

# ARDMORE

A I R P O R T

**August 4<sup>th</sup>, 2025**

Brabant Barristers  
Level 4,  
Vulcan Building Chambers  
**AUCKLAND**

**Attention: Jeremy Brabant**

## **RE: PROPOSED SUNFIELD DEVELOPMENT – FAST TRACK APPLICATION**

I am writing to you as the CEO of Ardmore Airport in order to provide background information on the Sunfield proposal by the Winton Group which is on the western boundary of Ardmore Airport and at the end of the main airport runway. There are many issues with the Sunfield proposal that have the potential to directly affect the airport business and airport operations. This letter outlines the unique risks and concerns of Ardmore Airport and the wider community.

### **sunfield site**

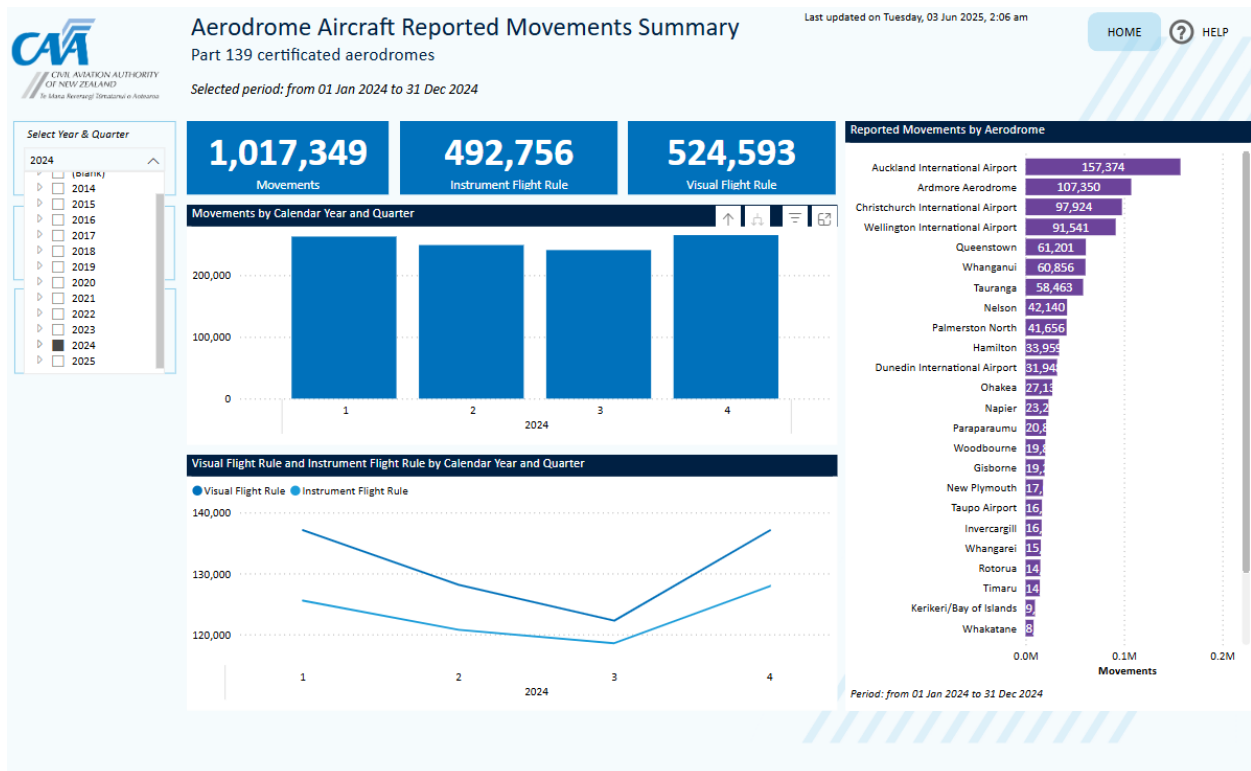


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### Background – Ardmore Airport

Ardmore Airport is the largest general aviation airfield in New Zealand and a significant regional economic hub. The airport has over 108 airport tenants which are predominantly aviation businesses having as much as 95% global trade. In total over 650 people are employed at Ardmore Airport. There are over 300 aircraft permanently based on site with additional 500 visiting aircraft annually. Ardmore Airport currently has over 100,000 flight movements annually which is less than 50% of its consented capacity for 250,000 aircraft movements per year. Ardmore Airport's existing flight movements exceed that of either Wellington Airport or Christchurch Airport and is growing each year. It now ranks as the second busiest airport in New Zealand.



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Sunfield is located at the western end of the main runway of Ardmore Airport. The level of aircraft movements, noise, vibration and frequency is an untested environment for a new residential, aged care and health care development in New Zealand and this has the potential to create new and unforeseen outcomes for the airport, airport businesses, pilots and future residents and occupiers of Sunfield. Specific concerns on Sunfield range from the effects of reverse sensitivity, adequate infrastructure, removal of existing council roads, safety of aircraft pilots, residents and occupants in the Sunfield development.

Our main areas of concern are outlined as follows:

- Reverse Sensitivity
- Restricting and/or halting Ardmore Airport operations, aviation businesses and regional economic activity
- Infrastructure and Transport
- Safety Risks – Public, Aircraft & Pilots
- Effects on Residents, Aged Care and Health Care Facilities

### **Sunfield – Reverse Sensitivity**

Reverse sensitivity is one of the most serious concerns of Ardmore Airport when accessing the proposed Sunfield development. There are examples of the existing rights and operations of an airport, or other facilities, that are reduced, restricted or stopped by special interest groups, new and established communities.

There is also a risk of future residents and businesses finding the airport operations and noise surprising and/or annoying. The risk is that lobbying for the airport to be restricted or closed due to the high noise, repetitive aircraft movements and perceived risk of aircraft accidents and/or personal safety due to the proximity of aircraft to outdoor areas tops of buildings will most certainly occur. Residential development adjacent to airports can, and does, give rise to material constraints on airport operations because of reverse sensitivity effects. Such constraints threaten to undermine the current operations, future growth and development of the airport and airport businesses.

### **Ardmore Airport – Regional & Airport Economic Activity**

The airport has been in existence since the 1940's and has been undergoing a stage of renewal and growth over the last ten years. In a recent twelve month period over 785 different aircraft used Ardmore Airport and this number is expected to double in the next 5 to 10 years with helicopter activity already doubling in the last six years. This includes essential services including rescue helicopter, police, ambulance and coastguard.

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The airport now has over 108 aviation tenants and by the end of 2025 this number will increase. These businesses rely on the airport remaining sustainable, open and unrestricted within its current operating consents. Any restriction to the airport and aviation operations places an enormous risk on these local businesses and their employee's. Due to Ardmore Airports presence in the national aviation infrastructure there is also a risk to the New Zealand aviation sector if restrictions occurred.



### Infrastructure and Transport

The Sunfield proposal proposes to close and realign Hamlin Road which is a primary access road to Ardmore Airport. Closing Hamlin Road for any amount of time is unacceptable. Ardmore Airport requires full and unrestricted access 24 hours per day for emergency and business access. Ardmore Airport has substantial growth plans and transport is a key aspect of this. Ardmore Airport is also concerned about the new Notice of Requirement for Mill Road and how this will integrate with existing access and growth plans. A commitment to a working group to resolve these issues and wider infrastructure is required.

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## **Safety Risks – Public, Aircraft & Pilot Consequences**

The approach and take-off from the main runway has clearly defined minimum approach angles. These angles then dictate the allowable obstruction heights from the ground thus ensuring that aircraft have a safe clearance from ground obstructions such as trees, structures or buildings when on approach for landing or take-off from the airport. We are concerned that the Sunfield application does not appear to take into account the risk of an aircraft having any failure or sudden lack of engine performance. With a minimal buffer from the top of the proposed buildings and the predetermined approach and take-off angles the risk to pilots, public and residents is much higher with the proposed Sunfield development and a lack of safe land out areas.

Aircraft can be affected by air turbulence, varying performance characteristics and either temporary or permanent engine failure. When these circumstances occur the time for pilots to respond is very short and they require options for emergency landings or sufficient height from obstacles to regain control. It is during this time when an aircraft is going through its initial power cycle that is most at risk. It is for this reason that all aviation students are taught simulated engine failures after take-off. These training sessions would take place over the Sunfield development and may prove disconcerting for residents and visitors. This is not only a safety risk but again introduces further risk of reverse sensitivity occurring. Residents and businesses living and working under low altitude aircraft undergoing standard training, approach or take-off procedures will soon give rise to safety concerns and actively lobby for the airport operations to stop or change.

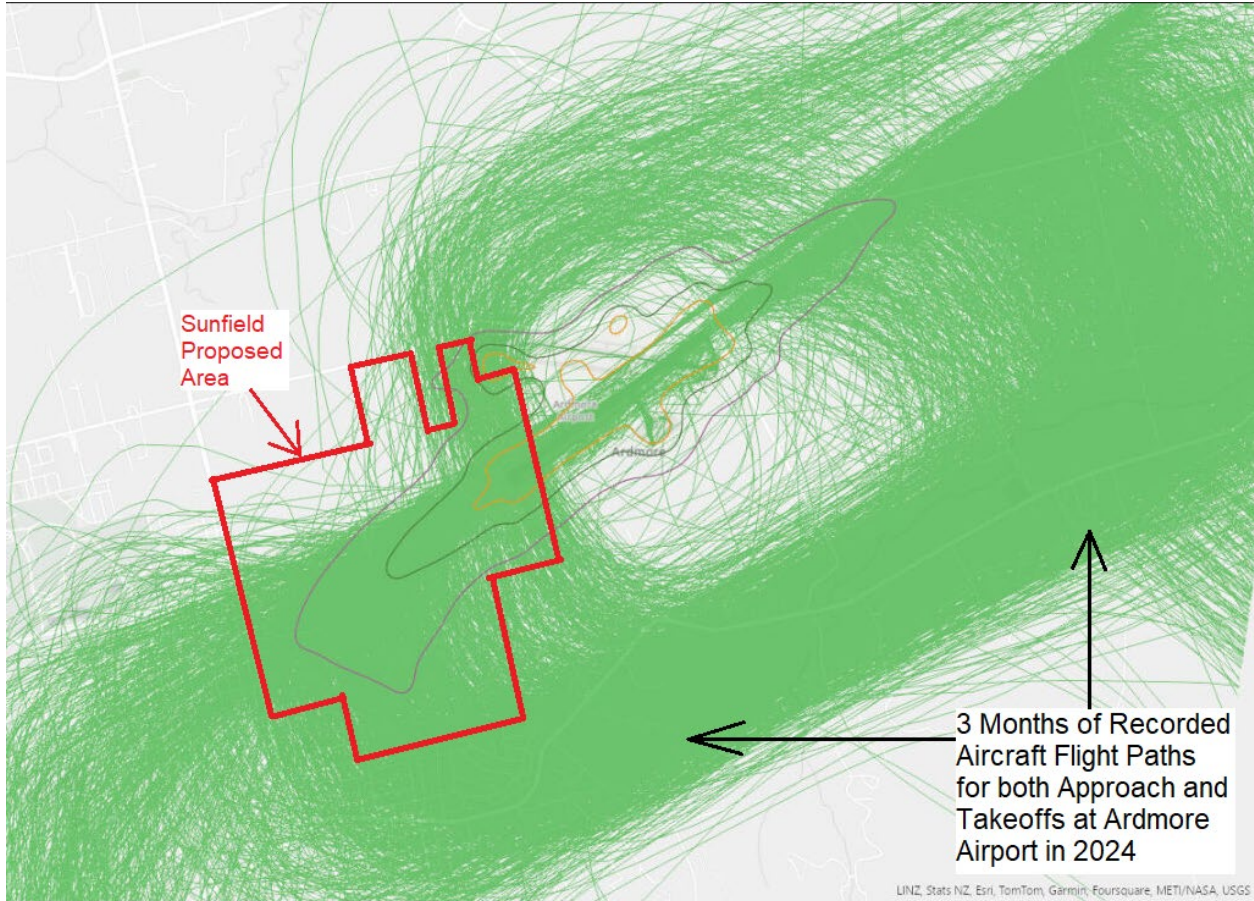
## **Effects on Residents, Health Care and Aged Care**

The Sunfield proposal is located directly under the Ardmore Airport aircraft takeoff and approach paths. It is important to understand that approximately 80% of the Sunfield proposal is under Ardmore Airport flight paths. Below is an example of a three month period in 2024 showing fixed wing aircraft flights paths over Sunfield using the main runway 03/21. This image is an accurate record of the aircraft movements over and around Sunfield and conveys the wide spread nature of aircraft flight paths. This image does not convey the altitude of each aircraft which has a broad and variable pattern from high powered steep climbs to low and close proximity approach and take-offs including simulated engine failures on takeoff. There are a number of reasons this variability occurs including wind direction, wind speed, weather, aircraft performance, proximity of other aircraft, approach direction and others. If this image is extrapolated over a longer time frame the extent of the aircraft flights will broaden further as well as becoming increasingly concentrated over Sunfield as depicted here.

To assess the effects of the airport operations on Sunfield residents, healthcare and aged care requires an understanding of the total number and variety of aircraft and flight paths. This includes the current aircraft movements (100,000 pa), future aircraft movement (up to 250,000 pa), aircraft noise, jet aircraft, warbirds, commercial, recreational and helicopter proximity and vibration.

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The resulting effects of indoor and outdoor aircraft noise, repetition and vibration may be untenable without appropriate mitigation and design. The airport is open 365 days per year and is available for aircraft 24 hours per day. Historical annual flight movements exceeded 180,000 annually.

Areas subject to the effects of aircraft noise are generally not appropriate for residential or noise sensitive development as exposure to high noise levels is inevitable. The effects of aircraft noise, by their nature, extend beyond the boundaries of airports and cannot be internalised. A full understanding of these effects and mitigation is required.

High density housing developments may be more sensitive to their surroundings, urban design and built form. Unusual or stressful extenuating or external effects could result in undesirable outcomes. A residential development in a new and untested form and adjacent to the second busiest airport in New Zealand presents such a concern that will require a considered resolution.

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## Conclusion

The Unitary Plan recognises that urban development should be promoted where it provides for high quality outcomes for communities and does not restrict the operations of necessary infrastructure. In the case of the Sunfield proposal Ardmore Airport remains concerned about how such substantial developments can co-exist in a manner that addresses all the concerns, facilitates ongoing growth and development and can operate compatible day to day businesses. Until all such issues are addressed the proposal places a risk on the airport operations and economic viability of the airport community, Ardmore Airport Ltd and the aviation sector of New Zealand. Reverse sensitivity, restricting and/or halting Ardmore Airport operations, aviation businesses and regional economic activity, safety risks to public, aircraft and pilots must conservatively be taken into account.

## REGARDS



**DAVE MARCELLUS**  
**CHIEF EXECUTIVE OFFICER**

4 August 2025

Environmental Protection Authority  
Attn: Expert Consenting Panel  
Via email: [substantive@fasttrack.govt.nz](mailto:substantive@fasttrack.govt.nz)

Tēnā koutou Philip Maw, Lee Beattie and Vaughan Smith

**Comments on behalf of Ardmore Airport on the Sunfield Masterplanned Community Development [FTAA-2503-1039]**

I provide planning comments below on behalf of Ardmore Airport on the proposed Sunfield Masterplanned Community Development application (**Sunfield application**), which has been accepted for processing under the Fast-Track Approvals Act 2024.

