental issues since the late 1960’s. The Organization’s work on the environment focuses primarily on those problems that benefit most from a common and coordinated approach on a worldwide basis, namely aircraft noise and engine emissions. Standards and Recommended Practices (SARPs) for the certification of aircraft noise and aircraft engine emissions are covered by Annex 16 of the Convention. ICAO has a membership of 190 Contracting States and works closely with other UN bodies and international organizations with an interest in aviation. ICAO has established three environmental goals:*

- *to limit or reduce the number of people affected by significant aircraft noise;*
- *to limit or reduce the adverse impact of aviation emissions on local air quality; and*
- *to limit or reduce the impact of aviation greenhouse gas emissions on the global climate.*

ICAO’s Committee on Aviation Environmental Protection (CAEP) is a technical committee of the ICAO Council and undertakes most of the Organization’s work in this area. It is the international forum of expertise for the study and development of proposals to minimize the impact of aviation on the environment. Every proposal in CAEP is analysed according to four criteria: technical feasibility; environmental benefit; economic reasonableness and in terms of the interrelationship between measures. The ICAO Council reviews and adopts the CAEP recommendations. It then reports to the ICAO Assembly, the highest body of the Organization, where the main policies on aviation environmental protection are defined and translated into Assembly Resolutions. The Organization also produces studies, reports, manuals and circulars on the subject of aviation and environment. “

117 The ICAO Environment Report is in 6 parts and Part 2 covers Aircraft Noise. In this part there are articles addressing the four sections of ICAO’s “Balanced Approach to Aircraft

²³ ICAO Environmental Report 2007, ICAO Environment Unit, 2007,

Noise Management” which consists of identifying the noise problem at an airport and then analyzing the various measures available to reduce the noise using four principal elements, namely:

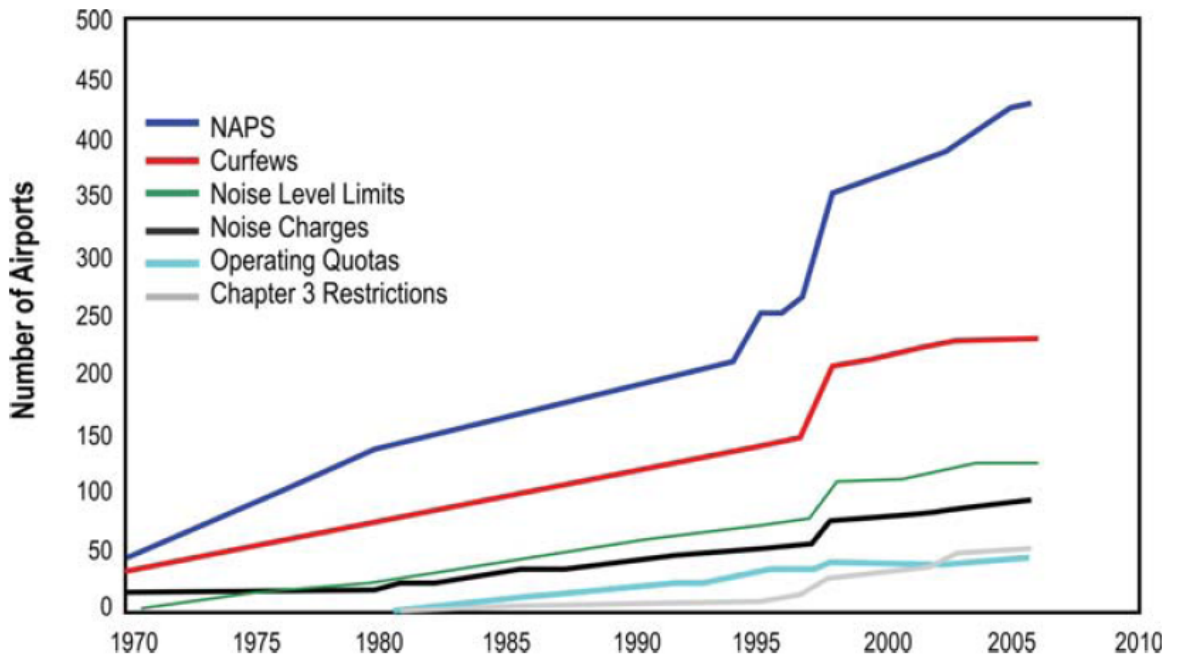
- Noise at the Source
- Land-Use Planning
- Noise Abatement Operational Procedures
- Aircraft Operating Restrictions.

