CONSULTANT ADVICE

Project:	West Coast Airports	**Document No.:**	Ca 002		
To:	West Coast Regional Council	**Date:**	16 May 2022		
Attention:	Edith Bretherton	**Cross Reference:**			
Delivery:	email	**Project No.:**	20210643		
From:	Steve Peakall	**No. Pages:**	4	**Attachments:**	Yes
CC:					
Subject:	West Coast Airports – proposed noise boundaries				

Introduction

Marshall Day Acoustics (MDA) has been engaged to prepare future noise contours for 5 aviation facilities in the West Coast district.

The five facilities are:

- Hokitika Airport;
- Westport Airport;
- Greymouth Airport;
- Karamea Airfield, and;
- Franz Josef helipad.

The intent of the noise contours was to apply a consistent noise management and land use planning regime in the District Plan for the West Coast Regional Council's (WCRC) aviation facilities. However, four of these are small regional airfield facilities with runways and infrastructure supporting both fixed wing and helicopter activity. Because Franz Josef Heliport is used by helicopters only and would be subject to a different noise standard, we adopt a different approach.

We therefore discuss Franz Josef Heliport in a separate consultant advice note (Ca 001)

This memo relates to the airfields only.

Background

The West Coast is a sparsely populated region, constrained by topographical features with a small number of regional towns which are hubs for the West Coast community. These are served by small regional airfields (some of which offer some limited scheduled services), but primarily the airfields are used by the local community in terms of general aviation and agricultural work. As such, the airfields currently have a small number of movements, and limited noise management regimes.

However, it is good planning practice to protect these facilities from reverse sensitivity because they are important for the needs of the region and therefore warrant special consideration. In terms of noise, this primarily means ensuring new noise sensitive activity is discouraged from establishing too close to the airfields. To that end, land use planning controls are a useful mechanism for preventing this occurring.

Noise Performance Standards

NZS 6805 provides a recommended approach for territorial authorities dealing with airports and land affected by airport noise. The Standard aims to manage the adverse effects of airport noise by

(i) establishing compatible land use planning around an airport; and

(ii) setting noise limits for the management of aircraft noise at airports.

NZS 6805 is used for all the major international and regional airports throughout New Zealand (as well as for a number of smaller airports and airfields) to manage airport noise emissions, through the implementation of its provisions in the various District Plans.

The Standard recommends two boundaries, the Airnoise Boundary (ANB) set at 65 dB L_{dn} and the Outer Control Boundary (OCB) set at 55 dB L_{dn}. These boundaries represent noise limits which the airport must not exceed, as well as guidelines for land use planning.

When establishing the location of noise boundaries, an allowance for the expected growth of the airport is made. NZS 6805 recommends a minimum 10 year projection of future aircraft operations. In terms of NZS 6805, aircraft operations include both fixed wing and helicopter flight operations.

The associated land use controls recommended in NZS 6805 are:

Inside the ANB

(i) *New* noise sensitive uses (including residential) should be prohibited;

(ii) *Existing* residential buildings and subsequent alterations should have appropriate sound insulation.

Between ANB and OCB

(i) New noise sensitive uses (including residential) should be prohibited unless a District Plan permits such use subject to appropriate sound insulation.

(ii) Alterations or additions to existing noise sensitive uses (including residential) should include appropriate sound insulation.

Overall, we agree with the approach outlined in NZS 6805 and consider it an appropriate standard to manage the noise effects from airports. Regarding land use controls between the OCB and ANB, from an acoustical effects point of view our interpretation of NZS 6805 is that new noise sensitive use should be prohibited. We recognise however that this approach is not always pragmatic, and that other considerations need to be taken account of (for example, regional development pressures, existing expectations of residential development, amongst others).

We recommend using the provisions of NZS 6805 and adopt a consistent approach for the recommended land use controls and airport noise management as part of process. However, because of the size of the airfields under consideration, we do not see any need to adopt an ANB for any airfields, discussed further below.

Noise Boundary Development

Several computer-based models have been developed to predict aircraft noise in the vicinity of an airport. The most widely used of the models (and the model referenced in NZS 6805) is the Integrated Noise Model (INM) developed by the US Federal Aviation Authority.

The INM has been used to generate the vast majority (if not all) of the airport noise contours used as the basis of District Plan controls in New Zealand. However, the FAA is no longer updating or supporting the INM and has developed new software, the AEDT, that calculates noise contours and air emissions.

The FAA state that the AEDT should give similar results as the INM. Our comparisons show that the INM and AEDT give similar results. Because of this (and because of some issues with AEDT) the INM was considered to be the best pragmatic modelling option for the preparation of the proposed aircraft noise contours in this case.