These comments focus on the potential effects of the Sunfield application on the efficient operation of Ardmore Airport. I do not comment on other aspects of the proposal.

Comments have also been provided by Marshall Day Acoustics on the potential noise and reverse sensitivity effects, which has a singular focus on that issue. The assessment below is broader and considers the relevant planning context, acknowledging the different decision-making framework set by the Fast Track Approvals Act 2024. While the comments identify a range of issues, Ardmore Airport is not opposed to development and seeks to work constructively with the Applicant to ensure an appropriate range of mitigation measures.

**Environment Court Code of Conduct**

I confirm that, in my capacity as author of the below comments, I have read and agree to and abide by the Environment Court's Code of Conduct for Expert Witnesses as specified in the Environment Court's Practice Note 2023.

I have worked on **behalf** of Ardmore Airport for several years on various projects, which I reference below.

**Ardmore Airport**

Ardmore Airport site comprises approximately 150 hectares of land with flat terrain located to the east of the proposed Sunfield development in Ardmore. The Ardmore Airport is zoned Special Purpose – Airports and Airfields zone and is subject to the Ardmore Airport Precinct under the Auckland Unitary Plan (AUP(OP)). In addition, there is a designation applied to the site (ID200 – Ardmore Airport), and a Height Restriction Designation which applies to the surrounding area, including the Sunfield Development site. Aircraft Noise Overlays also apply both to the Ardmore Airport site, along with expanding across the surrounding area, including parts of the Sunfield Development site. There are two existing runways at Ardmore Airport, each approximately 1.5kms long established on the site, however the runway running east-west has been decommissioned and has been out of use for approximately 20 years.

Ardmore Airport contributes a longstanding and rich history in New Zealand's aviation, and has played a leading role in training and engineering and general aviation since 1943. Ardmore Airport is considered New Zealand's safest general aviation airport and flight training facility.

### **Ardmore Airport Operations**

Ardmore Airport's existing and future operations are set out in the letter of Ardmore Airports CEO, Dave Marcellus. In summary, Ardmore Airport currently has over 100,000 flight movements annually which is less than 50% of its consented capacity for 250,000 aircraft movements per year. Ardmore Airport's existing flight movements exceed that of either Wellington Airport or Christchurch Airport and is growing each year. Ardmore now ranks as the second busiest airport in New Zealand, and 98% of the flights are training flights and many are with first time students.

### **Planned Development at Ardmore Airport**

Ardmore Airport is currently home to more than 100 businesses and over 600 employees. Ardmore is fast-evolving into one of Auckland's largest industrial developments, building on the rich aviation history – and laying the foundations for businesses of the future.

Ardmore Airports business and industrial development comprises 15ha of consented land in the western portion of the site designed to accommodate a mix of business and industrial activities, identified as "Stage 2" in **Figure 1** below, along with an additional 22ha which is currently being consented for business and industrial development referred to as "Stage 3". Development within Stages 2 and 3 will be a mix of aviation related and non-aviation related activities, and will accommodate approximately 82,000m<sup>2</sup> GFA of industrial and commercial activities and approximately 2,300m<sup>2</sup> of retail activities.

A further Stage 4 is planned to the east of Stage 3, on the remaining parts of the second runway, but is yet to be consented.



**Figure 1 Indicative Staging of Planned Development at Ardmore Airport.**

### Planning Context

The Ardmore Airport site is zoned Special Purpose – Airports and Airfields zone and is subject to the Ardmore Airport Precinct as well as Designation 200 – Ardmore Airport in the AUP(OP). The Aircraft Noise Overlay (outer control boundary (55dBA), inner control boundary (60dBA) and noise boundary (65dBA)) contours splay from the site in a general north-east / south-west alignment. The purpose of the Aircraft Noise Overlay is to manage the subdivision and location of noise sensitive activities in areas of high cumulative noise around airports.

The land that is subject to the Sunfield development, located immediately west of Ardmore Airport is zoned Rural-Mixed Rural and Future Urban zone in the AUP(OP) and all three Aircraft Noise Overlay contours apply to the site.

The purpose of the Ardmore Airport Sub-Precinct Airport is to enable the efficient use and development of the land and its operational facilities. Chapter I401 Ardmore Airport of the AUP(OP) is focused on providing for the efficient operation and development of the Ardmore Airport (Objective I401.2(1)) and allowing for the continued efficient operation of the existing airport including aircraft take-off and landing, associated equipment, maintenance and repair, manufacture and assembly (Policy I401.3(1)) and preventing the establishment of residential activities (Policy I401.3(4)) and reverse sensitivity effects on the airport (I401.3(6)).

The purpose of the Aircraft Noise Overlay (as provided in Chapter D24 of the AUP(OP)) is to manage the subdivision of land and location of activities sensitive to aircraft noise in areas of high cumulative noise

around the region's airports and airfields, so that the continued operation of the airports and airfields is not compromised and reverse sensitivity issues are addressed.

The following objectives and policies of Chapter D24 (Aircraft Noise Overlay) are particularly important in the context of the Sunfield Development:

*Objective D24.2(1) Airports and airfields are **protected from reverse sensitivity effects**.*

*Objective D24.2(2) The adverse effects of aircraft noise on residential and other activities sensitive to aircraft noise are avoided, remedied or mitigated.*

*Policy D24.3(1) **Avoid** the establishment of new activities sensitive to aircraft noise (except tertiary education facilities) within the 65dB Ldn noise contour in the Aircraft Noise Overlay.*

*Policy D24.3(3) **Avoid** establishing residential and other activities sensitive to aircraft noise at:*

- a) **airports/airfields except for Auckland International Airport: within the area between the 55dB Ldn and 65dB Ldn noise contours, unless the effects can be adequately remedied or mitigated through restrictions on the numbers of people to be accommodated through zoning and density mechanisms and the acoustic treatment (including mechanical ventilation) of buildings containing activities sensitive to aircraft noise excluding land designated for defence purposes...***

*Policy D24.3(5) Manage residential intensification and activities sensitive to aircraft noise within areas identified for accommodating urban growth in a way that **avoids reverse sensitivity effects as far as practicable, including reverse sensitivity effects between those land uses and such effects on Auckland International Airport, Ardmore Airport, Whenuapai Airbase and North Shore Airport, and that avoids, remedies or mitigates adverse aircraft noise effects on people and communities.***

Table D24.4.2 Activity table for Ardmore Airport sets out the activity status for development within the different Aircraft Noise Overlay boundaries. New activities sensitive to noise are; Prohibited within the 65dB noise boundary (D24.4.2(A9)), a Discretionary activity between 60dB and 65dB noise boundaries (D24.4.2(A14)) and Restricted Discretionary between the 55dB and 60dB noise boundaries (D24.4.2(A20)).

In light of this, in my opinion, there is scope for new noise sensitive activities in the outer control boundary (between 55dB and 60dB) *if* appropriate measures are in place to manage acoustic effects on future residents and Ardmore Airport can be protected from reverse sensitivity effects.

As per Chapter D24 of the AUP(OP), it is important when considering the Sunfield development application, that new activities sensitive to aircraft noise within the Aircraft Noise Overlay are, in the first instance avoided, however if new activities sensitive to noise are consented within the Aircraft Noise Overlay, these activities must be managed so that the continued operation of Ardmore Airport is not compromised, reverse

sensitivity issues are addressed and adverse effects of aircraft noise on residential and other activities sensitive to aircraft noise are avoided, remedied or mitigated.

### **Ardmore Airport comments on the proposed Sunfield Development**

Noting the enabling purpose of the Fast-track Approvals Act, to facilitate the delivery of infrastructure and development projects with significant regional or national benefits, it is acknowledged that the Sunfield development (which is a listed project under Schedule 2 of the Act) will provide regional benefits and contribute additional housing supply and choice in an area located adjacent to existing and/or planned development, and with significant infrastructure investment including the recently lodged Mill Road Stage 2 NoR. It is important to understand these regional benefits in the context of the regional benefits that Ardmore Airport itself offers, and ensure that these are protected for the long term.

It is also acknowledged that the Sunfield development has been comprehensively master planned and will contribute employment opportunities, which in turn will result in economic benefits, a new Town Centre, aged care facilities, significant residential supply and housing choice as well as a network of parks and open spaces to ensure a well-functioning urban environment.

Notwithstanding this, Ardmore Airport is an established airport and regionally significant facility. Given the greenfield context of the Sunfield development site, it is critical that the effects of any new neighbouring development approved under the Fast-track Approvals Act are managed appropriately.

I set out comments under the following themes, limited to potential effects on Ardmore Airport as a neighbour to the Sunfield development that Ardmore Airport:

- General Land Use configuration proposed through the Sunfield development;
- Transport and access; and
- Reverse Sensitivity effects on Ardmore Airport.

This feedback raises a range of issues that the Applicant will need to consider and comprehensively address.

In addition to this, it is important that the Sunfield application appropriately considers and accounts for Stages 2-4 of its development as outlined above. I comment on this with respect to transport below.

We would welcome the opportunity to discuss this constructively with the Applicant and consider alternative methods and approaches.

### **Sunfield Development Proposed Land Use Configuration**

Ardmore Airport supports in part the land use configuration proposed in the Sunfield Masterplanned Community Development application.

Ardmore Airport **generally supports** the extent and location of the proposed Employment Precinct adjoining the Ardmore Airport southwestern boundary. The Employment Precinct is located within the Aircraft Noise Overlay (65dBA inner noise boundary) and will be subject to the most significant noise effects resulting from Ardmore Airports ongoing and established operations. It is prohibited (D24.4.2(A9)) for new activities sensitive to aircraft noise to be located within this Aircraft Noise contour, and therefore it is considered appropriate to locate Employment activities in this part of the site. The Employment Precinct will also

integrate with Ardmore Airports planned Industrial Development more seamlessly than other potential land uses at the western boundary of the Sunfield development.

Ardmore Airport **does not generally support** the proposed location of the Health Care land use, located within Aircraft Noise Overlay (60dB inner control boundary), noting that hospital and healthcare facilities with an overnight stay are defined as activities sensitive to noise. The preference of Ardmore Airport is to relocate the Health care land use to the north of the proposed development, and to bring some of the proposed employment land use that is located entirely outside the Aircraft Noise overlay down into the inner two contours of the Aircraft Noise overlay. Ardmore Airport does acknowledge proposed Condition 142 requiring all new activities sensitive to noise within the Aircraft Noise Overlay boundary to be designed, constructed and maintained with sound attenuation and related ventilation to achieve an appropriate level of acoustic amenity, however this will not manage all adverse noise effects, including effects in outdoor living spaces and with doors and windows open.

Ardmore Airport **does not generally support** locating any activities sensitive to aircraft noise within the first two Aircraft Noise contour boundaries, without appropriate mitigation measures in place.

Ardmore Airport notes that the Sunfield development proposes both residential and aged care land uses within the 55dB (outer noise boundary) of the Aircraft Noise Overlay, both of which are activities sensitive to noise. While this is not the most desirable proposed land use in the outer noise boundary, given this is a greenfield development, Ardmore Airport do acknowledge that activities sensitive to noise in this outer contour are a Restricted Discretionary activity, and Sunfield development has proposed a suite of conditions and measures to manage the adverse effects of Ardmore Airport's ongoing and established operations.

Given the Sunfield development is a greenfield development and Ardmore Airport is a long established land use with known effects on noise sensitive receivers, it is Ardmore Airport's view that a more considered land use configuration could be achieved, with a greater portion of the proposed Employment land that is located outside the Aircraft Noise Overlay, relocated into the centre of the site where the 65dB noise boundary and 60dB inner control boundary of the Aircraft Noise Overlay are applied to the site.

### **Planted Buffer along Ardmore Airport Boundary**

Ardmore Airport **generally supports** the proposed eastern greenway and northern greenway and associated buffer planting identified in the Masterplan along the Ardmore Airport property boundary. It is important that the height of any vegetation planting at this boundary is appropriately maintained and does not interfere with the ongoing and established operations of the Ardmore Airport. In addition to the ongoing maintenance of this planted buffer along Ardmore Airports boundary, it is important that the selected plant species do not attract additional low-flying birds which could result in risk of bird strike for planes taking off and/or landing at Ardmore Airport. The proposed Town Centre site and adjoining parks / open spaces are within the boundary of the area identified by the NZ CAA and the AUP(OP) that has the potential to present a risk to airport operations through increased wildlife activity, particularly birds.

Ardmore Airport recommend amendments to proposed condition 31 Landscape Design Drawings, Specifications and Maintenance Requirements, requiring consultation with Ardmore Airport to determine the appropriate plant species along the Ardmore Airport boundary and in parks and open spaces, to ensure

that they will not require an unreasonable level of maintenance and that they will not attract birds that could contribute to increased bird strike risk.

### **Noise and Reverse Sensitivity effects on Ardmore Airport**

There are significant noise and reverse sensitivity effects associated with the proposed Sunfield development adjacent to and directly under flight paths and low-flying aircrafts associated with the Ardmore Airport.

The Sunfield development will be subject to frequent overflights of low flying aircrafts which, may result in adverse health effects for future residents and an increased risk of future restriction being imposed on Ardmore Airport. As noted in the letter of Ardmore Airport, the current flight numbers are permitted to more than double in the future. Proposed condition 142 goes some way to mitigating the potential adverse effects, however it may not resolve all the adverse noise effects, including effects in outdoor living spaces and with doors and windows open.

Ardmore Airport **supports** the inclusion of proposed condition 141, noting that Activities Sensitive to Aircraft Noise within the 65dB Aircraft Noise Contour Boundary are prohibited.

In addition, Ardmore Airport **supports** the no-complaints covenant proposed to be placed on all titles within the Sunfield development, enabling Ardmore Airport to conduct all approved activities in accordance with Designation 200 in the AUP(OP). This should extend to including appropriate notices to occupants and residents of care facilities located on one certificate of title. Ardmore Airport requests amendments to the relevant condition to require the approval of Ardmore Airport for the wording of the covenant. This would ensure that the risks and issues for any future residents are clearly and plainly expressed.

As noted above, we would welcome the opportunity to discuss this constructively with the Applicant and consider alternative methods and approaches.

### **Transport and Access**

Chapter E27 Transport of the AUP(OP) contains the following objectives and policy which are of particular relevance to the proposed Sunfield development and Ardmore Airports comments on the importance of development providing a coordinated, integrated and comprehensive transport network:

*Objective E27.2(1) Land use and all modes of transport are integrated in a manner that enables:*

*(a) the benefits of an integrated transport network to be realised; and*

*(b) the adverse effects of traffic generation on the transport network to be managed.*

*Objective E27.2(2) An integrated transport network including public transport, walking, cycling, private vehicles and freight, is provided for.*

*Policy E27.3(1) Require subdivision, use and development which:*

*(a) generate trips resulting in potentially more than minor adverse effects on the safe, efficient and effective operation of the transport network;*

...

*to manage adverse effects on and integrate with the transport network by measures such as travel planning, providing alternatives to private vehicle trips, staging development or undertaking improvements to the local transport network.*

The following comments have been informed by the technical advice of transport engineer, Mike Nixon (Commute).