ICAO identifies the goal of this approach (my emphasis) *“to address the **local** noise problems on an **individual** airport basis and to identify the noise-related measures that achieve maximum environmental benefit most cost-effectively using objective and measurable criteria.”*²⁴

It was noted that *“ICAO discourages the application of operating restrictions as the first option to mitigate noise around a specific airport...the other elements of the balanced approach should be considered first.”* The Christchurch regional planning authorities are taking a proactive approach such that future operational restrictions are avoided to the greatest extent possible. The figure on page 53 of the ICAO report, (originally sourced from Boeing²⁵) shows the increasing level of noise restrictions at airports worldwide to mitigate existing aircraft noise impacts and issues. The legend shows various noise mitigation measures such as curfews, Noise Abatement Procedures (NAPS) and Chapter 3 Restrictions (limiting access based on noise certification levels of aircraft).

²⁴ Ibid p21, bold emphasis is the author of this evidence, not in the ICAO paper.

²⁵ Growth in Airport noise restrictions at airports, worldwide, Boeing, 09/06/2006



118 In Part 2 of the ICAO Environment Report there are two articles of relevance to this discussion. The first is by Ms Elizabeth Andrade, who is head of the Land Use Compatibility Group of the Civil Aviation National Agency – Brazil. The article²⁶ notes that *“One of the major problems affecting the people living and working around airports is noise due to aircraft operations. Accordingly, residential developments near noise-sensitive airports have generated all sorts of complaints and community actions aiming to reduce noise due to aircraft operations. Of course, this may impose airport capacity constraints and significantly increase the costs of providing commercial services.”*

The author explains that ICAO dedicated an appendix (Appendix F) of its Assembly Resolution A35-5 to land use planned land management, where States (members of ICAO) are.. *“urged to:*

- *avoid inappropriate land-use or encroachment, whenever possible in areas where reduction in noise levels have been achieved;*
- *ensure that the potential reductions in noise levels to be gained from the introduction of quieter aircraft, particularly those complying with the new Chapter 4 standard, are also not avoidably compromised by inappropriate landuse or encroachment;*
- *minimize aircraft noise problems where the opportunity still exists through preventive measures, most of which are related to land use planning.”*

²⁶ Ibid p 34

119 The article further discusses land use planning and the need to take a long term perspective to planning, both in places where there are existing problems and land use changes may be limited or take a long time to remedy, and *“where substantial benefits can be gained from the correct application of land-use planning techniques to the development of new airports where initial constraints are minimal.”*

120 The article also emphasises the local factors that may contribute to the sensitivity of a particular community to a given noise exposure – *“On the other hand, the sensitivity of the community to this kind of aircraft noise is dependent on, among other things, factors such as: type of land use, building use, type of building construction, distance from airport, ambient noise in the absence of aircraft noise, and sociological factors.”*

121 A second article²⁷ in the Part 2 of the ICAO Environment Report is by Dave Southgate, Head of the Aviation Environment Policy Section in the Australian Government Department of Transport and Regional Services. The article deals with aircraft noise issues on the “distant” areas in contrast to the conventional focus on “close in” noise contour areas. The area in the 50 Ldn contour can include consideration of the “broad-area” issues raised in the paper.

“Until recently aircraft noise assessment and management has been focused on the ‘close in’ areas around airports which are exposed to the highest levels of aircraft noise. However, community pressures to impose operational constraints or oppose airport growth are increasingly coming from residents living in areas outside of conventional ‘close in’ noise contours. These aggrieved residents of the more ‘distant’ areas generally live under busy flight paths. This fundamental change in public reaction to aircraft noise raises the question of whether members of the public are becoming more sensitive to aircraft noise or whether this geographically broadened response is due to changes in the nature of noise exposure patterns around airports.”