We understand that to date no other implemented airport noise boundaries in New Zealand are based on AEDT calculations.

Our predictions are based on movement data provided by West Coast Regional Council. Because of the low number of annual movements that occur at the airfields, and the limited growth at each airfield that is predicted, there is a risk that even a slight change in airfield activity could cause compliance issues. Therefore, WCRC advised that a conservative approach to the movement forecasts be adopted therefore a more robust forecast is used to fully protect the airfields. This is reflected in the future noise contours.

Taking this into account, the predicted future noise contours are shown in Figures 1-4.

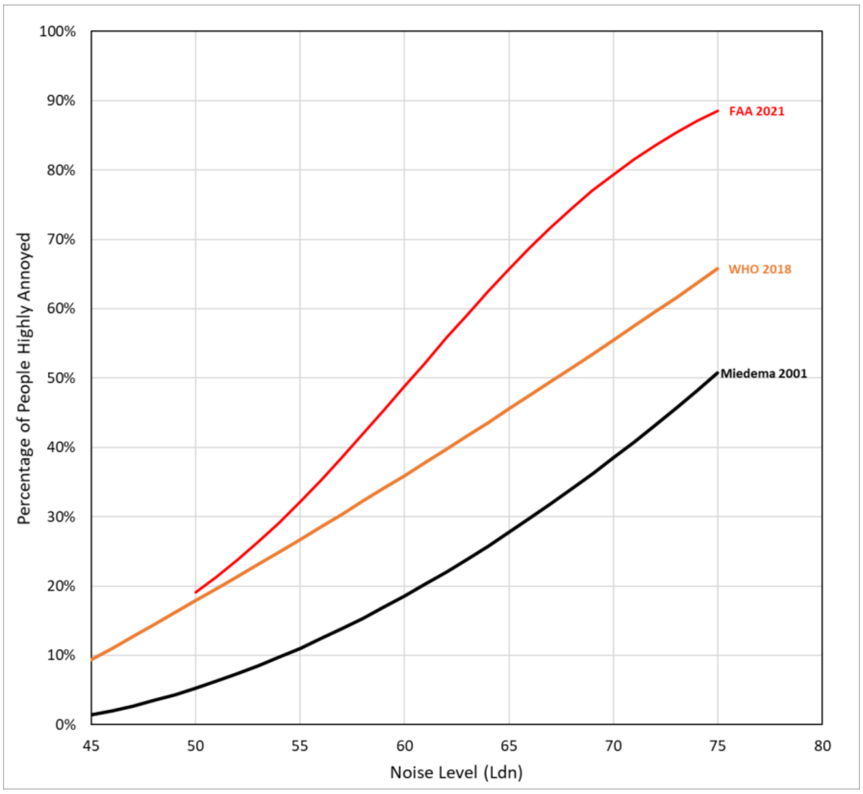
Aircraft noise effects

The typical way adverse noise effects are experienced is by a change in noise level received, annoyance effects from a given helicopter noise exposure and sleep disturbance effects.

Individual responses to a certain level of aircraft noise vary greatly. A large number of studies have been carried out overseas in relation to the overall relationship of a given community's annoyance with reference to varying noise levels they receive (known as a dose response relationship). Much of this was taken into account when NZS 6805 was developed.

A dose response relationship specific to aircraft noise was developed by Miedema and Oudshoorn and has been used extensively for airports here and overseas since that time in assessment of noise effects studies. This relationship has until recently generally been regarded as the latest research in this area. The latest and most relevant research is now considered to be the World Health Organisation (WHO) study in 2018 and to a lesser extent the Federal Aviation Administration (FAA) study in the US in 2021.

Both the FAA and WHO studies show a higher level of annoyance than the Miedema 2001 dose-response curve. The dose response curves from the FAA and WHO studies are shown below along with the Miedema study for comparison.



The WHO 2018 dose response relationship indicates that for aircraft noise environments of 65 dB L_{dn}, 46% of the population are likely to be highly annoyed. This shows why NZS 6805 recommends prohibition of noise sensitive activity inside the ANB. For aircraft noise environments of 55 dB L_{dn}, 27% of the population are likely to be highly annoyed by the noise, which is also of significance.

Recommendations

Because of the high noise levels and resultant adverse effects that can eventuate, we recommend that the 55 dB noise contours (shown in each of Figure 1-4) be implemented in the District Plan as an Outer Control Boundary (OCB) for each of the four airfields.

In keeping with the provisions of NZS 6805, we recommend that new noise sensitive activity inside the proposed OCBs be prohibited where practicable to do so.

This is because, NZS 6805 recommends that noise sensitive activity is prohibited between the OCB and the ANB unless a district plan permits it subject to appropriate sound insulation requirements. This approach recognises that not all of the effects of aircraft noise can be mitigated by insulating buildings, particularly for residential activity.

