MEMO

MARSHALL DAY Acoustics

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INTRODUCTION

To monitor the noise impact of flight path changes related to the Divergent Missed Approaches Protection Systems (DMAPS), WIAL installed a temporary noise monitor in a residential area affected by the changes. The monitor supplied by Envirosuite, was installed at a residential address in Khandallah and has been providing data to WIAL's operations and noise monitoring database (ANOMS) since 28 October 2022.

The monitor recorded noise levels for approximately five weeks prior to the DMAPS flight path changes commencing on 1 December 2022 and will continue to measure until the end of February 2023 unless this date is reviewed.

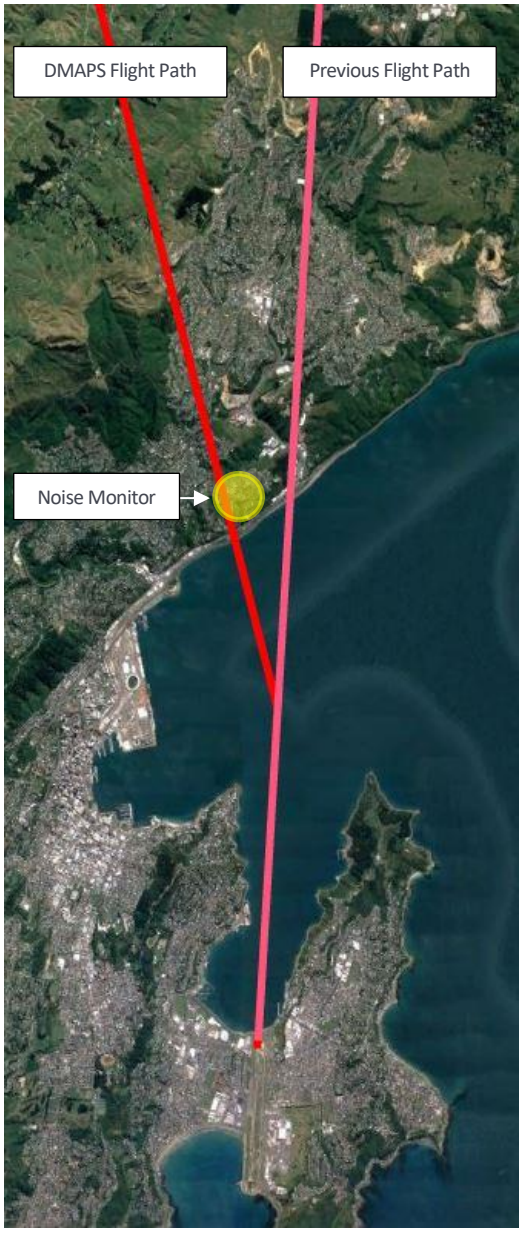
The monitor measures noise levels continuously and the data is uploaded to WIAL's noise monitoring database managed by Envirosuite. Aircraft operations data including actual flown flight paths is also uploaded to the database. The Envirosuite software correlates measured noise events at the monitors with aircraft within close range at the time of the event. The monitor in Khandallah also records audio files of noisy events which can be played back to help identify the noise source. We have analysed data from the noise monitor in Khandallah to quantify the change in noise resulting from the DMAPS flight paths. This memo summarises our findings.

This follows earlier modelling carried out before DMAPs to predict the noise effects of the flight path changes, which predicted any impacts would be within reasonable limits. The noise monitoring results verify our earlier assessment.

FLIGHT PATH CHANGE FOR DOMESTIC AND INTERNATIONAL JET DEPARTURES

The DMAPS flight path changes involve a number of new departure flight paths. The change affecting Khandallah and nearby suburbs is the altered flight path for jet departures to the north (using Runway 34). Previously the published flight path for jet aircraft heading to Auckland or Trans-Tasman destinations would track directly north over Johnsonville and Newlands areas. The new DMAPS flight path turns while over the harbour to the north west, and then overflies Khandallah and Broadmeadows. Figure 1 illustrates the change. WIAL's temporary noise monitor is in Khandallah in the yellow area shown in Figure 1.

Figure 1: Change in Trans-Tasman and Domestic Jet Flight Path



In practice aircraft did not all fly on the published departure flight paths prior to the introduction of DMAPS. Aircraft heading to Auckland would generally continue on the straight flight path however aircraft heading to southern destinations would often turn west off the published flight path before reaching Newlands and would overfly Khandallah and surrounding areas. Figure 2 shows the spread of A320 jet departure flight paths prior to the introduction of DMAPS.