#### **Coordination of Ardmore Airport Stages 2 and 3 and Mill Road Stage 2**

The traffic modelling set out in the Sunfield Transportation Assessment prepared by Commute, **does not** include the traffic generated by Stages 2 and 3 of the Ardmore Airport industrial development. Stage 2 is consented, however not yet operating, and Stage 3 has recently been lodged with Auckland Council and is currently being processed. Stage 4 should also be considered, to the extent that aviation related industrial activities are permitted in the Ardmore Precinct (I401.4.1).

To ensure the benefits of an integrated transport network are realised, and adverse effects of traffic generation on the transport network are managed (E27.2(1)), the Sunfield development traffic modelling must include the traffic generated by the consented and proposed industrial development at Ardmore Airport, to provide an accurate assessment of traffic volumes in the area.

An integrated and comprehensive transport network needs to be established for this area, which also includes the traffic effects of the Mill Road Stage 2 NoR recently lodged by NZTA. Ardmore Airport consider there is a need to develop and agree a transport network for the wider area that integrates planned development at Ardmore Airport, Sunfield as well as the Mill Road Stage 2 project. The Sunfield development traffic modelling (or any modelling being undertaken by a third party, for example NZTA for Mill Road Stage 2 NoR) must consider this integrated and comprehensive road network when assessing effects and determining mitigation measures.

In particular, it is important that the traffic modelling of the new Mill Road / Hamlin Road / Walters Road intersection in the Sunfield Transportation Assessment includes traffic generation as a result of the consented and planned development at Ardmore Airport.

Ardmore Airport Stage 3 development proposes to upgrade the intersection at Mill Road / Hamlin Road to a new roundabout to improve safety and efficiency of right turn movements out of Hamlin Road, as set out in **Figure 2** below.



**Figure 2 New roundabout at Hamlin Road and Mill Road, proposed as part of Ardmore Airports Stage 3 development**

The Sunfield development application proposes a different upgrade to Mill Road / Hamlin Road to that proposed by Ardmore Airport as part of the Stage 3 development, essentially determined by the proposed realignment of Hamlin Road at the western end to align with Walters Road. It is important that the Sunfield development is coordinated and integrates with planned development on adjacent properties, and a cohesive transport network for this area is developed.

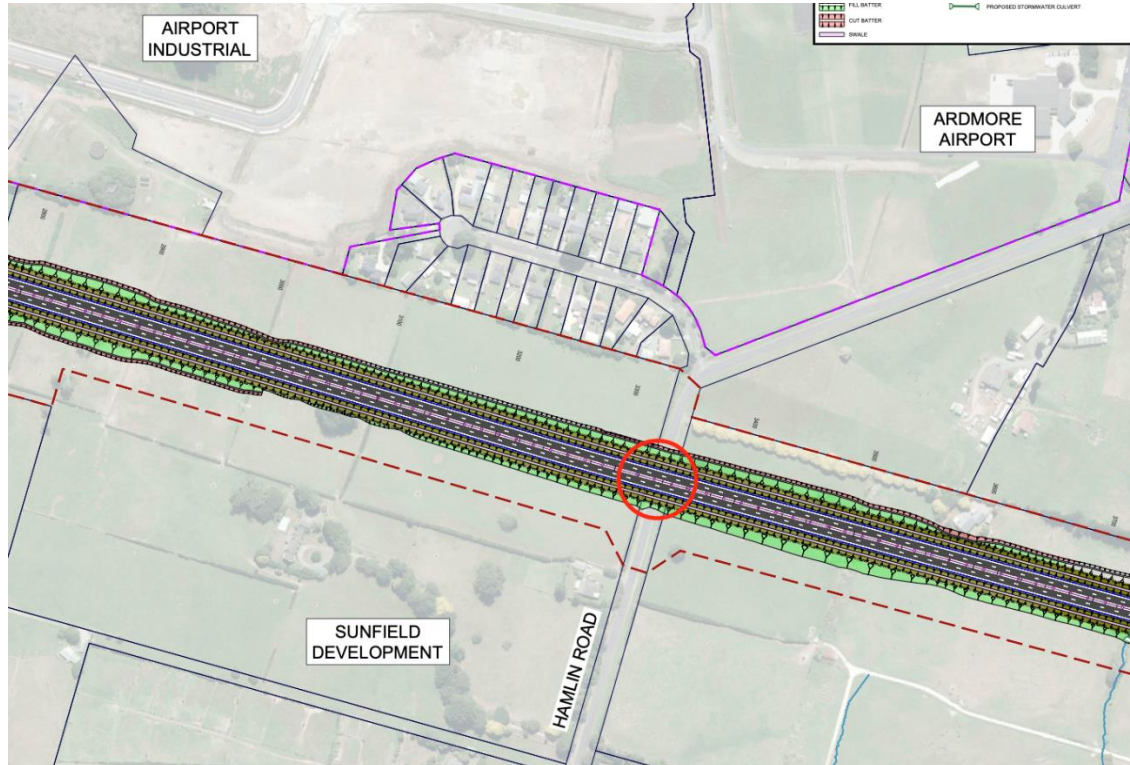
Ardmore Airport also proposes upgrades to Hamlin Road / Village Way / Corsair Lane intersection to a new crossroads roundabout enabling direct connection into the Ardmore Airport site. It is important that the eastern Airfield Link proposed in the Sunfield development (and the Mill Road Stage 2 NoR alignment) takes into consideration the close proximity with the proposed upgraded intersection, and that these intersections located within close proximity of one another can operate safely and efficiently.

#### *Mill Road Stage 2*

The Mill Road Stage 2 NoR has been lodged with Auckland Council. It is important that the Sunfield development provides for integration with the proposed alignment of Mill Road Stage 2.

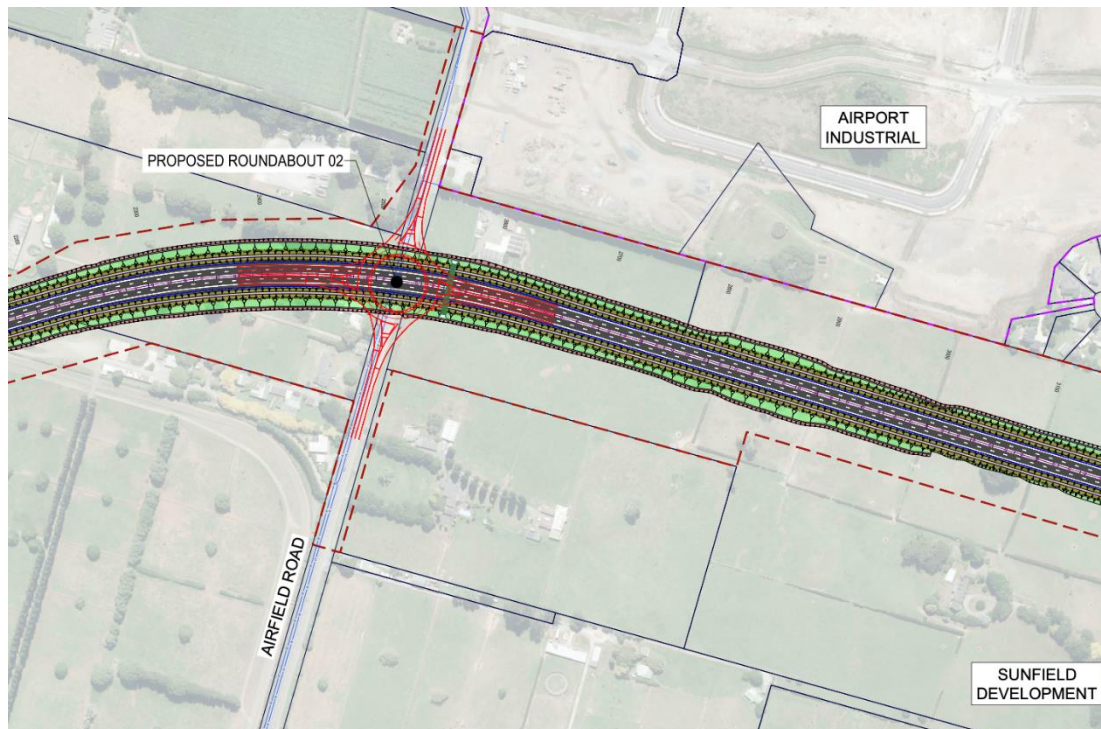
Ardmore Airport seeks a new roundabout at the intersection of the new Mill Road Stage 2 corridor and the existing alignment of Hamlin Road is included in the Sunfield development. Ardmore Airport does not support a road network where Hamlin Road is terminated either side of the Mill Road Stage 2 alignment.

Ardmore Airport requests that the Sunfield development incorporates a new roundabout at the intersection of the new Mill Road Stage 2 corridor and the existing alignment of Hamlin Road into their proposed transport network. The general location of this new roundabout is shown in **Figure 3** below (circled in red).



**Figure 3 Location of new roundabout at Mill Road Stage 2 / Hamlin Road intersection sought by Ardmore Airport**

Ardmore Airport supports the new Mill Road Stage 2 / Airfield Road two-lane roundabout proposed in the Mill Road Stage 2 NoR. Ardmore Airport requests that the Sunfield development incorporates this intersection into their proposed transport network. The Mill Road Stage 2 / Airfield Road two-lane roundabout (Proposed Roundabout 02) is shown in **Figure 4** below.



**Figure 4 Proposed 2-lane roundabout at Mill Road Stage 2 / Airfield Road intersection under NoR lodged by NZTA**

#### Access to Ardmore Airport

It is essential that access to and from Ardmore Airport for its staff and users / visitors is maintained and provided for along Hamlin Road and Airfield Road **at all times** to ensure business continuity and for emergency services using the airport.

#### *Hamlin Road*

The proposed realignment of Hamlin Road to provide an East-West link through the Sunfield development is generally supported. However, it is important that the staging of the realignment of Hamlin Road is clarified and any temporary effects on the transport network are understood and catered for. Currently the upgrade to Walter Road / Cosgrave Road / Hamlin Road intersection is required after the first 50 dwellings within the development site (proposed condition 176), however the timing of the Hamlin Road realignment is not clearly set out.

The staging plan prepared by Maven as part of the Sunfield development application notes that the realigned Hamlin Road is required for Stage 8 of the Sunfield development, however it is Ardmore Airport's view that greater clarity needs to be provided around the required timing of the realigned Hamlin Road being constructed and operational.

Ardmore Airport request a condition requiring Hamlin Road to remain open at all times for traffic movements to and from the airport. Specifically, Ardmore Airport request that the new realigned section of Hamlin Road is constructed prior to closing the existing (and proposed to be redundant) section of Hamlin

Road, ensuring that the existing section of Hamlin Road remains open until traffic can be diverted to the realigned route.

#### *Airfield Road*

The Sunfield development proposes upgrades to the Mill Road / Airfield Road intersection. It is important that the design of this intersection takes into account Ardmore Airport traffic generation, as well as access to Ardmore Airport via Airfield Road being maintained during all stages of construction of the intersection upgrade. It is recommended that this is managed via a Construction Traffic Management Plan.

#### Conditions of Consent

Ardmore Airport seeks the following conditions be amended, to ensure the matters raised above are appropriately managed.

#### Condition 31

Ardmore Airport **supports in part** the proposed condition of consent 31 for landscape drawings, specifications and maintenance requirements, including the requirement for a landscape maintenance plan. Given the potential risks that vegetation and plant species could have on Ardmore Airport and its ongoing operations, especially along the planted buffer at the boundary of the Sunfield development and Ardmore Airport, it is important that Ardmore Airport are consulted with to determine the appropriate plant species. Ardmore Airport seek condition 31 be amended to require consultation with the Ardmore Airport be demonstrated, to determine the appropriate plant species along the Ardmore Airport boundary, to ensure vegetation will not require an unreasonable level of maintenance and will not attract birds that could contribute to increased bird strike risk.

#### Condition 20 and 21

Ardmore Airport generally **supports** the proposed conditions of consent 20 and 21. However, Ardmore Airport request that when any existing roads are realigned and/or reconstructed, that efficient access to Ardmore Airport can be maintained at all times.

#### Condition 96

Ardmore Airport **supports** the inclusion of proposed condition of consent 96, limiting heights of all buildings, structures, masts, poles, trees or other objects from penetrating any of the approach surfaces, transitional surfaces, horizontal surface or conical surface as defined in Designation 200 Ardmore Airport Conditions and Restrictions Section 1 Height Restriction.

#### Condition 97

Ardmore Airport **supports** the inclusion of proposed condition of consent 97, requiring new proposals for buildings or solid structures exceeding 4m in height above ground level to obtain the approval of and shall be referred for consent to, the Airport Authority and clarification that this specific height restriction overrides the AUP Height Restriction set out in proposed condition 96, and the AUP(OP) zone height standards.

#### Condition 98

Ardmore Airport **supports in part** the proposed condition of consent 98. Given the significant risk of wildlife, to Ardmore Airport and its ongoing operations, it is important that the Wildlife Management Plan (WdMP) demonstrates consultation with the Ardmore Airport, and provide details outlining how the WdMP responds to concerns raised by Ardmore Airport.

#### Condition 110-112

Ardmore Airport **support in part** the proposed conditions of consent 110-112 however seek confirmation from the Applicant and/or Auckland Transport that appropriate parking enforcement will be undertaken to avoid potential effects of overspill parking demands adversely affecting access to and from Ardmore Airport, or requiring Ardmore Airport to manage the off-site parking demands of the Sunfield development on their property.

#### Condition 123

Ardmore Airport request that when any intersection upgrades are undertaken, they are required to take into account traffic generated by Stages 2-4 of the Ardmore Airport development. Ardmore Airport also seeks to understand whether the proposed upgrades by the Sunfield development, and associated timing of the upgrades, are likely to change as a result of the recently lodged Mill Road Stage 2 NoR.

#### Condition 126

Ardmore Airport **supports** proposed condition 126. Notwithstanding earlier comments regarding Hamlin Road, Ardmore Airport supports the proposed road reserve widths of Hamlin Road through the Sunfield site. It is understood that in accordance with the Maven Engineering plans (Drawing C310), Hamlin Road is a Type 3 and Type 5 road with 25-30m road reserve widths.

Yours sincerely | Nāku noa, nā

**Barker & Associates Limited**



**Rachel Morgan**

Director

021 638 797 | [rachelm@barker.co.nz](mailto:rachelm@barker.co.nz)



Project:                   **SUNFIELD Masterplanned Community**

Prepared for:           **Ardmore Airport Ltd**  
                                 **PO Box 72253**  
                                 **Papakura**  
                                 **Auckland 2244**

Attention:               **Mr Dave Marcellus**

Report No.:             **Rp 001 20241219**

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**Document control**

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## 1.0 INTRODUCTION

I have been asked by Ardmore Airport Ltd (AAL) to provide comments on the proposed Sunfield development inside the Airport's noise control boundaries. I have read the application documentation with respect to the masterplan and the location of noise sensitive activities within the aircraft noise boundaries, the assessment of noise effects by Styles Group and the peer review of that report by Hegley Acoustics. In my opinion, the Styles Group assessment of noise effects is inadequate, is missing key information and does not sufficiently describe the noise environment or assess the noise effects. In my view, the assessment oversimplifies the application of NZS 6805 and the AUP provisions without any considered assessment of what residents will actually experience and whether that is a suitable environment for residential activity.