122 The article contrasts the previous noise impacts around airports, such as Christchurch, being dominated by the operations of the noisiest aircraft. As technology has introduced relatively quieter aircraft (such as the B777 aircraft operating into Christchurch on routes that were previously flown by the noisier B747-200 model)) the number of flights has increased (scheduled jet aircraft movements at Christchurch Airport grew from 26,600 in 1999 to more than 42,300 in 2008). As explained by Southgate: *“While it is difficult to be definitive about the evolution of community sensitivity to aircraft noise it is very evident that in recent years the nature of aircraft noise patterns around airports has changed significantly. That is, individual aircraft are much quieter, but numbers of aircraft*

²⁷ Ibid, p38

movements have increased substantially. As a result, while the total noise dose received at a particular point on the ground near an airport may not have changed, or even may well have reduced, the composition of that noise dose is very different. The resident living at that particular point today is likely to receive their noise dose from a higher number of relatively quiet overflights; rather than from a relatively small number of very loud noise events, as was formerly the case.

Thus, the issue of concern for many people living in the areas outside the conventional sound contours is not so much the level of noise generated by individual aircraft, but rather the cumulative impact of a large number of overflights. They perceive that the times when there are no overflights, the periods of 'respite', are rapidly disappearing and that noise events are becoming more frequent in the sensitive time periods such as evenings and weekends. This change in the nature of the noise pattern would appear to be a significant factor in the widening geographic range of adverse community reaction to aircraft noise."

123 The paper is not advocating that land-use planning restrictions be extended to all areas covered in the "distant" areas, mainly because *"residents living in the outer areas are too distant from the airport to be eligible for acoustic insulation or other common remediation programs (e.g. property buyouts, aviation easements, etc) and are generally in areas where it would be impractical to impose aircraft noise-related land-use planning controls."* That is to say the impracticality relates to existing residents, but this does not preclude maintaining existing land use controls so as not to introduce new residents into areas directly under the main approach and departure flight paths, where there are alternative areas within a region to accommodate urban growth with minimal penalties. It is noted that *"if a person unknowingly moves into a house under a busy flight path in an outer area they may find the unexpected noise highly annoying."*

124 *"Land-use planning has limited area wide application since, irrespective of the noise exposure levels, in general it is not practical to impose aircraft noise based restrictions on land use at long distances from airports. However, **at some airports opportunities do exist for basing land-use planning on flight path corridors rather than on conventional noise contours. In these instances where concentrated flight paths over unoccupied land can be fully integrated with planning it may be feasible to impose planning constraints at considerable distances from airports.**"*

125 The purpose of bringing the material from Southgate (my emphasis in the quote above) is not to suggest at this stage that PC 1 should now depart from the provisions of the New Zealand Standard in adopting alternative metrics for land use planning (such as the flight corridor concept). However, it is my opinion that in the case of Christchurch the outcomes

advocated by Southgate can be achieved using the Ldn contours from the Expert Panel, with the Ldn 50 contour providing de facto protection under the main flight path corridors.

- 126 The philosophy of protecting flight path corridors has been long advocated around Canberra Airport and the discussion which follows presents some of the reasoning for this.
- 127 Canberra Airport has been advocating the concept of a High Noise Corridor to signal appropriate and inappropriate areas for residential development. The Canberra Airport website²⁸ notes that this *“...was first proposed in 1999 with extensive consultation conducted with business, government, industry and the community. In April 2001 the High Noise Corridor was released for public consultation as the Canberra International Airport Regional Plan for Aircraft Noise. The High Noise Corridor concept has developed significantly and has progressively gained public and government support since 1999.*
- 128 *The High Noise Corridor is an area of land around Canberra Airport subject to significant adverse aircraft noise exposure. Canberra Airport argues that this is the preferred measure to be used in determining the suitability of residential development, and within which no further residential development should be permitted. Areas throughout this Corridor will be subject to high noise exposure, which will increase as aviation traffic grows. Lesser amounts of noise may still be experienced outside the Corridor, as evidenced by actual aircraft tracks and single event noise contours.*
- 129 The concept incorporates consideration of actual flight paths (as plotted from noise and flight path monitoring systems installed around the airport environs, as well as single event noise contours, to supplement the traditional ANEF (Ldn) contour based land use planning criteria in the Australian (and New Zealand) standards.
- 130 Canberra Airport advocates the High Noise Corridor *“as a solution to the inherent uncertainty created by varying aircraft tracks and the differing noise made by different aircraft...Canberra Airport has developed a High Noise Corridor within which no residential development should occur. The High Noise Corridor not only caters for current aircraft activity but looks to the future, protecting future residents from increased aircraft activity as Canberra Airport grows to meet future demand.”*

²⁸ http://www.canberraairport.com.au/air_noise/noise_minimising.cfm accessed 3/12/2008