Since DMAPS was introduced on 1 December 2022, aircraft have generally followed the new published flight path although some aircraft heading to southern destinations still turn west early and overfly the city. Figure 3 shows the spread of A320 flight paths since DMAPS was introduced.

Figure 2: A320 flown departure flight paths before DMAPS (Oct – Nov 2022)

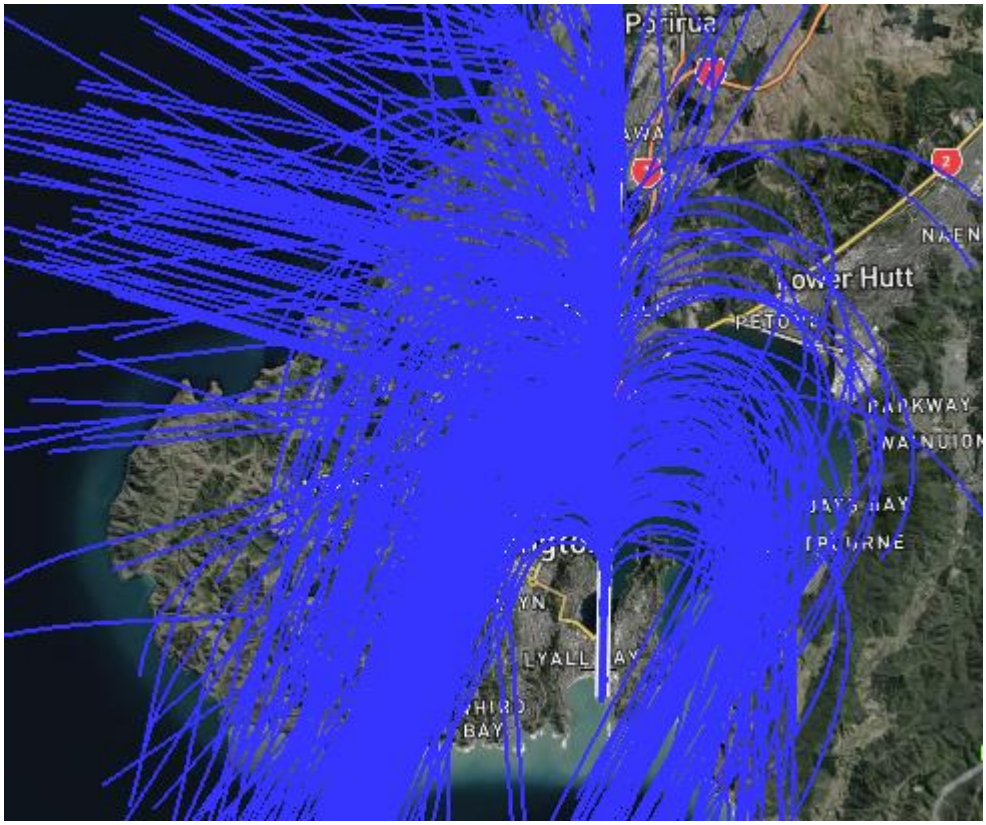
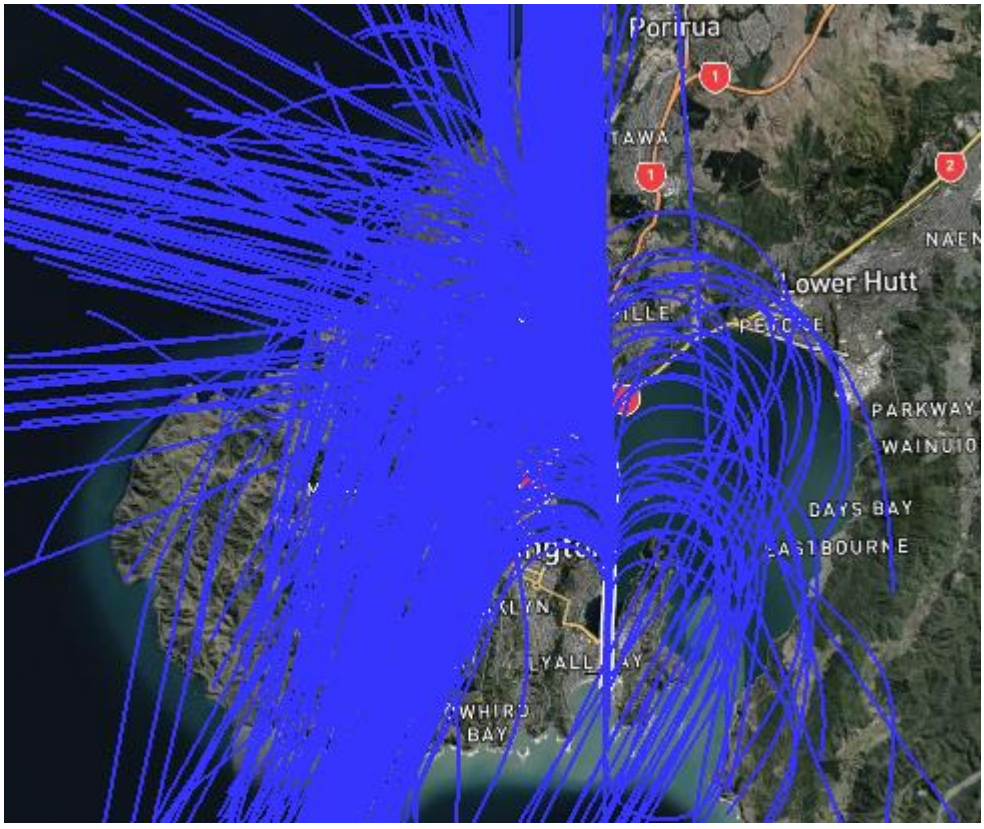