I have been employed by Marshall Day Acoustics since 2002 as an acoustician. I hold a Bachelor of Mechanical Engineering from the University of Auckland. Since 2004, I have focused on environmental noise control from airports and general environmental noise assessments. Having worked in this field for over 20 years, I have undertaken many assessments of noise effects related to airport noise. I have also been involved in the development of land use planning measures surrounding many New Zealand airports and am familiar with the range of approaches taken around the country.

I was engaged by AAL during the process of implementing the aircraft noise boundaries in the Papakura District Plan in 2005 which are the same boundaries that are operative in the Auckland Unitary Plan (AUP). In 2021, I undertook in-field noise monitoring for several months at five locations in the community around Ardmore Airport including two locations within the Sunfield site. I present the data from that monitoring in this report. This year I prepared noise contours for actual aircraft operations during the 2024 Financial Year (FY24) at Ardmore<sup>1</sup>. As part of this work, I downloaded flight track data from FlightRadar24 which I present in this report. This data illustrates the extent the Sunfield site is impacted by aircraft flyovers currently. The current aircraft activity at Ardmore is permitted to more than double in the future.

I am familiar with the Environment Court's Code of Conduct for Expert Witnesses, and I have complied with those principles in preparing this report.

In summary, my position on the Sunfield proposal is that from a noise effects and reverse sensitivity management perspective, the development of large scale and intensive residential and aged care accommodation on a greenfield site within the Ardmore Airport noise boundaries is not supportable. The reasons for my view, which I expand on in this report, are as follows:

- Recent research and guidelines indicate that the Sunfield development will likely result in adverse health effects for residents and an increased risk of future restriction being imposed on Ardmore Airport.
- The Sunfield site is subject to frequent overflights of low flying aircraft which on busy days will disrupt communication over a hundred times a day. This is permitted to more than double in the future.
- Locating dwellings directly under flight paths of low-flying aircraft will likely induce safety fears and exacerbate health effects for residents.
- The provision of acoustic insulation does not resolve all the adverse noise effects, including effects in outdoor living spaces and with doors and windows open. Indoor environments are only insulated when windows and doors are closed which then requires mechanical ventilation and thermal control which results in an inferior outcome for residents. The disbenefits include operating costs, disconnection from the outdoors, undesirability of living/sleeping in air-conditioned spaces.

- Introducing ASAN<sup>2</sup> as proposed on the Sunfield site is contrary to recent research, health guidelines and international trends in managing the effects of aircraft noise on communities.

## 2.0 SHORTCOMINGS OF THE ASSESSMENT OF AIRCRAFT NOISE EFFECTS

The main shortcoming of the Styles Group assessment of noise effects report is that it does not adequately or accurately describe or quantify the aircraft noise environment at the Sunfield site. Nor does it sufficiently describe or quantify the noise effects. These are key aspects of an assessment of noise effects, however the Sunfield report addresses these matters superficially. The report also contains some errors of fact which I identify below.

The Styles Group report relies entirely on the AUP aircraft noise boundaries to describe the aircraft noise environment at the Sunfield site. The report attempts to describe what residents will experience in section 8.4 with the following paragraph which is the extent of the report's description and quantification of the noise environment and noise effects.

*"The residual effects will generally be experienced as hearing the regular noise of aircraft overhead – and especially during the day. Based on our experiences of the area, we expect that the noise level of aircraft overhead will range from being inaudible at times or distant but noticeable, through to close and loud enough to affect outdoor conversation, especially if the distance between people talking is more than a few metres. This may be similar to living a short distance from a busy road, but less than what would be experienced living next to a busy road."*

In my view, this is inadequate. As I will explain in this report, the  $L_{dn}$  noise boundaries provide one assessment method of the aircraft noise effects at the site and there are others – none of which appear to have been used by the Styles Group.

With respect to quantifying the noise effects such as annoyance, which is a standard method for transportation noise, the Styles Group report suggests the community annoyance relationships such as those recommended by the World Health Organisation (WHO) are not applicable to the Sunfield situation because all houses will be acoustically insulated and Ardmore doesn't have night-time operations. I do not agree, and I will explain in this report that local research demonstrates the annoyance curves are applicable and that research shows general aviation aircraft noise is considered more annoying than noise from commercial passenger airports (on which the WHO data is based).

The Styles Group report disregards any sleep disturbance effects and incorrectly states that the airport designation conditions include a night-time curfew on flights to avoid night-time noise effects. In fact, there are some night-time restrictions but not a total curfew on flights. Some specific operations are restricted at night, for example circuit training is not permitted after 10pm (10:30pm during daylight saving) Monday to Saturday. Since a large component of operations at Ardmore is flight training, which requires a certain amount of night flying, this activity may impact residents who sleep early particularly children and elderly.

In terms of mitigating the noise effects, the Styles Group report relies on acoustic insulation stating it will mitigate the majority of noise effects while downplaying the outdoor noise effects, despite the report not adequately quantifying the noise levels or noise effects. In Section 5.0 I explain why acoustic insulation does not resolve all noise effects (this view was endorsed by the High Court in the case of AIAL vs Auckland Council [6]).

I note that the Styles Group report incorrectly states that NZS 6805:1992 specifies an indoor design level of 45 dB  $L_{dn}$  and therefore Chapter D24 of the AUP which specifies 40 dB  $L_{dn}$  is an improvement. NZS 6805 does

<sup>1</sup> In accordance with AUP, operations during the busiest three months were modelled

<sup>2</sup> ASAN Activities sensitive to aircraft noise as defined in the Auckland Unitary Plan

not specify an indoor design level at all. Typical practice throughout New Zealand is an indoor design level of 40 dB L<sub>dn</sub>.

With respect to land use planning for ASAN inside the aircraft noise boundaries, the Styles Group report inaccurately simplifies the recommendations of NZS 6805:1992 and the provisions of the AUP. I will explain in this report that our knowledge of aircraft noise effects on people’s health is vastly different now compared with when NZS 6805:1992 was developed. Internationally, authorities are acting to reduce the number of people exposed to aircraft noise with 55 dB L<sub>dn</sub> being a typical threshold (10 dB higher than the WHO recommendation). The Styles Group report dismisses the latest health recommendations from WHO as being “optimistically low” and “impracticable” but fails to identify the WHO target is 45 dB L<sub>dn</sub> whereas the Sunfield development is proposed at noise levels 10 – 15 dB higher (55 – 60 dB L<sub>dn</sub>).

The recent health evidence shows that authorities should take a precautionary approach to land use planning around airports. In my view, this is particularly relevant to greenfield development at noise exposure levels where historically a compromise on ‘amenity’ may have been made based on outdated research (specifically inside the 55 dB L<sub>dn</sub> where NZS 6805 recommends new ASAN are prohibited unless a district plan permits such use subject to appropriate sound insulation). In this report I quantify the health effects on Sunfield residents exposed to 55 – 60 dB L<sub>dn</sub> aircraft noise including with the provision of acoustic insulation. The impact of noise at this level is no longer considered just an amenity effect.

With respect to the acoustic insulation standards in the AUP, the Styles Group report does not clearly identify that under D24.6.2 there are two performance standards applied to new ASAN and alterations to existing ASAN. One standard is the indoor design level of 40 dB L<sub>dn</sub> (D24.6.2(1)). The additional standards D24.6.2(3) and D24.6.2(4) require that ASAN are constructed to achieve a noise reduction of at least 25 dBA for habitable rooms and sleeping areas or rooms for convalescing and learning. The AUP appears to be remiss as this additional standard does not apply to new ASAN between 60 and 65 dB L<sub>dn</sub>, only alterations, however it does apply to new and altered ASAN between 55 and 60 dB L<sub>dn</sub>. The Styles Group report and the proposed conditions (Condition 142 advice note) reference D24.6.2(1) and D24.6.2(5) as being the applicable standards. The acoustic insulation standards should also include D24.6.2(4), and D24.6.2(3) should be applied for new ASAN between 60 and 65 dB L<sub>dn</sub> (i.e. healthcare facilities). Note that D24.6.2(5) relates to Care Centres which is defined as daytime care centres in Chapter J of the AUP, which is not the same as healthcare facilities with overnight stay.

With respect to assessing the Sunfield development in relation to the AUP provisions, the Styles Group report avoids considering the proposal against the following policies and assessment criteria stating these are planning matters:

D24.3 Policies

- 1) ...
- 2) ...
- 3) *Avoid establishing residential and other activities sensitive to aircraft noise at:*
  - a. *Airports/airfields except for Auckland International Airport: within the area between 55 dB L<sub>dn</sub> and 65 dB L<sub>dn</sub> noise contours, unless the effects can be adequately remedied or mitigated through restrictions on the numbers of people to be accommodated through zoning and density mechanisms **and** the acoustic treatment (including mechanical ventilation) of buildings containing activities sensitive to aircraft noise excluding land designated for defence purposes;*
  - b. ...
  - c. ...
- 4) ...

- 5) *Manage residential intensification and activities sensitive to aircraft noise within areas identified for accommodating urban growth in a way that avoids reverse sensitivity effects as far as practicable, including reverse sensitivity effects between those land uses and such effects on Auckland International Airport, Ardmore Airport, Whenuapai Airbase and North Shore Airport, and that avoids, remedies or mitigates adverse aircraft noise effects on people and communities.*

D24.8.3.1 Assessment Criteria

- 1) ...
- 2) ...
- 3) ...
- 4) ...
- 5) *Having regard to all the circumstances, including location in relation to the airport/airfield/airbase, likely exposure of the site to aircraft noise, noise attenuation and ventilation measures proposed, and the number of people to be accommodated, the nature, size and scale of the proposed activity should not be likely to lead to potential conflict with and adverse effects upon the operation of the airport/airfield/airbase.*

Rather than address the matter of density, number of people, nature and scale of the proposal, the Styles Group report relies on acoustic insulation and no complaints covenants to mitigate noise and reverse sensitivity effects. This is simply an application of the acoustic performance standard D24.6.2 rather than an assessment against the policies, criteria and the effects. I explain in this report why acoustic insulation is not a complete solution and how the scale of noise effects is related to the size of affected population.

In relation to density, the Styles Group report mentions the presence of a residential area on the west side of Cosgrave Road with a similar density to the Sunfield proposal, implying this warrants further residential development deeper inside the noise boundaries. It is important to note that dwellings west of Cosgrave Road are on the outskirts of the noise boundaries (future 55 to 56 dB L<sub>dn</sub> contour), and that the current noise level in this area is approximately 4 dB below the future permitted level. Also, these dwellings are not affected in quite the same way as the Sunfield site by converging flight tracks and low flying aircraft as I will explain in this report.

The Styles Group report also attempts to rationalise the need to trade-off acoustic amenity for other benefits such as access to transport in urban areas and that this might somehow warrant the proposal. However, there is no such trade-off in the Sunfield situation. Ardmore Airport, as the noisemaker, will not provide tradeable benefits to Sunfield residents.

In my view, the assessment of noise effects report has not provided adequate consideration of the adverse noise effects on people and the reverse sensitivity effects on the airport in relation to the above policies and assessment criteria.

### 3.0 NOISE FROM AIRCRAFT OPERATIONS AT ARDMORE

Appendix A provides a description of aircraft noise metrics and NZS 6805:1992 *Airport Noise Management and Land Use Planning*. This standard recommends that  $L_{dn}$  noise contours are used to manage aircraft noise and land use planning around airports. However, not all airports are the same and the  $L_{dn}$  noise exposure does not provide the full picture of an airport noise environment. Likewise, the land use planning recommendations in the standard are not one size fits all. In this section I describe the aircraft noise environment using several metrics to provide an understanding of what Sunfield residents would experience.

Noise from aircraft operations at Ardmore is permitted to increase over time to the extent of the noise boundaries in the Auckland Unitary Plan as shown in Figure 1. Over half of the proposed Sunfield residential neighbourhoods and aged care facilities are located between the future 55 and 60 dB  $L_{dn}$  boundaries and many are directly under the main flight paths. The current and future permitted number of aircraft movements is described below.

#### Current Operations

107,000 annual aircraft movements

Average day = 120 flights over Sunfield = one overflight every 7.5 minutes for 15 hours every day

Busy day = 210 flights over Sunfield = one overflight every 4 minutes for 15 hours

#### Future Operations

275,000 annual aircraft movements

Average day = 330 flights over Sunfield = one overflight every 3 minutes for 15 hours every day

Busy day = 400 - 600 flights over Sunfield = one overflight every 2 minutes for 15 hours

In 2021 MDA carried noise monitoring at two locations in the Sunfield site as shown in Figure 2. We have analysed the measured levels from position 1 for a busy day when the wind was from the southwest (i.e. departures over Sunfield) and a busy day when wind was from the northeast (i.e. arrivals over Sunfield). On each day there were at least 240 measured flights over Sunfield. The measured single event noise levels are summarised below and overpage.

#### Flyover Noise Levels

Average duration of audible noise = 50 seconds per flyover

Maximum level during departure flyovers range from 55 to 104 dB  $L_{Amax}$

Average level = 68 dB  $L_{Amax}$

Figure 1: Future permitted aircraft noise boundaries (AUP)

