

ANCCG Meeting

Monitoring Period
May 2019 – July 2019

Meeting: 2 September 2019



NB: Glossary of terminology given in Appendix A



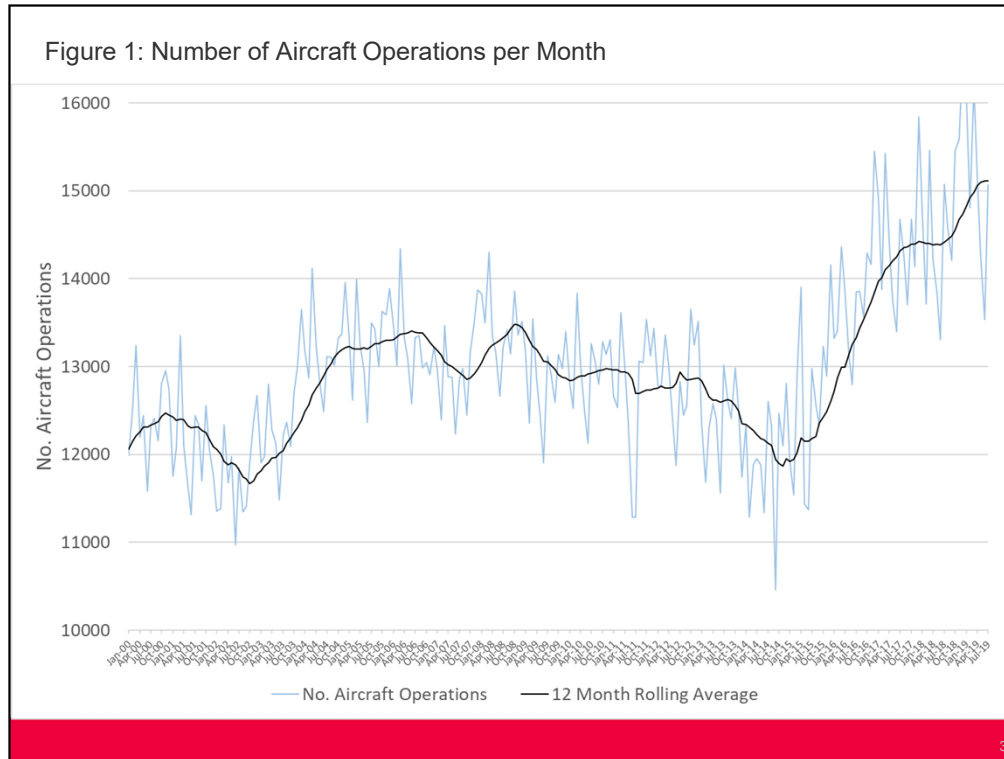


Figure 1 shows the number of aircraft operations per month since the year 2000 (blue line) and the 12 month rolling average (black line).

Aircraft operations have fluctuated over the years with a dip in 2002 and 2014.

Since 2015 aircraft operations have increased steadily.

The number of aircraft operations in the three month period May 2019 to July 2019 has increased by 1% when compared to the same period last year.

Daytime operations have increased by 1% and night-time operations have increased by 2% when compared to the same period last year.

Table 1: Summary of Aircraft Operations

Operation	Total	Day	Night
Arrivals	21,401	18,347	3,054
Departures	21,372	19,492	1,880
Circuit	87	82	5
Total	42,860	37,921	4,939

Table 2: Average Daily Aircraft Operations

Total	Day	Night
466	412	54

Table 1 shows a breakdown of aircraft operations in the three month period May 2019 to July 2019.

Table 2 shows that there were on average 466 aircraft operations that occurred per day (24 hour period), 54 of these were at night-time.