- 131 Attempts to create large residential sub-divisions under the flight path corridors around Canberra Airport has a history of recent litigation (for more than 6 years) and is complicated by cross-jurisdictional issues (the airport is in the Australian Capital Territory (ACT) and the housing developments proposed are in a separate local government district and also in the State of New South Wales).
- 132 The New Zealand Standard already implicitly takes into account an element of the flight corridor concept in supplementing the Ldn contours with the SEL (single event) contour for the largest aircraft regularly using particular runways and not just the Ldn 65 dBA contour in defining the Airnoise Boundary (ANB).
- 133 Complaints are not a good measure of noise impact, as I explain in detail later in this statement. The proponents of residential development in the Canberra Airport flight corridors base much of the argumentation on low noise complaint statistics in areas of similar noise exposure, that the impacts will only be felt in the long term (as airport traffic increases) and relies on noise insulation in areas between the 20 and 25 ANEF which can be developed according to the letter of the Australian Standard “conditionally” (ie building houses with noise insulation to meet strict attenuation criteria). I would suggest that this approach should only be adopted when no better or more convenient locations for urban development remain. If appropriate suitable sites are available in a city environs, then good long term planning should be a priority to protect areas under the approaches to airport runways from residential development to the greatest extent possible.
- 134 The ACT government noted in its State of the Environment Report from 2004²⁹ noted: *“The data provided by Council does not suggest any rise in noise complaints. Council noted however that many complaints were beyond their jurisdictional powers and as such were not registered. It was felt that noise in the environment was increasing, exacerbated by large houses on smaller blocks, increased urban development, and aircraft and traffic noise. Although the figures do not show any appreciable rise in noise complaints it is possible that people felt powerless to effect change in their local environment.”*

²⁹ <http://www.environmentcommissioner.act.gov.au/soe/soe2004/Queanbeyan/noise.htm>
accessed 3/12/2008

135 In the background to NSW Department of Planning – Planning Review, Queanbeyan City Council, Residential and Economic, Strategy 2031, April 2007³⁰ it was noted that: *“There is a long and protracted history relating to the consideration of proposals for the residential expansion of Queanbeyan. Consideration of the various residential proposals has been complicated by a number of factors including the relationship of Queanbeyan to the ACT, the need for multiple development fronts to provide affordable housing for the community and the need to respond to environmental issues. Resolution of these issues is critical given that Queanbeyan has virtually exhausted its supply of new residential land. At risk are increasing housing prices given the area’s history in providing an affordable housing alternative to the ACT. Given the continued strong demand for housing and the expected ongoing population growth projected for the area, the identification and development of new residential land is critical.*

In terms of the specific land release issues, the key recommendations of the Panel in summary were:

- *Residential use of land affected by aircraft noise should be avoided where alternative greenfield residential development opportunities exist within the Queanbeyan local government area and the cross border region generally.*
- *The Googong site should be considered favourably for residential development on the basis that it is largely unconstrained.*
- *The Poplars site should not be considered further for residential development given the adverse affects of aircraft noise*
- *• The Tralee site should be considered a significant regional asset for employment and transport uses. It should not be considered for residential development.*
- *• Tralee Station, and Environa/Robin should also not proceed for the same reasons as Tralee.”*

136 As further background to what can happen when there are protracted disputes between an airport and its environs relating to growth and land use, it becomes a public issue as demonstrated in the recent development of a community group, claiming to have a petition with 3,000 signatures call for a curfew on Canberra Airport³¹ The groups website explains:

³⁰ http://www.duap.nsw.gov.au/plansforaction/dop_qbyn_finalreport_270407.pdf accessed 3/12/08

³¹ <http://www.curfew4canberra.org.au/index.html> accessed 3/12/08

“Curfew 4 Canberra has been formed in response to the dramatic changes proposed in Canberra Airport’s draft 2008 Master Plan, in particular the unrelenting night time aircraft movements and the impact this will have on the quality of life for all residents of the Canberra region. Its membership draws on the residents associations of Pialligo, Hackett, Watson, North Canberra, Gungahlin and Jerrabomberra. One of our key platforms is the introduction of a night time curfew at Canberra Airport.