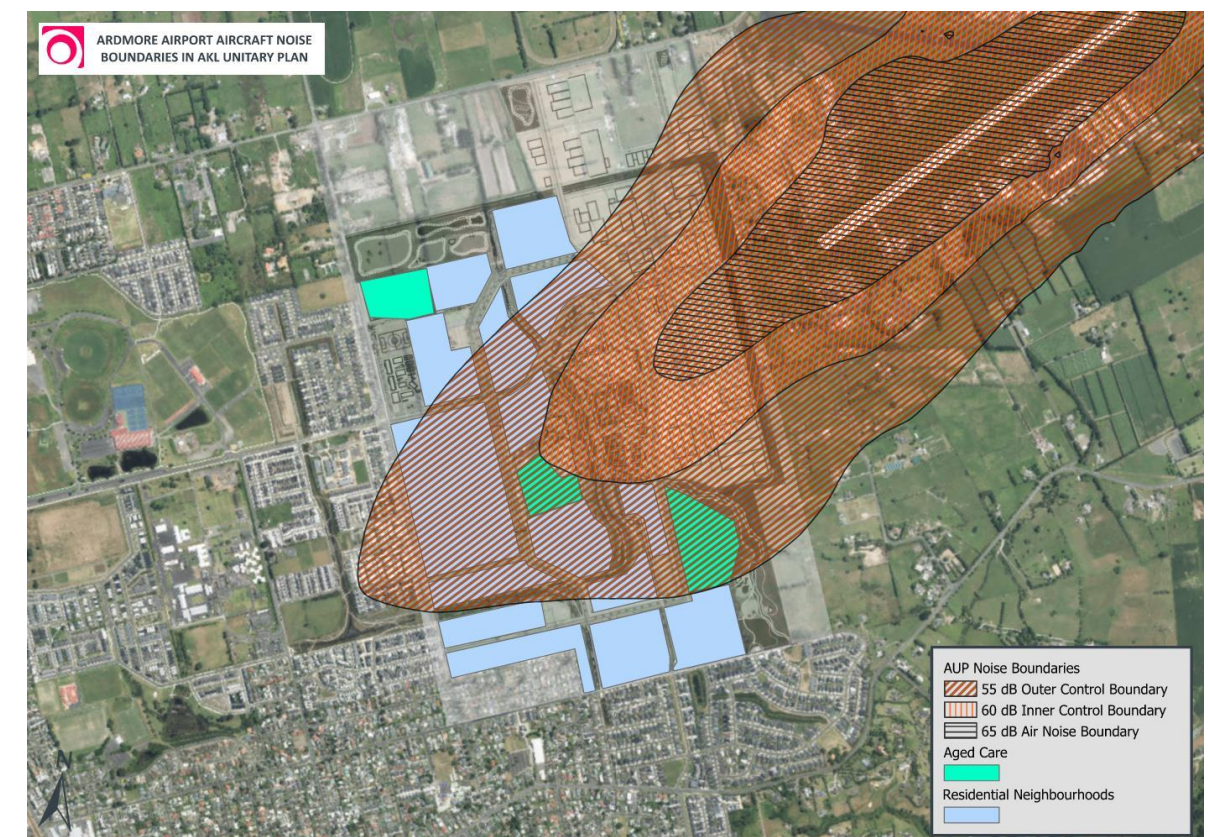
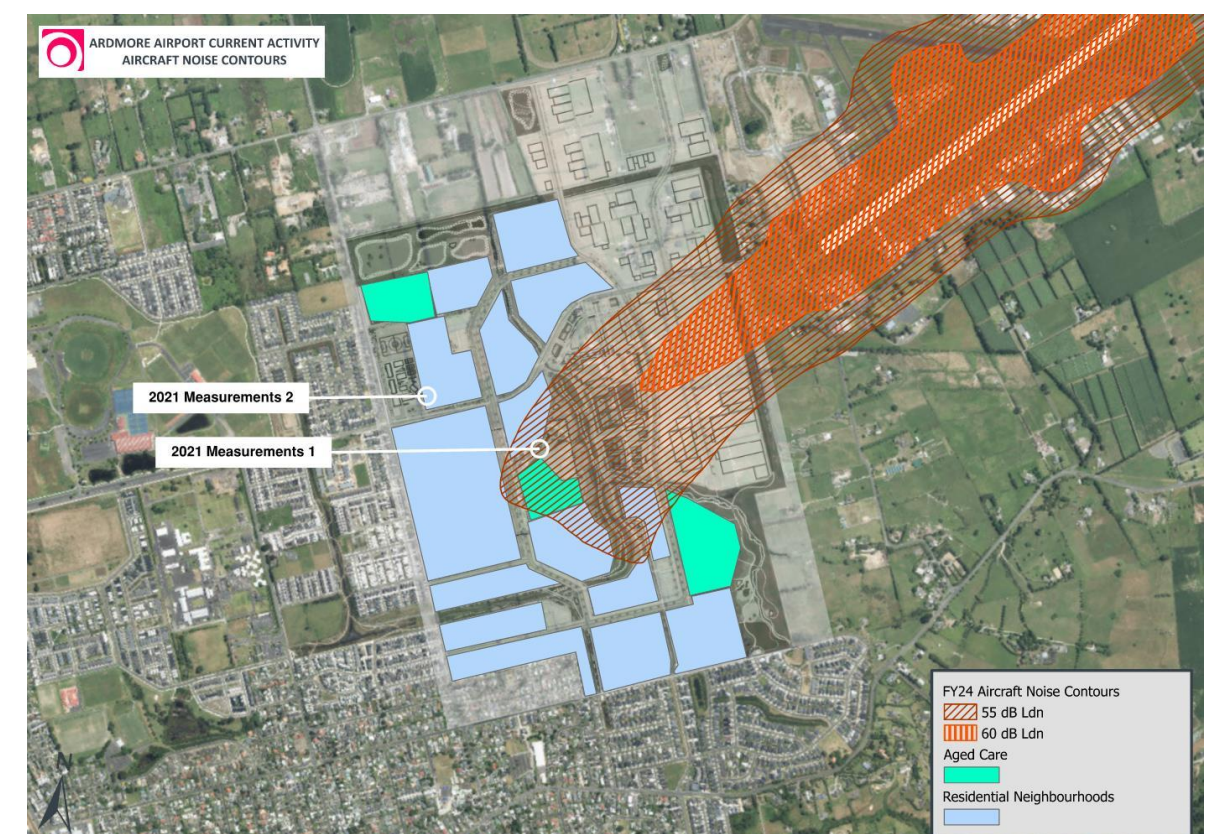


Figure 2: Current aircraft noise exposure (FY24 busy three months)



Single Event Noise Levels

Figure 3 shows that for one day of departures, over 100 events (almost half) were 70 dB  $L_{Amax}$  or greater which is typically used as a threshold to identify aircraft events that would interrupt communication outdoors and indoors with windows open and are considered disruptive. The results also show that some events such as the ex-military jets and other warbirds are particularly high (> 100 dB  $L_{Amax}$ ). Several of these aircraft are resident at Ardmore and these flights are common (on average 3.3 movements per week are permitted and up to 10 movements in any 7-day period).

The measured noise levels from arriving aircraft were generally lower than for departures with  $L_{Amax}$  levels ranging from 51 to 82 dB with an average of 61 dB  $L_{Amax}$ . The average wind conditions are such that arrivals over Sunfield occur 30% of the time whereas departures occur 70% of the time.

Figure 4 shows the trace of measured one second noise levels over an hour on 18 April 2021 when aircraft were departing over Sunfield. The green peaks have been identified as aircraft flyovers. The figure shows the magnitude of aircraft noise events above the ambient sound level. It also shows the frequency of disruptions (above 70 dB) is approximately every 5 minutes. I note this was measured in 2021 and aircraft operations are permitted to more than double in the future.

Figure 3: Measured maximum noise levels at measurement position 1 (2021)

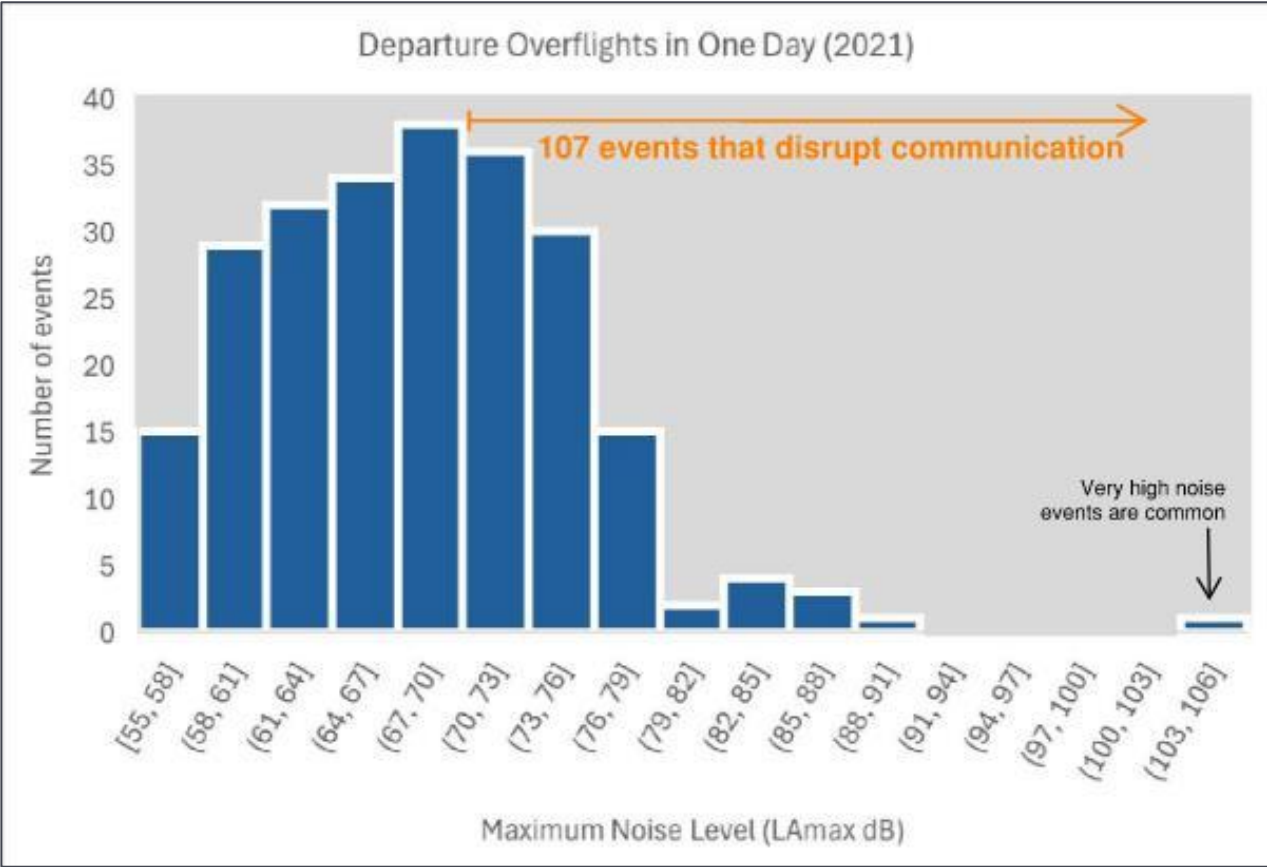
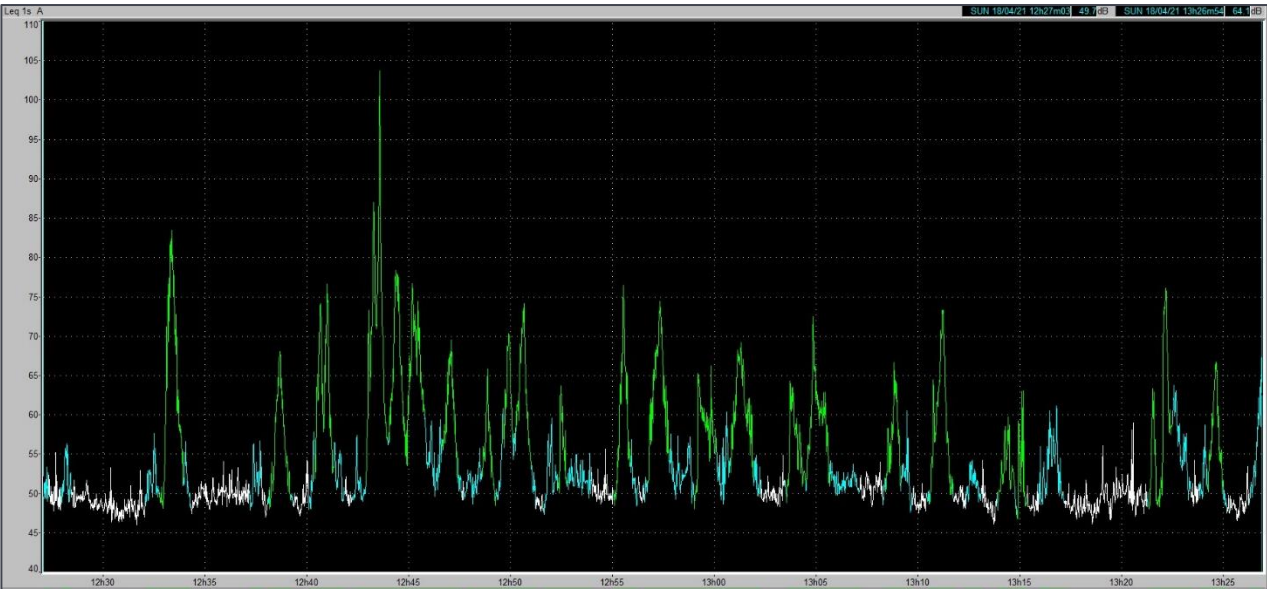


Figure 4: Sample one hour time trace from measurement position 1 (time v noise level dBA)



Flight Paths

Figures 5 – 7 show the dispersion of aircraft flight paths over the Sunfield site on representative days and an average week in November 2023. This data was sourced from FlightRadar24 for the FY24 noise contours. Figure 5 shows a day when aircraft are departing over the Sunfield site. Figure 6 shows a day when aircraft are arriving over the Sunfield site.

The flight track maps shows that Brookside aged care and Neighbourhoods 6, 7, 8, 9, 10 will be exposed to concentrated overflights. Brookside and Neighbourhood 10 are directly under the extended runway centreline where the flight tracks converge. Residents do not have to be directly under a flight path to experience the noise however being directly underneath will exacerbate safety fears particularly as aircraft will be low flying over the site. I will explain in Section 4.0 that people find light aircraft noise more annoying than commercial aircraft noise due to acoustical and non-acoustical factors including safety fears.

Figure 5: Flight paths for busy day with southwest winds which is typically 70% of the time (November 2023)

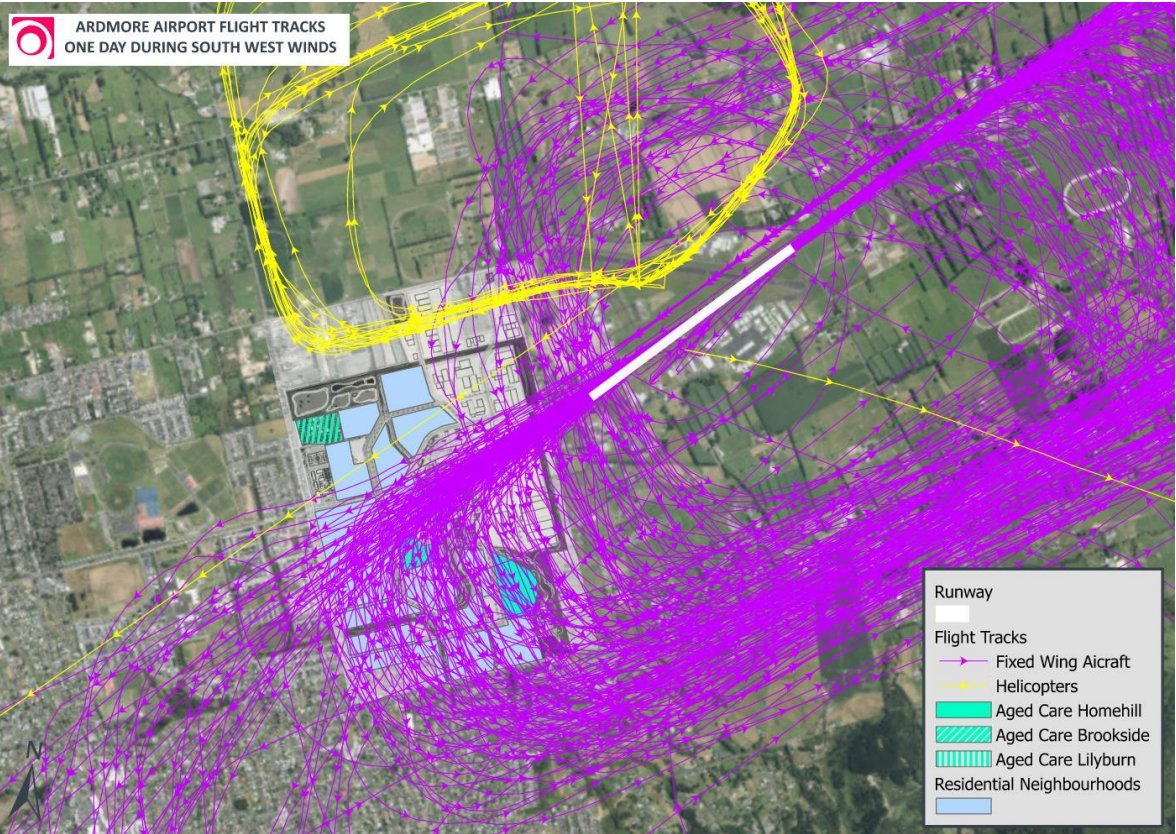


Figure 6: Flight paths for busy day with northeast winds which is typically 30% of the time (November 2023)