Figure 3: A320 flown departure flight paths with DMAPS (Dec 2022 – Jan 2023)

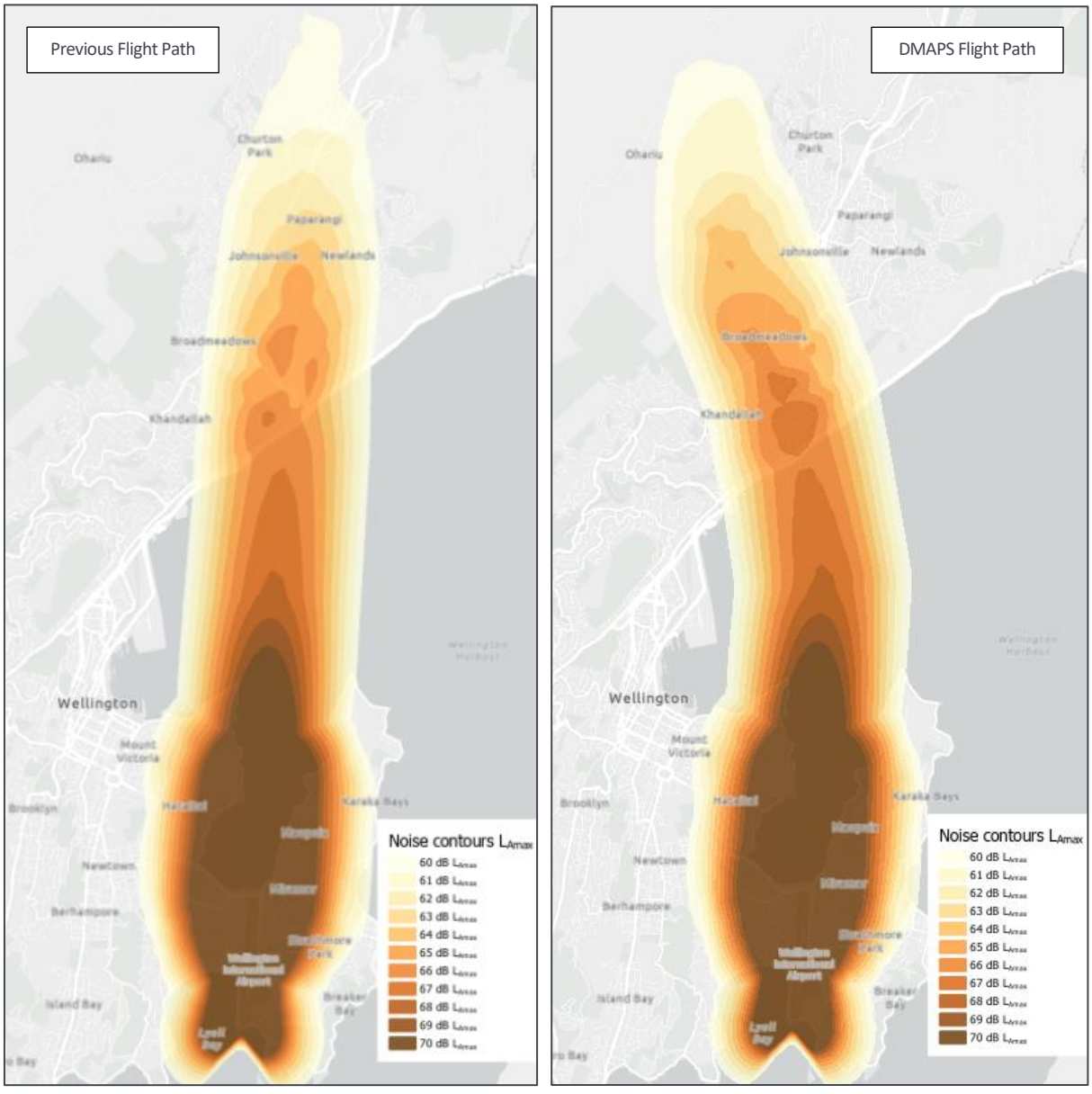


CHANGE IN NOISE

The impact of the changes would be noticed by residents under the new departure flight path only during northerly wind conditions when aircraft take-off towards the north. In southerly wind conditions, aircraft approach the airport from the north to land and there has been no change to the arrival flight paths.

We undertook a noise modelling study prior to DMAPS to predict the noise effects of the flight path changes. Figure 4 compares the extent of the L_{Amax} noise contours for a jet departure to Auckland on the previous and new flight paths.

Figure 4: Modelled noise contours (L_{Amax}) for A320 departure to Auckland before and after DMAPS



We can see from Figures 2 and 4 that the Khandallah and Broadmeadows areas were previously impacted by noise from jet departures prior to the introduction of DMAPS. We can also see from Figures 3 and 4 that DMAPS has likely resulted in higher noise levels and increased number of overhead jet flyovers for these areas. In contrast, Johnsonville and Newlands areas will have experienced reduced noise levels and fewer overhead jet departures.

To quantify the change in noise due to DMAPS, we have analysed the noise monitoring data from the Khandallah monitor and determined the following:

- Change in single event noise for A320 jet departures to Auckland
- Change in L_{dn} (24 hour noise exposure) for days during northerly winds

The results are summarised in Table 1 and Table 2. The *Before DMAPS* data is from 21 October to 30 November 2022. The W*ith DMAPS* data is from 1 December 2022 to 31 January 2023.