137 *Canberra International Airport is planning massive expansion under its latest draft Master Plan. It wants to become Sydney’s second airport, including a 24-hour airfreight hub. Unlike Sydney, we don’t have a night time curfew. There will be bigger planes with much greater frequency – up to 1 plane movement every 2 minutes. There are significant social & environmental costs to the Canberra & Queanbeyan communities.*

Curfew4Canberra core objectives:

- To secure an 11pm-6am curfew;*
- To oppose Canberra Airport becoming a 24 hour freight hub;*
- To oppose Canberra Airport becoming Sydney’s 2nd Airport;*
- To oppose the construction of a parallel (third) runway.”*

138 While not making any judgements on the merit of arguments of Curfew4Canberra, the above demonstrates that where there are real or perceived current or future aircraft noise issues, public pressure groups will form to demand relief in the form of operational restrictions on an airport.

139 The difference in community reaction prompted a study for Canberra Airport³² by an Australian aviation noise expert, Stephen Cooper. Mr Cooper notes that the acceptability criteria for land use planning in Australia (similar to New Zealand and other countries) is based on affected residents having been exposed to aircraft noise for a period of at least two years. Mr Cooper argues that the accepted noise-dose response curve is inappropriate for aircraft land use planning under two scenarios.

140 His report refers to a noise dose response curve adjusted up by 7-8 ANEF units (Ldn units) in the Draft EIS for the Second Sydney Airport Proposal (1999) prepared for the Australian Department of Transport and Regional Services. This adjusted dose response curve for consideration of persons newly exposed to aircraft noise, indicates that they

³² “ A Fresh Look at the Aircraft Noise Standard, A New Tool for Land Planning, Steve Cooper for Canberra International Airport, 1998.

would be more affected at a lower level than the standard curve which was developed for communities already exposed to aircraft noise.

- 141 Mr Cooper goes on to make the point that the Australian Standard's use of the 20 ANEF (55 Ldn) was developed for "*densely populated urban/industrial/traffic areas in the major capital cities of Australia.*" He suggests that there are many airport situations in Australia where airport noise has been found to give rise to disturbance outside the ANEF 20 zone".
- 142 On this basis a noise contour map designated ANER (Aircraft Noise Exposure Response) was developed as "*an extension of the official ANEF 20 map ... by developing an ANER 13 contour.*" The proposition was "where areas around a regional airport are not presently used for residential purposes, then the area between the ANER 13 (Ldn 48) contour and the ANER 20 (Ldn 55) contour should be considered as conditional, or may even be considered unacceptable by some persons..(and).. for the purpose of noise impact on new residents, be considered as unacceptable."
- 143 I would suggest that in terms of land-use, urban density and general residential lifestyle there are strong parallels between Canberra and Christchurch.
- 144 The population in the Canberra regional area is of the order of 350,000³³. The population density is about 13 persons per hectare "*when the population of Canberra (309,844 persons) is considered within only the size of the developed urban area, including 24,383 hectares of urban green space*"³⁴ and in urban areas the density can be between 24 and 27 persons per hectare³⁵. More detailed density figures for each suburb have not been calculated for this report. The airport capacity is quoted in the airport Master Plan as 230,000 annual movements, including wide body aircraft on domestic and international services. Canberra Airport has two runways; the main runway is 3,283 metres long while the intersecting runway is 1,679 metres long. Future planning for Canberra Airport includes provision for an extension to the intersecting runway (to 2,029 metres) For comparison the Greater Christchurch population was around 413,500 in 2006³⁶. Christchurch Airport has sealed two runways, the main runway is 3,548 metres long and

³³ <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1301.0> referenced 1 December 2008

³⁴ <http://www.environmentcommissioner.act.gov.au/SoE2000/ACT/IndicatorResults/Populationgrowth.htm>
http://www.actpla.act.gov.au/tools_resources/planning_data

³⁵ http://www.actpla.act.gov.au/plandev/neighbourhood_plans/snapshots/turnersnapshot.pdf
http://www.actpla.act.gov.au/plandev/neighbourhood_plans/snapshots/dicksonsnapshot.pdf

³⁶ Page 3, eCan - Volume 3, Part 6 Officer Report Under Section 42a of The Resource Management Act 1991 on Submissions to Proposed Change No 1 to the Canterbury Regional Policy Statement

the crossing runway is 1,801 meters long. The ultimate capacity is quoted in the Expert Panel Report as 225,000 total annual aircraft movements. As noted in paragraph 86, the population density in Christchurch City is about 21 persons per hectare.