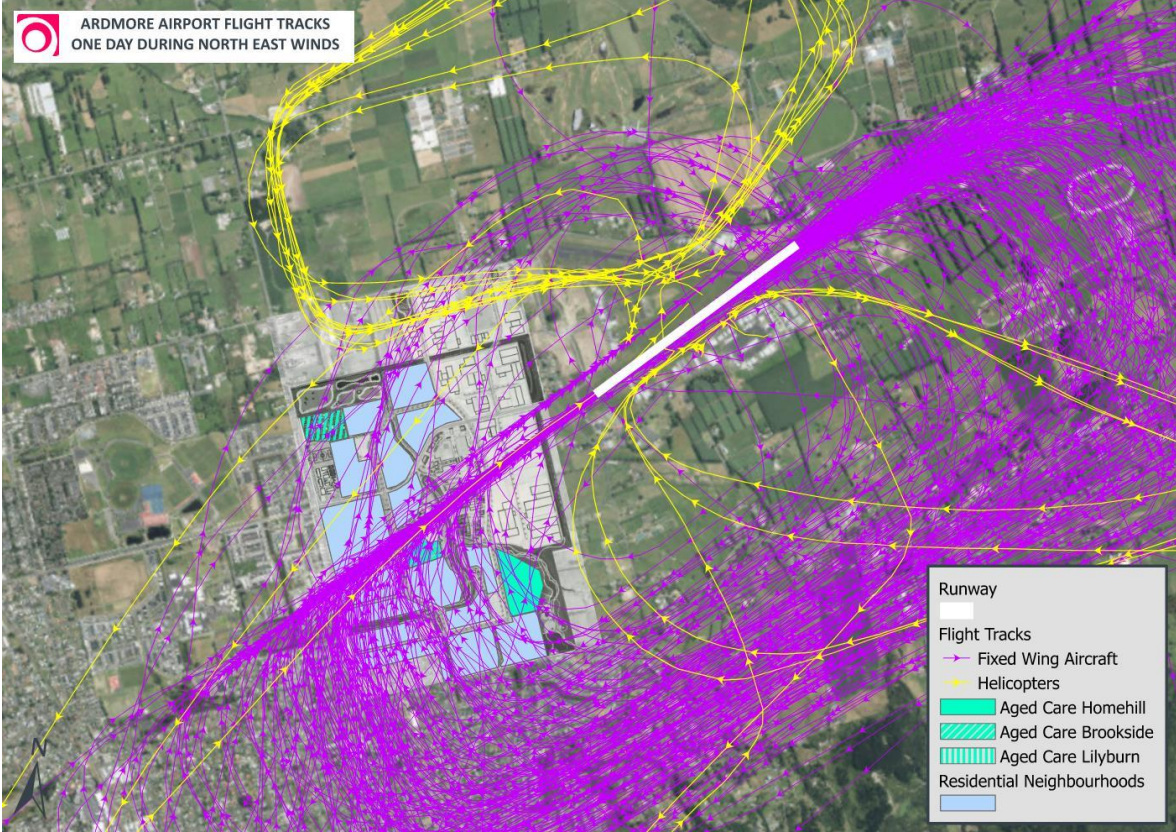
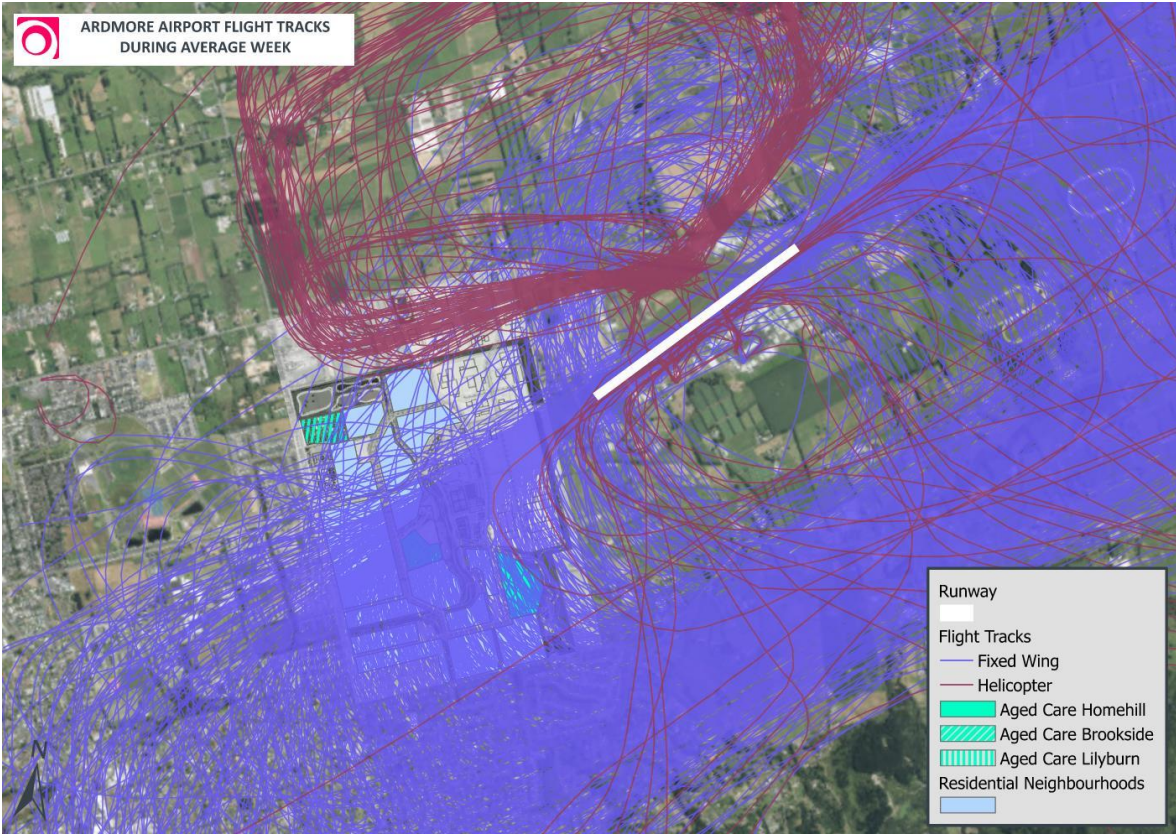


Figure 7: Flights paths for average week (November 2023)



### Aircraft Altitude

The Sunfield site is located relatively close to end of the runway meaning that aircraft overflying the site will be low flying in the context of the Civil Aviation Authority (CAA) definition. Civil Aviation Rules (CAR) Part 91 defines general operating and flight rules for safety purposes including minimum heights for aircraft in-flight. The minimum height over congested areas of a city, town or settlement is 1000 ft above the surface. For other areas the minimum height is 500 ft above the surface. Although this rule clearly does not apply for aircraft taking-off or landing at an airport, it provides a useful guide for what is considered a safe and reasonable overflight altitude for residential areas.

Landing aircraft typically descend on a three-degree angle as they approach a runway. Figure 8 shows this altitude profile (scale is stretched vertically) and hence the altitude of aircraft (300 ft to 450 ft) as they overfly the 55 and 60 dB  $L_{dn}$  noise boundaries for Ardmore Airport, which is the location of the Sunfield development. For comparison the location of the Auckland Airport 55 and 60 dB noise boundaries are also indicated.

At Ardmore Airport, aircraft coming into land when the wind is from the northeast will be below 500 ft when overflying the Sunfield residential neighbourhoods. This is below the minimum in-flight altitude for uncongested areas and substantially below the minimum altitude for residential areas defined by the CAA. The altitude of aircraft taking off will vary more but my review of FlightRadar24 data shows that on average aircraft taking off will be between 500 ft and 1000 ft when overflying Sunfield residential neighbourhoods.

In summary, aircraft will be low flying over Sunfield residents which will exacerbate safety fears and increase the likely annoyance response as discussed further in Section 4.0.

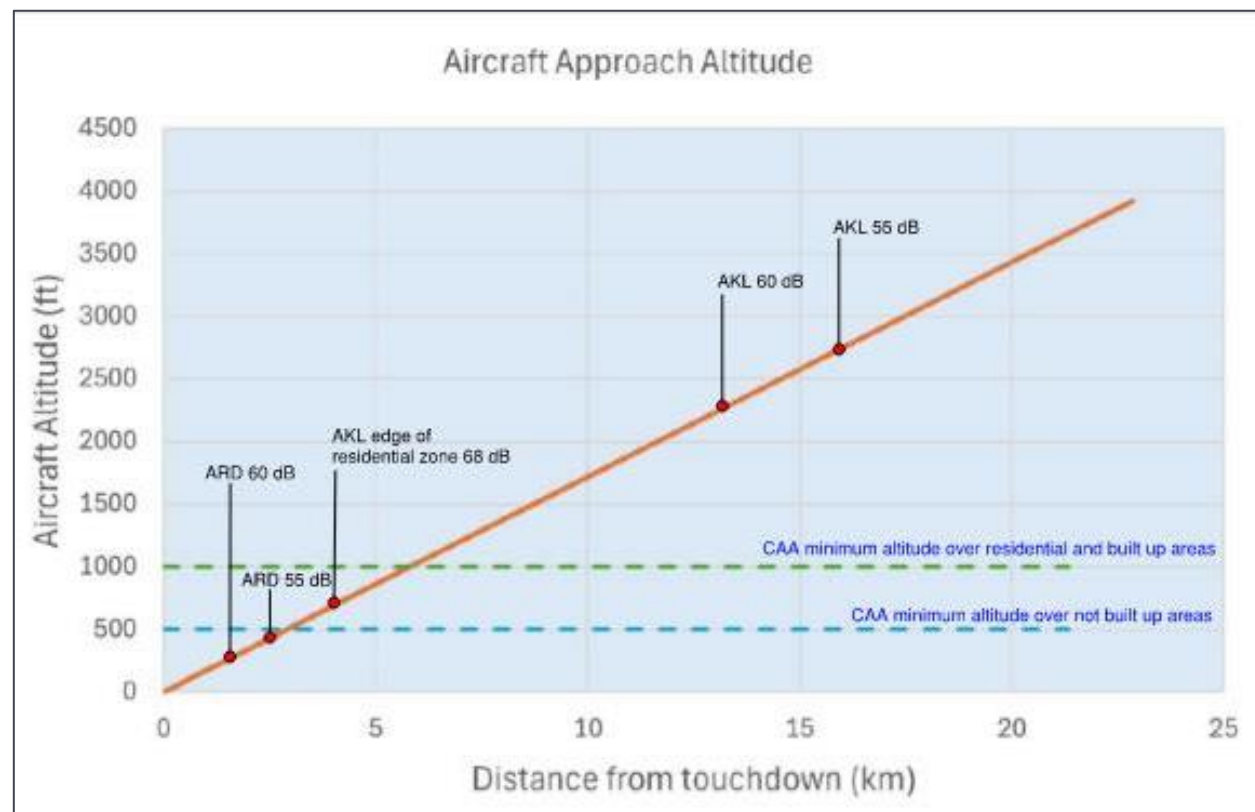
### Summary of Aircraft Noise at the Sunfield Site

Currently there are over a hundred low flying aircraft overflights per day on average, half of which are loud enough to disrupt conversation outdoors and indoors with windows open. Some events are greater than 100 dB  $L_{Amax}$  which is very loud.

A busy day currently is equivalent to one overflight every 4 minutes for 15 hours. In the future the number of aircraft flyovers is permitted to more than double meaning overflights every 3 minutes on average or every 2 minutes on busy days.

For residents spending most or all of their time in the Sunfield community, the presence of aircraft noise and low flying aircraft overhead will be a frequent and on busy days, almost constant effect.

Figure 8: Aircraft altitude between 55 and 60 dB  $L_{dn}$  noise boundaries for Ardmore and Auckland Airport



4.0 AIRCRAFT NOISE EFFECTS

Health Effects of Aircraft Noise

To quantify and assess the effects of aircraft noise we rely on available research and evidence-based guidelines. Over time the quality and volume of available research has increased. In 2018 the World Health Organisation European Region published Environmental Noise Guidelines which have the stated purpose to provide recommendations for protecting human health from exposure to environmental noise originating from various sources including road, rail and air traffic, wind turbines and leisure noise. The 2018 WHO guidelines provide the most comprehensive, evidence-based recommendations on aircraft noise effects at this point in time. The guidelines identify the following health effects associated with aircraft noise:

- 1. Annoyance
- 2. Sleep disturbance
- 3. Cognitive impairment (children’s reading and oral comprehension)
- 4. Cardiovascular disease (low quality evidence)

The guideline recommendations for residential areas affected by aircraft noise are:

Recommendations

For average noise exposure, the GDG **strongly** recommends reducing noise levels produced by aircraft below **45 dB  $L_{den}$** , as aircraft noise above this level is associated with adverse health effects.

For night noise exposure, the GDG **strongly** recommends reducing noise levels produced by aircraft during night time below **40 dB  $L_{night}$** , as aircraft noise above this level is associated with adverse effects on sleep.

To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from aircraft in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions the GDG recommends implementing suitable changes in infrastructure.

The recommended average noise exposure limit of 45 dB  $L_{den}$  is equivalent to 45 dB  $L_{dn}$  which is 10 dB lower than the NZS 6805 threshold for managing aircraft noise effects. The guideline values are generally considered low and achieving these retrospectively in already urbanised areas is likely unrealistic. Nonetheless the guideline values can inform decisionmakers and in my view, the guideline limits are particularly relevant when considering land use planning decisions relating to greenfield situations.

The recommendation is based on the relationship between high annoyance and aircraft noise which WHO identifies as a health effect. To laypeople, annoyance might be seen as an amenity effect only, however epidemiologists are of the opinion there is a correlation between annoyance, the human nervous system and health impacts.

An international health expert, Professor Charlotte Clark has recently prepared a report for Christchurch Airport titled ‘*Airport noise exposure and health effects*’[1]. Professor Clark is President of the International Commission on the Biological Effects of Noise (ICBEN) and she has produced influential evidence reviews on the effects of environmental noise on health, wellbeing and learning for the WHO and others. Paragraphs 2 and 3 of Professor Clark’s report explains the link between environmental noise and physiological responses.