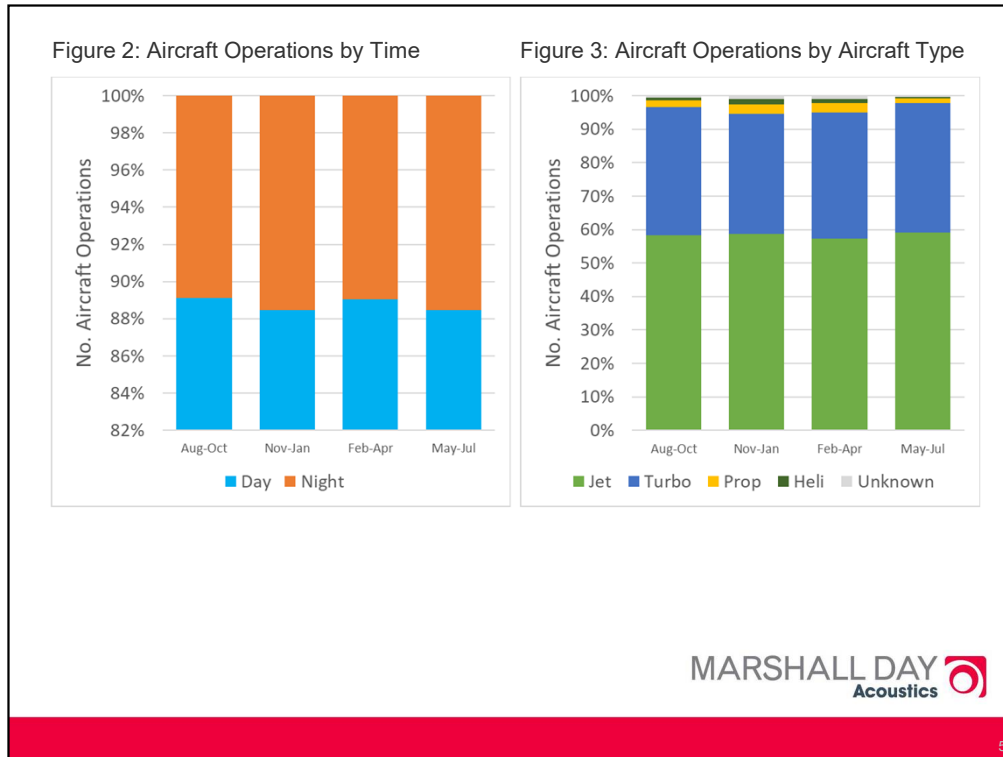


Figure 2 shows the breakdown of aircraft operations by time of day for the three month period May 2019 to July 2019 and the three quarters preceding.

For the three month period May 2019 to July 2019 the majority (88%) of aircraft operations occurred in the daytime between 7am and 10pm and the remainder (12%) occurred at night-time.

This was similar to previous quarters.

Figure 3 shows the breakdown of aircraft operations by aircraft type in the three month period May 2019 to July 2019 and the three quarters preceding.

For the three month period May 2019 to July 2019 the majority (59%) of aircraft operations were jets with 39% being turboprops.

Propeller and helicopter aircraft made up less than 2% of the total aircraft operations during this period.

This was similar to previous quarters.