145 The 2004 Canberra Airport Master Plan recommended consideration of the ANER plan as a better indicator of community reaction to exposure and a basis for planning where residents have no prior exposure to aircraft noise (or greenfield site development)³⁷.

146 There may be those that wish to argue that the low level of noise complaints does not justify a conservative approach to compatible land use planning. There are two weaknesses to this approach.

1. The Canterbury Regional Council and the Airport must plan for the longer term, as planning decisions based on short term consideration, particularly encroachment of residential development is basically irreversible.

2. Complaints are a poor measure of aircraft noise impacts. This is illustrated in the Figure from Appendix 8 of the Year 200 Annual report of Airservices Australia, who monitor and report on noise issues at the major Australian Airport.

147 The accepted standards for land use compatibility are based on community surveys. A sample population with known exposure level to aircraft noise is graded in terms of annoyance – high, medium or low annoyance level. Complaints on the other hand, will depend on the person making a conscious effort to lodge a complaint. The number of complaints has often been shown to reflect the current level of awareness of aircraft noise and a community or political issue.

148 The number of complaints can be inflated by an individual or group making multiple complaints, so the number of complainants needs to be examined.

³⁷ See Section 10.4 of the “Year 2020 draft Master Plan for Canberra Airport”, Capital Airports Group, 2000

Airport	Number of Telephoned Noise Complaints	Reduction (from 1998/99 Financial year)	%Reduction (from 1998/99 Financial Year)	Comments
Sydney	30,528	10,000	24.7	16,152 from 427 complainants
Melbourne (including Moorabbin, Essendon)	681	353	34.1	231 from one complainant
Brisbane (including Coolangtta)	7,218	1011	12.3	1,016 from one household
Adelaide (Including Parafield)	224	—	0.0	22 from two households
Perth ⁷ (Including Jandakot)	1,214	28	2.3	120 from one household

Note: A total of 17,541 telephoned noise complaints were made by 432 complainants or an average of 40 calls per complainant. Approximately 44 per cent of total telephoned noise complaints came from the same group of complainants.

Source: Airservices Australian, Annual Report 2000, Appendix 8

149 It is acknowledged that the 50 Ldn is conservative compared to boundaries at other airports, but I consider this appropriate for Christchurch on the basis of:

- a) The New Zealand Standard precluding downgrading of “existing protection”
- b) Other more suitable land available for residential development
- c) The New Zealand Standard permitting a higher level of protection
- d) Low ambient levels and lifestyle issue which have been recognised in recent studies in Australian and Europe, reflecting the potential for a noise-dose response in Christchurch, particularly in areas of greenfield residential development, with lower thresholds than in large European and North American cities.

Conservative forecasts required

150 The noise contours used as the basis of PC1 are from the work of the Expert Panel. They are for a nominal ultimate runway capacity for Christchurch Airport. The use of ultimate runway capacity aircraft movements in the preparation of noise contours is gaining popularity, compared to the previous practice of limiting forecasting horizons to 10 or 20 years.

151 Even though most airport Master Plans in the region are based on a forecast horizon of 20 years, and very often include consideration of long term expansion capability beyond the Master Plan horizon (sometimes out to 50 years), many of these still include noise contours based on the ultimate capacity of the airport (as shown in the table below).

Airport	Most Recent Master Plan	Previous Master Plans	Master Planning Horizon	Noise Contour in terms of aircraft movements or Timeframe
Wellington	Currently being updated	1991	20 years	
Auckland	2005	1990	20 years	Ultimate for future 2 runway system, (nominally 2030 traffic)
Brisbane	2008/9 In progress	2003, 1998, 1991, 1983	20 years	Ultimate capacity for current and future parallel runway systems
Cairns	2003/4	1988, 1981	20 years	Ultimate for future parallel runway system
Canberra	2008/9 In progress	2005, 1998	20 year	Ultimate capacity for 2 runway system
Christchurch	2003	1985	50 years	Ultimate capacity of current runway system with extension
Melbourne	2008/9	2003, 1998	20 years	Ultimate capacity compilation for 2, 3 and 4 runway systems
Perth	2008/9 In progress	2004, 1998, 1989	20 years	Ultimate capacity
Sydney	2008/9	2003, 1990	20 years	20 year (427,400 annual aircraft movements which is probably starting to approach the constrained capacity of the airport)

152 As a result of some ambiguities uncovered in recent litigation, the Australian Government – through the Department of Infrastructure and Airservices Australia, has confirmed the basis of preparing aircraft noise exposure maps on which town planning for appropriate land use planning in the vicinity of airports is based. The process involves the airport preparing a draft aircraft noise exposure chart, (in Australia referred to as an Australian Noise Exposure Forecast (ANEF)) for sighting by State and Local Government authorities. Comments received from these planning bodies must be recorded and the proponent (the airport) must then provide evidence that “*it has paid due regard to all issues raised*”. It is then submitted to Airservices Australia as the endorsing body on behalf of the responsible Minister.