Table 1: Measurement results for A320 departures to Auckland at Khandallah noise monitor

	Average Sound Exposure Level	Average Maximum Level
Before DMAPS	80.6	69.8
With DMAPS	81.8	71.4
Increase	1.2 dB L_{AE}	1.6 dB L_{Amax}

Table 2: Measurement results for Runway 34 days (northerly winds) at Khandallah noise monitor

	Average L_{dn}
Before DMAPS	49.3
With DMAPS	51.4
Increase	2.2 dB L_{dn}

The results show that single event noise levels increased by less than 2 decibels which is generally an imperceptible increase in noise. The overall noise exposure on days where Runway 34 was used, increased by 2.2 dB L_{dn} which is likely due to a combination of increased single event levels and increased number of overhead flights. A two decibel increase in noise exposure is not considered significant. The long term aircraft noise exposure includes days when Runway 16 is used and there is no change to the flight paths over the Khandallah and Broadmeadows areas on these days.

In summary, our analysis of the noise impact of the DMAPS flight path change over the Khandallah area shows a slight increase of 1 – 2 dB in single event and L_{dn} noise exposure levels.

GLOSSARY OF TERMS

dB	Decibel. The unit of sound level.
L_{AE}	Exposure Level. An A-weighted measure of the total sound energy over a certain time period, compressed into 1 second. Used to describe the sound energy of a single event, such as a train pass-by or an aircraft flyover.
L_{Amax}	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time–weighting i.e. L_{AFmax}
L_{dn}	The day-night sound level calculated from the measured L_{Aeq} over a 24 hour period with a 10 decibel penalty applied to the night-time period (2200-0700 hours)