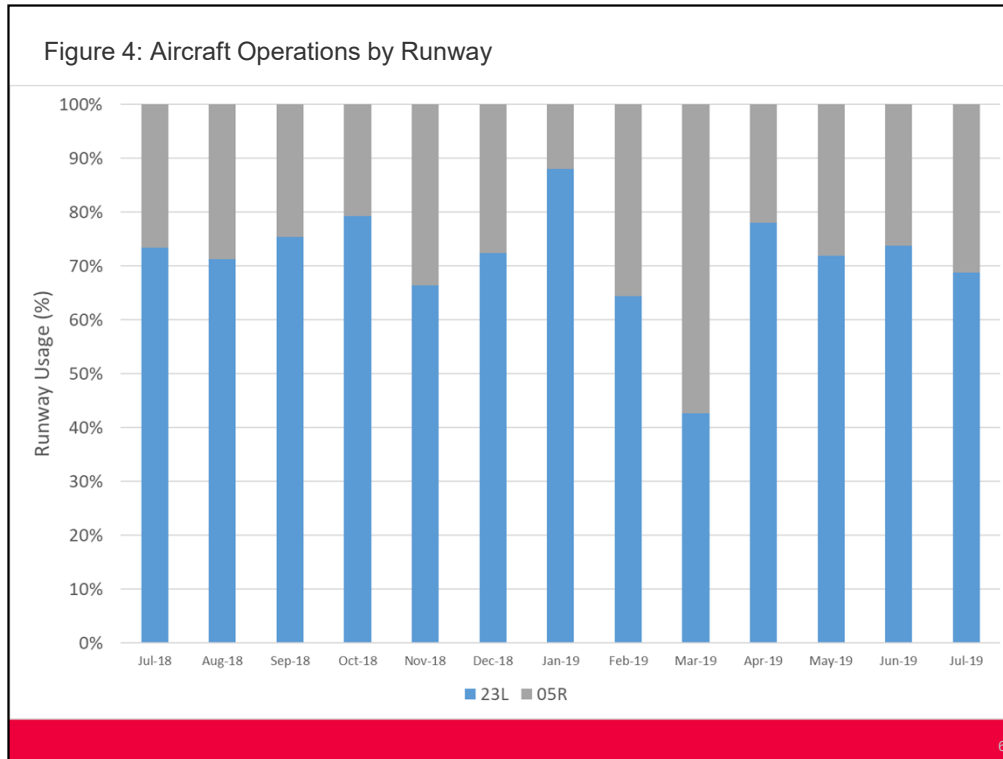


Figure 4 shows the percentage of aircraft operations that used each runway (23L and 05R) over the past 13 months.

Runway 23L is used when westerly winds prevail and Runway 05R is used when easterly winds prevail (refer glossary for explanation)

The historical average runway usage is RW23L 70%/RW05R 30%

The runway usage in the three month period May 2019 to July 2019 was RW23L 71%/RW05R 29%.