153 The endorsement recognises three types of ANEF (noise exposure) charts:

1. a "standard ANEF"(ie a forecast of noise exposure levels up to a maximum of 20 years)
2. a "long range ANEF" (ie a forecast of noise exposure levels beyond 20 years)and specify the number of years
3. an "ultimate practical capacity ANEF"(ie a forecast of noise exposure levels likely if an airport was operating at its ultimate practical capacity).

The "manner of endorsement" recently approved by the Minister now ensures compliance with the requirements of the Airports Act 1996 that ANEFs for all airports covered under

the Act are endorsed 'in a manner approved by the Minister'. A copy of the 'manner of endorsement' for ANEFs is attached. You will note that, in general, the approved manner reflects the current practices adopted by Airservices with some changes. Two important changes are that the proponent must now also demonstrate that: the forecast numbers of aircraft movements, operating times and the aircraft types carrying out operations are not greater than the physical ultimate capacity of the existing or proposed runway/s using accepted and published methodologies; and · it has paid due regard to all issues raised by State and Local Government authorities in relation to the ANEF³⁸ If the endorser is satisfied that the criteria for endorsement have been met the endorser should stamp the ANEF as being endorsed as the official ANEF for the airport for the purposes of the Master Plan. The endorsement must specify if the ANEF is a "standard ANEF"(ie a forecast of noise exposure levels up to a maximum of 20 years); a "long range ANEF" (ie a forecast of noise exposure levels beyond 20 years) and specify the number of years; or an "ultimate practical capacity ANEF"(ie a forecast of noise exposure levels likely if an airport was operating at its ultimate practical capacity)."

154 Ultimate capacity ANEFs have been prepared for Melbourne, Brisbane, Perth, Canberra, Launceston and Moorabbin (to name a few). Auckland Airport has effectively published a "long range" noise contour (beyond 20 years) in its approval processes for the planned parallel runway. I believe the airports are choosing to prepare Ultimate Capacity aircraft noise exposure contours, in recognition that airports

- are vital community transport infrastructure assets which are not easily relocated
- are investments (particularly runways) for the very long term
- have external impacts generally aligned with the extended centrelines of runways along approach and departure flight paths for considerable distances (many kilometres)
- local and regional town planning schemes have a long lead time for development and implementation through the regulatory and judicial processes, such that a general update even every 5 years becomes impractical.

155 I believe that the Expert Panel and those involved were very prudent in selecting an "ultimate capacity" noise contour as the basis for planning in the vicinity of Christchurch Airport, and that fits with what is now accepted as good practice.

³⁸ Written communication to all those undertaking the preparation of aircraft noise exposure contours at Australian Airports from the Environment and Climate Change Unit of Airservices Australia, 2 May 2008.

156 I have reviewed the basis of the calculation of the airports calculation of the “ultimate capacity” for the purposes of developing the noise contours and believe that it is generally appropriate. As a comparison, the recently published Melbourne Airport Master Plan quoted capacity modelling for that airport indicating the annual capacity of the existing two runway system is about 256,000 movements. For the last financial year statistics³⁹ for Melbourne Airport show it handled 194,000 on the two crossing runways, and Brisbane handled 177,000 annual aircraft movements on a dependant two runway system. In 1989 Sydney Airport, prior to the opening of the 3rd runway, handled 207,000 annual movements with two (crossing) runways. The 175,000 scheduled operations and 225,000 total annual aircraft movements estimated in Section VI of the Expert Panel Report, is a reasonable basis for long term planning, taking into account some local limiting factors at Christchurch Airport. One of the reasons is that noise contours increase in a non-linear relationship (logarithmic) to the number of movements – even a 10% increase in annual movements results in a much smaller increase in noise footprint (all other things being equal).