*“Environmental noise is accepted as a public health issue which has significant impacts on physical health, mental health, and wellbeing (European Environment Agency, 2020). In terms of aviation noise, the past two decades have seen an increase in evidence linking exposure to a range of health outcomes including annoyance (Guski et al., 2017), sleep disturbance (Basner, 2021; Basner & McGuire, 2018; Smith et al., 2022), cardiometabolic health (van Kempen et al., 2018) children’s learning (Clark, Head, et*

*al., 2021; Clark & Paunović, 2018a), and mental health (Clark, Head, et al., 2021; Clark & Paunović, 2018b; Hegewald et al., 2020).*

*Environmental noise can influence health, as it can trigger biological responses in an individual. When sound enters the ears, it is also interpreted by the amygdala in the brain which handles endocrine and autonomic functions, and the flight or fight response. If the amygdala is overactivated by noise the endocrine system will increase levels of the stress hormones cortisol and adrenaline. The sympathetic nervous system will also be hyperactivated, resulting in a quickening heart rate, increases in blood pressure, the production of inflammatory cells, and a change in blood fats and blood glucose (Munzel et al., 2017; Munzel et al., 2018). If these biological responses are triggered over a long period (i.e., if exposure is chronic, over several years), they are risk factors for diseases such as diabetes, heart attacks and strokes. These biological responses can also influence mental health and can also be triggered by annoyance and sleep disturbance associated with aircraft noise exposure (Basner & McGuire, 2018; Gong et al., 2022).”*

More recently, an extensive 2025 report by the European Environment Agency [2] discusses annoyance as a health effect. On page 70, the report states; “*The 2030 zero pollution target for noise refers to reducing the number of people who are ‘chronically disturbed by noise’. This term includes a range of negative health effects such as annoyance, sleep disturbance and cardiometabolic issues amongst others. High annoyance is considered a good indicator of the adverse health impacts of noise, as it can be a harbinger of more severe health problems.*”

The report also recommends mitigation strategies including the creation of buffer zones around noisy infrastructure with the emphasis of avoiding the establishment new activities sensitive to aircraft noise.

Quantifying Annoyance Effects from Aircraft Noise

Many international studies have been carried out over time to investigate community response to environmental noise. The general approach of these studies is to survey residents (verbally or in writing) as to their level of annoyance to a particular noise source. The noise level at the respondent’s location is then determined by either measuring it or by using calculated noise contours. Analysis of these results allows a ‘dose-response curve’ (regression analysis) to be prepared showing the percentage of people highly annoyed versus the level of noise they are exposed to.

In 1978 T J Schultz produced a dose response curve relating transportation noise exposure ( $L_{dn}$ ) to residents being highly annoyed (refer Figure 9). New Zealand Standard NZS 6805:1992 was informed by this research.

Since 1978, many other highly annoyed dose response curves have been developed, and community annoyance continues to be a key measure of transportation noise effects. In 2001 Miedema and Oudshoorn [3] developed separate annoyance curves for aircraft, road and rail traffic. This study identified that aircraft noise was appreciably more annoying than road and rail noise (refer Figure 9). This study also found the annoyance response to aircraft noise was greater than the Schultz relationship predicted. For many years this 2001 annoyance curve was used in New Zealand and internationally to quantify annoyance effects.

Since 2001 there have been many more studies internationally correlating community annoyance with aircraft noise. The WHO 2018 Guidelines apply a 2017 study by Guski [7]. The United States FAA carried out a study in 2021 [8]. In 2024 Waka Kotahi carried out a study of community response to several forms of transportation including aircraft noise in New Zealand [9]. The results of these key studies are summarised in Figure 10.

Figure 9: Early dose response curves for community annoyance

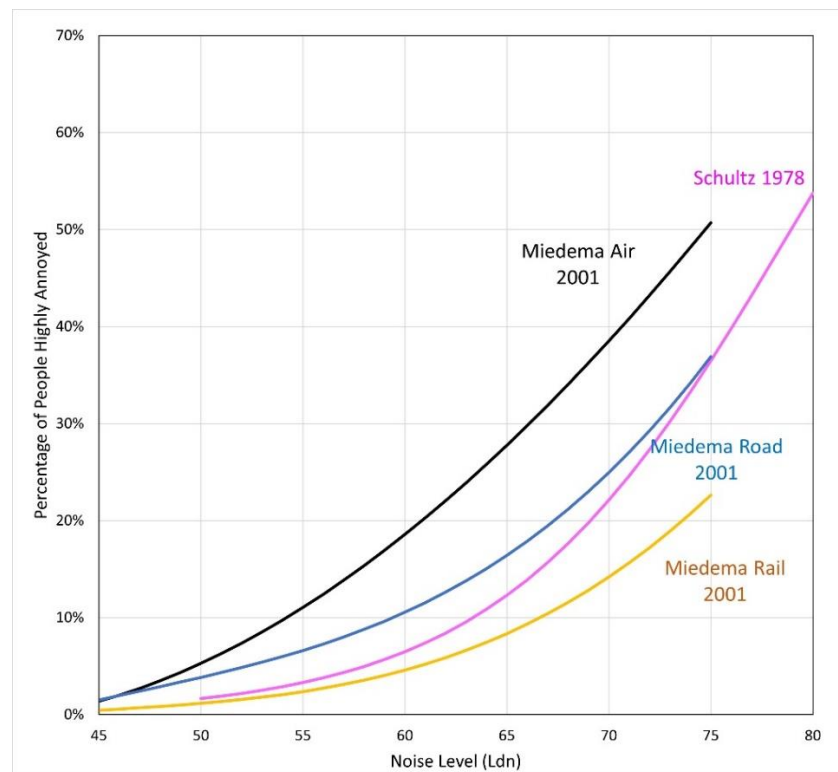
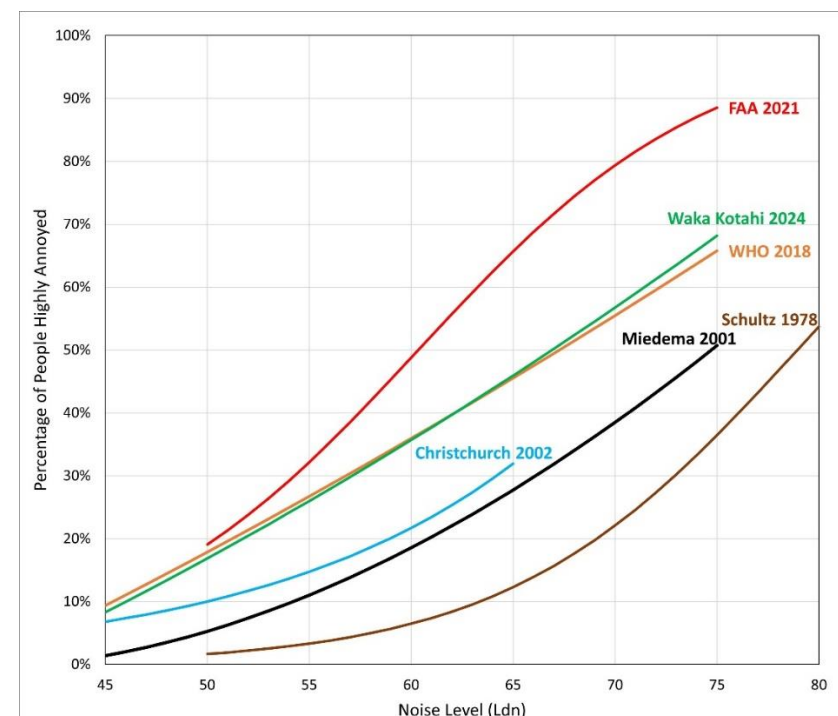


Figure 10: High annoyance dose response relationships to aircraft noise



The clear conclusion from these recent studies, is that community annoyance from aircraft noise is significantly higher today than the results from 20 to 40 years ago when NZS 6805:1992 was written. The recent Waka Kotahi study shows that the WHO 2018 data is broadly applicable to the New Zealand context.

The Styles Group report states that most guidance and standards on aircraft noise effects are based on studies of communities near to international airports with 24-hour operations and a mix of acoustically treated and untreated dwellings. As such, the report considers that using these dose response relationships will overstate the effects for Sunfield residents because all Sunfield houses will be acoustically treated and the noise effects at Ardmore are restricted to daytime hours only. I do not agree with this assumption for the following reasons:

- Many of the international airports included in the studies have night-time curfews.
- Ardmore Airport does not have a night-time curfew. Only some operations are restricted after 10 pm (10:30pm during daylight saving). I do agree that Ardmore does not have what might be termed a 24-hour operation.
- Acoustically untreated dwellings with windows closed achieve the same internal noise levels as the proposed Sunfield dwellings (i.e. for outdoor aircraft noise levels of 55 – 60 dB L<sub>dn</sub>, standard building construction achieves the indoor design criterion of 40 dB L<sub>dn</sub>).
- The Waka Kotahi study has a very similar response curve to the WHO 2018 curve. The three airports surveyed in the Waka Kotahi study were Auckland, Rotorua and Queenstown. Queenstown and Rotorua airports include general aviation activity and do not have night-time operations. All three airports have acoustic insulation requirements and retrofit acoustic treatment programmes. Also, as mentioned above, the untreated dwellings between 55 and 60 dB L<sub>dn</sub> around these airports achieve the same indoor noise environment as the proposed Sunfield dwellings when windows are closed.
- Research shows people find noise around general aviation airports more annoying than noise around commercial airports for passenger services.

In my view, it is reasonable to apply either the WHO 2018 or the Waka Kotahi 2024 dose response relationship to Sunfield to quantify the annoyance effects. Figure 10 shows that for Sunfield residents located between the 55 and 60 dB L<sub>dn</sub> aircraft noise boundaries, 27% to 36% are likely to be highly annoyed by future aircraft noise.

The 2018 WHO guidelines limit of 45 dB L<sub>dn</sub> is set where 10% of people are highly annoyed. The Schultz curve (that informed NZS 6805:1992) shows that 10% are highly annoyed at 64 dB L<sub>dn</sub> and the standard recommends new ASAN are prohibited inside 65 dB L<sub>dn</sub>. Recent discussions amongst experts considering land use planning around New Zealand airports, has resulted in a consensus that a practicable compromise is somewhere in the range from 10% – 25% highly annoyed<sup>3</sup>.

I have quantified the number of residents in each of the 15 neighbourhoods and aged care facilities likely to be highly annoyed and this is summarised in Table 1<sup>4</sup>. The location of the neighbourhoods and aged care facilities relative to the future aircraft noise contours is shown in Figure 11. The neighbourhoods affected by the higher noise levels will result in the greatest health effects. Removing dwellings from these areas (e.g. Brookside and Neighbourhoods 6, 7, 9 and 10) would have the greatest benefits in terms of reducing adverse effects in the community. These areas are also located under the regular flight paths, exacerbating the low flying safety concerns for residents if dwellings were built in those areas.

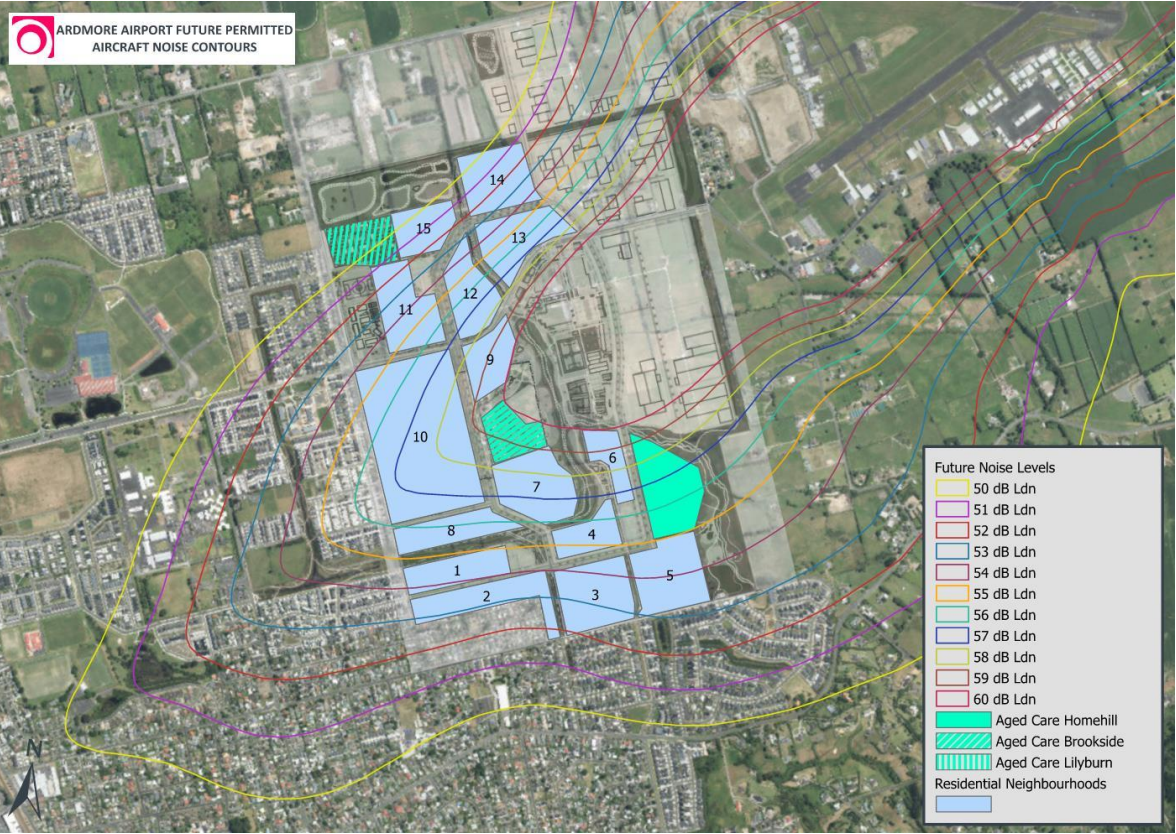
<sup>3</sup> <https://chch2023.ihp.govt.nz/assets/Joint-Witness-Statements/Joint-Expert-Witness-Conferencing-of-Airport-Noise-Experts-7-November-2023.pdf>

<sup>4</sup> For aged care facilities, we estimated 1.5 residents per unit and 3.5 residents per unit in residential neighbourhoods which aligns with the 2023 Census household occupancy rate in the area west of Cosgrave Rd. The average future noise contour over each neighbourhood (refer Figure 11) has been used to determine %HA.

Table 1: Number of Sunfield residents likely to be highly annoyed by aircraft noise

Neighbourhood	# Units	% Highly Annoyed	# Residents Highly Annoyed
1	155	26%	141
2	195	23%	159
3	232	23%	189
4	98	28%	95
5	215	24%	182
6	96	33%	112
7	219	31%	241
8	160	29%	161
9	126	34%	151
10	784	29%	813
11	221	24%	187
12	150	28%	146
13	202	28%	197
14	219	21%	165
15	125	20%	86
Brookside	140	35%	74
Homehill	221	30%	101
Lilyburn	139	17%	35
Total			3234

Figure 11: Sunfield neighbourhoods and future aircraft noise levels



Factors Influencing Annoyance at General Aviation Airfields

It is widely recognised and supported by research that an individual’s response to aircraft noise depends on both acoustical and non-acoustical factors. Acoustical factors relate to the noise level, character, frequency, predictability etc. Non-acoustical factors are all other aspects such as an individual’s attitude towards the noise source, safety concerns, sense the noise is necessary or fair, personal sensitivity etc. Some researchers believe acoustical and non-acoustical factors contribute equally to the annoyance response.

General aviation airfields differ to commercial airports in both acoustical and non-acoustical factors. Several studies have been carried out to understand differences in community response to light aircraft around general aviation airfields compared with passenger aircraft around commercial airports. A paper by Smeatham [11] provides a summary of three studies by others and the results of a survey of local authorities in Britain regarding their experience and assessment of light aircraft noise. Two studies from 1978 and 1980 found that annoyance around general aviation airfields was greater than the Shultz curve predicted for general transportation noise. A third study from 1988 concluded that:

“People perceive different categories of flying and attach very different levels of importance to them and that within the range of noise levels encompassed in the study, reaction to general and business aviation noise are significantly higher than those to air transport.”