People generally have a desire for exposure to the outdoors and an expectation to be able to spend time in the garden, entertain guests outdoors and leave doors and windows open. In these situations, the level of aircraft noise exposure cannot be practicably mitigated. If new residential activity is to be permitted inside the proposed OCB it can be expected that some residents would be annoyed by aircraft noise outdoors.

We support the NZS 6805 approach to prohibit new noise sensitive activity inside the OCB as a desirable starting point but acknowledge that other factors such as historical land use development, landowners' expectations of property rights and regional pressures on developable land can result in relaxed land use restrictions rather than the ideal restrictions being imposed.

For the 4 airfields, the OCBs cover an area including several different land use zones. We understand that there is an existing expectation for residential development in the residential zones.

Although not desirable from an acoustic point of view, this expectation may be accommodated provided appropriate acoustic insulation is installed for new noise sensitive activity in this zone.

This existing expectation for residential development does not apply to the rural or commercial zone areas inside the OCBs.

As a result, we recommend that new noise sensitive activity inside the OCB should be prohibited in all other zones, ie the rural and commercial zones.

This would also ensure there was no possibility of noise sensitive activity being constructed at higher noise levels inside the OCB, and therefore because of this (and because there are no existing noise sensitive activities exposed to future noise levels of this magnitude), there is no need to apply an ANB to ensure such protection.

If new noise sensitive activity is not prohibited in the residential zones they should be subject to sound insulation measures to ensure an acceptable internal noise environment. Sound insulation requirements should also apply to new alterations or additions to *existing* noise sensitive activity in all zones. The cost of acoustic insulation for new noise sensitive activity and additions/alterations to existing noise sensitive activity would be borne by the developer or homeowner.

We note that there should also be a mechanism imposed in the District Plan to ensure aircraft noise emissions do not exceed these noise levels at the noise boundaries.

HOKITIKA AIRPORT
FUTURE NOISE CONTOURS

Future Noise Contours

- 55 dB Ldn (Proposed OCB)
- 60 dB Ldn
- 65 dB Ldn

Client:
West Coast Regional Council

Authors:
Steve Peakall

Date of Issue:
12/05/2022 3:25 PM

Drawing Details:
Scale: 1:9,845
Projection: NZGD 2000 New Zealand Transverse Mercator

Map Notes / Comments:
This map is for graphical purposes only. While every effort has been made to ensure that the data are accurate and reliable, Marshall Day Acoustics cannot assume liability for errors or omissions in the data graphically represented.
The noise contours produced by SoundPLAN are for graphical purposes only. The noise contours are generated by interpolations of calculated grid points (spacing typically 5-25m), with varying interpolation accuracy. Therefore, the calculated noise level at a given point may differ from that implied by the noise contours when the reader interpolates between two contour lines. It is therefore not recommended that high-resolution noise level predictions are based on noise contour interpolation.

GREYMOUTH AERODROME FUTURE NOISE CONTOURS

Future Noise Contours

- 55 dB Ldn (Proposed OCB)
- 60 dB Ldn
- 65 dB Ldn

Client:
West Coast Regional Council

Authors:
Steve Peakall

Date of Issue:
12/05/2022 3:25 PM

Drawing Details:
Scale: 1:5,159
Projection: NZGD 2000 New Zealand Transverse Mercator

Map Notes / Comments:
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WESTPORT AIRPORT
FUTURE NOISE CONTOURS

Future Noise Contours

- 55 dB Ldn (Proposed OCB)
- 60 Ldn
- 65 Ldn

Client:
West Coast Regional Council

Authors:
Steve Peakall

Date of Issue:
12/05/2022 3:25 PM

Drawing Details:
Scale: 1:9,423
Projection: WGS 1984 Web Mercator Auxiliary Sphere

Map Notes / Comments:
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KARAMEA AERODROME FUTURE NOISE CONTOURS

Future Noise Contours

- 55 Ldn (Proposed OCB)
- 60 Ldn
- 65 Ldn

Client:
West Coast Regional Council

Authors:
Steve Peakall

Date of Issue:
12/05/2022 3:25 PM

Drawing Details:
Scale: 1:11,052
Projection: WGS 1984 Web Mercator Auxiliary Sphere

Map Notes / Comments:
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The noise contours produced by SoundPLAN are for graphical purposes only. The noise contours are generated by interpolations of calculated grid points (spacing typically 5-25m), with varying interpolation accuracy. Therefore, the calculated noise level at a given point may differ from that implied by the noise contours when the reader interpolates between two contour lines. It is therefore not recommended that high-resolution noise level predictions are based on noise contour interpolation.