Technical Accuracy of the Noise Contours

157 Although I have prepared my evidence on the understanding that the location of the PC 1 contours (as prepared by the Expert Panel) is not being challenged, I have been asked to comment on the technical accuracy of the noise contours on which the Proposed Plan is based.

158 Noise exposure forecasts are prepared as “contour maps”, based on the internationally accepted methodology. The INM computer model, which contains the noise profiles of a wide range of the most common aircraft in use worldwide, is used to generate the contours. The model requires input of aircraft type, flight paths, runways and other relevant details.

159 The New Zealand Standard, as the basic guideline for land use planning in the vicinity of airports, defines zones based on Ldn values. These are referred to as the Outer Control Boundary (OCB) and the Airnoise Boundary (ANB).

160 Definition of the OCB and ANB for land use planning in the vicinity of airports requires the definition of noise boundaries based on projection of future noise exposure. While the current aircraft noise exposure can be measured for each individual aircraft movement and summed to provide the cumulative noise exposure metrics on which the OCB and

³⁹ Movements at Australian Airports, Data sourced from the Operational Data Warehouse, 2008 Financial Year Totals ,As at JUN 2008 – accessed from the Airservices Australia website on 1 December 2008 at http://www.airservicesaustralia.com/projectsservices/reports/movements/finlytd07_08.pdf

ANB are based, this is not an efficient or effective means of preparation of noise exposure contour maps.

- 161 The noise contour program originally developed by the FAA and approved in the USA for use land use compatibility studies is the Integrated Noise Model or INM. This program can also generate single event contours. It is referred to in NZS 6805 §1.4.3.1 as the means of contour projection. Available since the 1980's, it has undergone continuous enhancement. The latest version available and used by the work of the Expert Panel is INM version 7.
- 162 The Expert Panel examined existing operations and anticipated near term enhancements in air traffic management (such as Required Navigation Performance (RNP) and Controlled Descent Approaches (CDA)) which are use currently available technology and in practice at some airports around the world, and gradually being to airports in this region. The assumptions of these procedures are considered appropriate for a long term (ultimate capacity) noise contour.
- 163 Figures 9 and 10 of the Expert Panel Report, indicate that flight tracks were appropriately modelled as "backbone tracks" to represent a nominal flight track and sub-tracks were used to represent the range of tracks that occur in practice as a result of variation in day to day operations. The report, does not however give further details of the split between the backbone and subtracks.
- 164 The INM model includes information on noise levels from aircraft currently in operation obtained from detailed test data during noise certification trials. The noise tables in the model are used by the model to vary the noise output calculation based on standard thrust level and flap settings. The Expert Panel chose aircraft from the INM database which are appropriate and would appear to be representative of the fleet likely to operate at Christchurch in the future based on current information and anticipated trends in airline route structures and equipment choices.

Summary

- 165 The contours on which PC1 is based prepared by the Expert Panel, based on an nominal ultimate capacity of the airport are a reasonable and appropriate for long term planning of compatible land use in the vicinity of the airport.
- 166 It is recommended that PC1 retain the Ldn 50 contour as the Outer Control Boundary based on
- the fact that the New Zealand Standard NZS 6805:1992 does not mandate 55 Ldn as the Outer Control Boundary, specifically makes provision for a greater

level of protection, where the local authority deems this appropriate and specifically states that the standard is not to be used to downgrade the level of protection.

- PC1 maintains and is consistent with the planning regime which has effectively protected the rural land around the airport
- there is evidence from around the world that "the effects of noise from aircraft are not confined to areas where the noise exposure exceeds 55 Ldn and may occur at or below 55 Ldn
- there are adequate and suitable alternative areas available for expansion of residential areas, not under the flight paths of an international airport with regular wide-body jet aircraft operations
- Christchurch could be considered a relatively low-density urban setting, where the more relaxed and quieter lifestyle is valued (compared to say large European and North American cities).
- planning for airports and their environs must take a long term perspective. as it is difficult (and expensive), if not impossible, to resume land (through compulsory acquisition) which has been released for residential use, if the noise contours were underestimated
- urban encroachment within the airport environs, usually through poor long-term planning, is identified as one of the key issues for airports today. It creates tensions between resident groups, local authorities and the aviation industry, which result in a "lose-lose" outcome. Populations are adversely affected, while mitigation measures impact on airport operations.