To understand the reasons more, the authors undertook a survey of all the chief Environmental Health Officers in Britain asking them for relevant experience in dealing with the annoyance of microlight and light aircraft. The conclusions drawn from this survey were as follows:

“The replies to the circulated letter indicate that annoyance is as much due to the presence of light and microlight aircraft as the noise they produce. Annoyance is also dependent on the type of manoeuvre the aircraft performs, for instance circuits and bumps seem to be more annoying than normal landings and take-offs.

When people do complain about the noise it is its long duration, highly tonal nature which appears to annoy people. The loss of privacy and safety aspects of low level flight annoy people just as much if not more than the noise itself. This implies that when making an environmental impact survey it is important to address such things as the flight paths, the height at which aircraft overfly property, hours of operation and the types of operations carried out on the airfield as well as an assessment of the noise.”

These studies are relatively dated however I am not aware of any recent research providing a specific annoyance response relationship for general aviation airports. I note that many of the characteristics about general aviation noise identified as increasing annoyance, have not changed and are still relevant today. The non-acoustical factors such as safety and privacy concerns and attitude towards the noise maker are not mitigated by acoustic insulation.

## 5.0 LIMITATIONS OF ACOUSTIC INSULATION

Some proponents of residential development in areas affected by aircraft noise suggest that sound insulation fitted to new dwellings is sufficient on its own to mitigate the adverse effects of noise and to protect the efficient operation of an airport. While acoustic insulation is a tool that can be used to mitigate some of the adverse effects, I do not agree that sound insulation alone is sufficient to prevent annoyance and reverse sensitivity effects as it does not:

- (a) reduce the noise levels in outdoor areas, or
- (b) reduce the noise level when people open their windows and sliding doors.

People generally prefer to open their windows and sliding doors rather than live in air-conditioned spaces for a number of reasons including fresh air, connection with the surrounding environment and lower running costs. General aviation flying relies on good weather more than commercial passenger services do. Therefore, busy flying days at Ardmore will coincide with those days when residents want to open their houses and spend time outdoors. I anticipate residents will not want to be shut inside to mitigate aircraft noise on fine summer days.

Research indicates annoyance effects occur at aircraft noise levels of 50 – 55 dB  $L_{dn}$  (18 – 27% highly annoyed) where indoor noise levels with windows open would meet typical indoor design criteria (40 dB  $L_{dn}$ ). This shows that achieving 40 dB  $L_{dn}$  indoors does not mitigate all the effects.

The 1999 WHO noise guidelines [4] includes target values for environmental noise in residential outdoor living areas and balconies as follows:

*“To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.”*

Therefore, according to WHO outdoor noise environments do matter for residential activities, and structures generally cannot mitigate aircraft noise in these environments. The ICAO Airport Planning Manual [5] also recognises that *“the major drawback to noise insulation is that it does nothing to mitigate noise outdoors”*. Aircraft noise received in residential outdoor living areas is problematic because:

*“In single-family dwellings in temperate and warm climates, families live outside during many of the daylight hours, especially in the summer months [...] It is this outdoor activity that creates the real noise compatibility problem for residential property in the vicinity of the airport.”*

NZS 6805 recommends that new residential development in areas exposed to 55 – 65 dB  $L_{dn}$  are prohibited as a preference but provides a fall-back option of requiring acoustic insulation. Clearly the preferred approach is to prohibit however the standard recognises this is not always practicable and a territorial authority may need to compromise, particularly in established residential zones. In my view this approach recognises that insulation does not mitigate all the effects but sometimes a compromise is necessary.

The Styles Group report has a different interpretation suggesting the standard implies that ASAN between 55 and 65 should be permitted provided they are acoustically insulated and that the outdoor noise effects are accepted as unavoidable. I do not agree with this over simplistic interpretation of the standard. As discussed in Section 4.0 the recent health evidence shows the health effects inside 55 dB  $L_{dn}$  are greater than previously thought and therefore a precautionary approach should be taken to land use planning around airports particularly for greenfield development.

For the proposed Sunfield dwellings (i.e. between 55 and 60 dB  $L_{dn}$ ), the acoustic treatment will require nothing more than standard construction plus the provision of ventilation thermal control. The indoor noise levels for these ‘treated’ dwellings will be the same as for untreated dwellings with windows closed. The only difference is the ability to control air quality and thermal comfort. I agree with the Styles Group report that these factors

are important as these enable residents to reduce noise levels while simultaneously controlling air quality and thermal comfort. However, it is important to understand that these houses will be constructed the same as standard houses and therefore will not reduce noise any more than standard houses. It is also important to understand that the indoor design criterion of 40 dB  $L_{dn}$  is an average noise level and individual aircraft noise events will still be audible.

In summary, I consider that noise mitigation by insulation introduces compromised living conditions and results in an inferior outcome for residents. It would not mitigate all the effects including in outdoor living areas and when doors and windows are open and it would not mitigate non-acoustical factors such as safety concerns. In my opinion, sound insulation is a less desirable option to avoiding the effects of airport noise through appropriate land use.

6.0 INTERNATIONAL TRENDS LAND USE PLANNING AROUND AIRPORTS

In general, the two main objectives of noise management frameworks are:

- 1. Minimise noise effects on people
- 2. Minimise operational restrictions on airports

It is widely understood that the two outcomes are inherently connected. Objective 1 can be achieved through operational restrictions, but this fails to meet objective 2. Achieving objective 1 through other means also benefits objective 2.

Airport noise management frameworks are predicated on the understanding that allowing incompatible land use in airport noise affected areas increases noise effects on people which in turn increases the likelihood of operational restrictions. Managing the effects of aircraft noise relies on a multidimensional approach and land use planning is a key component. The scale of aircraft noise effects on a population is directly related to the size of the population exposed.

Airport noise management frameworks apply objective measures and thresholds based on research to manage noise effects. It is generally not practicable to control for zero effects therefore thresholds are selected to minimise effects as far as reasonably practicable. There is a wide range of approaches taken internationally with most countries implementing bespoke frameworks that are often based on local research. Different countries have different views of reasonably practicable thresholds, that are related to the local context.

Although it is difficult to distil the range of approaches internationally, in general the best practice approach to land use planning around airports is to avoid greenfield development for noise sensitive activities inside 55 dB L<sub>dn</sub>.

7.0 CONCLUSIONS

Recent research and guidelines indicate that the Sunfield development will likely result in adverse health effects for residents and an increased risk of future restriction being imposed on Ardmore Airport.

The Sunfield site is subject to frequent overflights of low flying aircraft which on busy days will disrupt communication over a hundred times a day. This is permitted to more than double in the future.

Locating dwellings directly under flight paths of low-flying aircraft will likely induce safety fears and exacerbate health effects for residents.

The provision of acoustic insulation does not resolve all the adverse noise effects, including effects in outdoor living spaces and with doors and windows open. Indoor environments are only insulated when windows and doors are closed which then requires mechanical ventilation and thermal control which results in an inferior outcome for residents. The disbenefits include operating costs, disconnection from the outdoors, undesirability of living/sleeping in air-conditioned spaces.

Introducing ASAN as proposed on the Sunfield site is contrary to recent research, health guidelines and international trends in managing the effects of aircraft noise on communities. The international and New Zealand research suggests that over 3000 people would be expected to be highly annoyed by aircraft noise if the Sunfield development went ahead as proposed.

8.0 REFERENCES

[1] [https://www.waimakariri.govt.nz/\\_data/assets/pdf\\_file/0035/166985/STREAM-7A-and-7B-COMBINED-EVIDENCE-9-SUBMITTER-7A-254-FS-80-7B-V1-81-FS-15-CHRISTCHURCH-INTERNATIONAL-AIRPORT-PROFESSOR-C-CLARK-AIRCRAFT-NOISE-AND-HEALTH.pdf](https://www.waimakariri.govt.nz/_data/assets/pdf_file/0035/166985/STREAM-7A-and-7B-COMBINED-EVIDENCE-9-SUBMITTER-7A-254-FS-80-7B-V1-81-FS-15-CHRISTCHURCH-INTERNATIONAL-AIRPORT-PROFESSOR-C-CLARK-AIRCRAFT-NOISE-AND-HEALTH.pdf)

[2] <https://www.eea.europa.eu/en/analysis/publications/environmental-noise-in-europe-2025>

[3] Henk Miedema and Catherine Oudshoorn (2001) Annoyance from Transportation Noise. Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals 109(4) Environmental Health Perspectives 409.

[4] World Health Organisation *Guidelines for Community Noise* 1999.

[5] International Civil Aviation Organization *Airport Planning Manual: Part II - Land Use and Environmental Management* (2018, fourth edition) at [7.2.3.4] and at [3.5.8].

[6] High Court of New Zealand *Auckland International Airport Ltd v Auckland Council* [2024] NZHC 2058 [26 July 2024]

[7] Guski, R., Schreckenberg, D., & Schuemer, R. (2017). *WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Annoyance*. International Journal of Environmental Research and Public Health, 14(12), 1539.

[8] U.S Department of Transportation (FAA). (2021). *Analysis of the Neighbourhood Environmental Survey*. National Technical Information Service.

[9] Waka Kotahi New Zealand Transport Agency (2024) Research Report 727 Community response to transport noise exposure in New Zealand.

[10] World Health Organisation. (2018). *Environmental Noise Guidelines for the European Region*. Copenhagen: WHO Regional Office for Europe.

[11] Smeatham D, Wheeler P D, Kerry G. (1993) *Community Response to Noise from Light Aircraft* Proceeding of Institute of Acoustics Vol 15 Part 8

## APPENDIX A INTRODUCTION TO NZS 6805:1992 AND AIRCRAFT NOISE METRICS

NZS 6805:1992 Airport Noise Management and Land Use Planning (**the Standard**) is the basis for the management of airport noise effects at the majority of airports in New Zealand. The Standard was published in 1992 with a view to providing a consistent approach to noise planning around New Zealand airports. Since publication, the principles of the Standard have been applied to more than 15 New Zealand airports.

The approach to airport noise management that the Standard provides for is to *“implement practical land use planning controls and airport management techniques to protect and conserve the health of people living near airports without unduly restricting the operation of airports”*.

The Standard states that it provides the minimum requirement needed to protect people from adverse effects of aircraft noise and uses the ‘noise boundary’ concept as a mechanism for local authorities to:

- a) establish compatible land use planning” around an airport; and
- b) set noise limits for the management of aircraft noise at airports.

The Standard’s recommended approach involves fixing an Outer Control Boundary (**OCB**) and a smaller Air Noise Boundary (**ANB**) around the airport and defining land use and noise controls within those boundaries.

The noise boundaries are based on a 24-hour noise metric commonly used to quantify transportation noise, which is the night-weighted noise exposure ( $L_{dn}$ ).  $L_{dn}$  is the sum of the sound energy from all aircraft noise events averaged over 24 hours with a weighting applied to night-time events. The night weighting means that aircraft noise events between 10pm and 7am are weighted by an additional 10 decibels to account for people’s heightened sensitivity to noise at night. International research correlates the  $L_{dn}$  and the similar  $L_{den}$  metrics with community annoyance to aircraft and other transportation noise.

When establishing the location of the noise boundaries, the Standard recommends calculating noise contours for a future projection of aircraft operations. It recommends a minimum 10-year period for the projection, and it recommends using the average  $L_{dn}$  over the busiest three months of the year when calculating the noise boundaries.

The Standard defines the OCB as an area outside the ANB within which there should be no new incompatible land uses, and that aircraft noise at or outside the OCB shall not exceed 55 dB  $L_{dn}$ . The ANB is defined as an area around an airport within which aircraft noise is sufficiently high to require mitigation measures as well as prohibiting new incompatible land uses. The Standard states that aircraft noise shall not exceed 65 dB  $L_{dn}$  at the ANB. The Standard suggests the Federal Aviation Administration (**FAA**) Integrated Noise Model (**INM**) or other appropriate models for calculating the projected noise contours. The FAA replaced the INM with the Aviation Environmental Design Tool (**AEDT**) in 2015. In New Zealand there is no national statutory requirement for modelling software. Best practice in New Zealand is to use the AEDT for new airport noise models as it includes the latest database of modern aircraft types.

Once the location of the noise boundaries has been established and agreed, the Standard recommends that the local authority incorporates the noise boundaries into relevant district plan maps and gives effect to the recommended land use controls summarised below. The Standard recommends that local authorities implement the following land use restrictions via the district plan:

- a) Inside the ANB (65 – 70 dB  $L_{dn}$ ):
  - i. New noise sensitive uses (including residential) should be prohibited; and
  - ii. Existing residential buildings and subsequent alterations should have appropriate sound insulation.
- b) Between the ANB and the OCB (55 – 65 dB  $L_{dn}$ ):

- i. New noise sensitive uses (including residential) should be prohibited unless a district plan rule permits such use subject to appropriate sound insulation; and
- ii. Alterations or additions to existing noise sensitive uses (including residential) should include appropriate sound insulation.

The Standard considers that noise levels above 70 dB  $L_{dn}$  are not suitable for residential activity and any existing dwellings subject to that level of noise should be repurposed.

The combination of noise limits defined at the noise boundaries and land use controls inside those boundaries work together to control the extent of future aircraft noise effects on sensitive activities around an airport.

The Standard provides the minimum requirement needed to protect people from adverse effects of aircraft noise. It states that a local authority may determine that a higher level of protection is appropriate in a particular locality. Throughout New Zealand the Standard has been adapted to suit the local situation taking account of the specific airport operational requirements and existing surrounding land uses.

### Aircraft Noise Metrics

Several noise metrics are used to describe aircraft noise. Average exposure metrics such as  $L_{dn}$  and  $L_{den}$  measure the average noise from all aircraft events over a period of time such as days or months with a penalty applied during night-time and evening hours. Other metrics such as  $L_{Amax}$  and  $L_{AE}$  measure the noise from an individual aircraft event.

$L_{dn}$  (the Day Night Noise Level) is a ‘cumulative noise exposure index’. It is influenced by the number of aircraft noise events that occur, how loud they are individually and what time of day they occur.  $L_{dn}$  can be determined over a 24-hour period or over several months.

Individual aircraft events can have short term effects that can be assessed using single event noise metrics such as  $L_{Amax}$  and  $L_{AE}$ .  $L_{AE}$  (or SEL) is the total sound energy from a noise event normalised to a one second duration.  $L_{Amax}$  is the maximum noise level occurring during the aircraft noise event (as shown in Figure 12 below). Single event noise levels are usually applied to assess sleep disturbance at night and communication interference during the day. In New Zealand, typical district plan noise limits in residential areas are 70 or 75 dB  $L_{Amax}$  at night. While  $L_{Amax}$  can be useful, it makes no allowance for the cumulative impact of noise events experienced.

The  $L_{dn}$  and  $L_{Amax}$  metrics are completely different metrics and cannot be compared with each other.  $L_{Amax}$  will always be a much higher ‘number’ than  $L_{dn}$ . For example, a hypothetical site affected by aircraft noise, might have a cumulative noise exposure of 60 dB  $L_{dn}$  and single event maximum noise levels of 70 to 80 dB  $L_{Amax}$  from individual aircraft depending on the aircraft size.

Figure 12: Aircraft Noise Events