The runway use in the same quarter last year was RW23L 72%/RW05R 28%

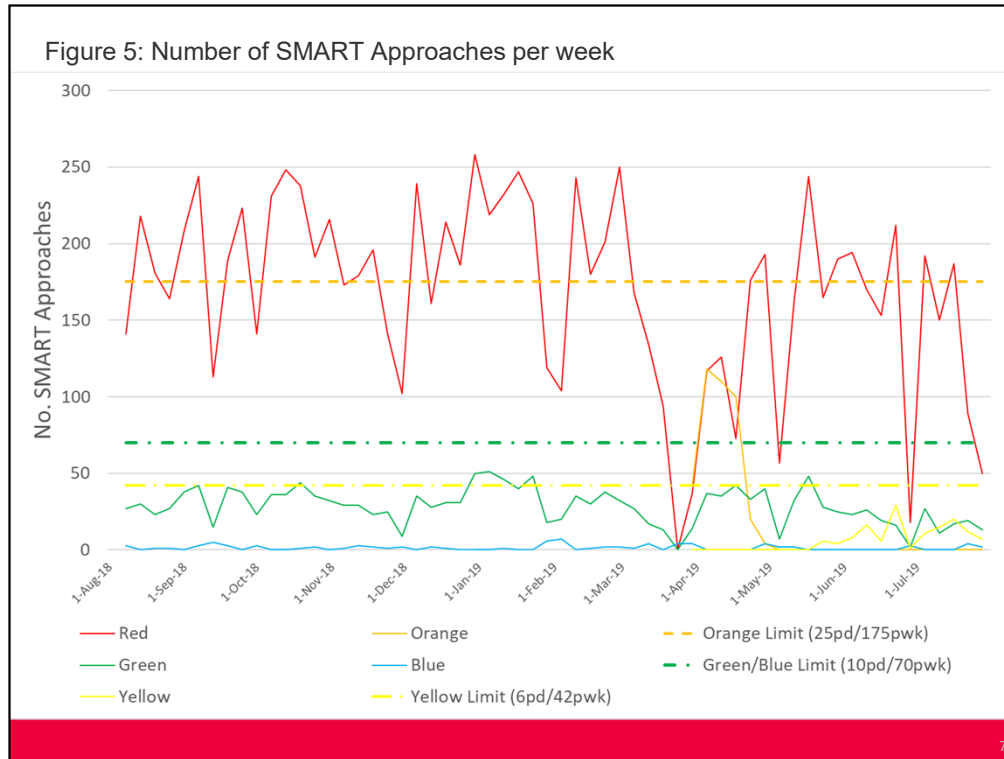


Figure 5 shows the number of SMART flights flown in the past 12 months.

The SMART Approaches are named as follows:

- Blue X05A – International arrivals from the north on Runway 05R overflying Lynfield
- Green X23A - International arrivals from the north on Runway 23L overflying Highbrook
- Yellow U23 - International arrivals from the north on Runway 23L overflying Whitford
- Red – Domestic arrivals from the south on Runway 23L overflying Wattle Downs
- Orange S23 – Domestic arrivals from the south on Runway 23L overflying Clevedon

There is a limit of:

- 10 SMART approaches per day on the Green and Blue SMART approaches
- 6 per day on the Yellow SMART approach
- 25 per day on the Orange SMART approach

This limit has been complied with over the past 12 months.

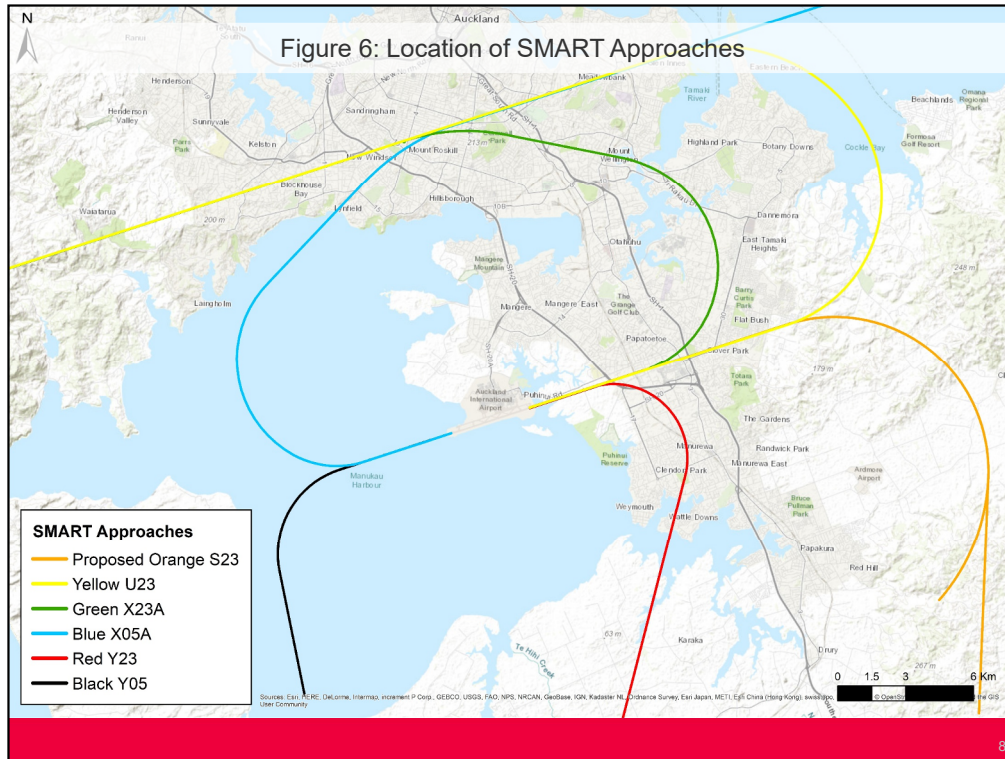


Figure 6 shows the location of the SMART approach flight paths.



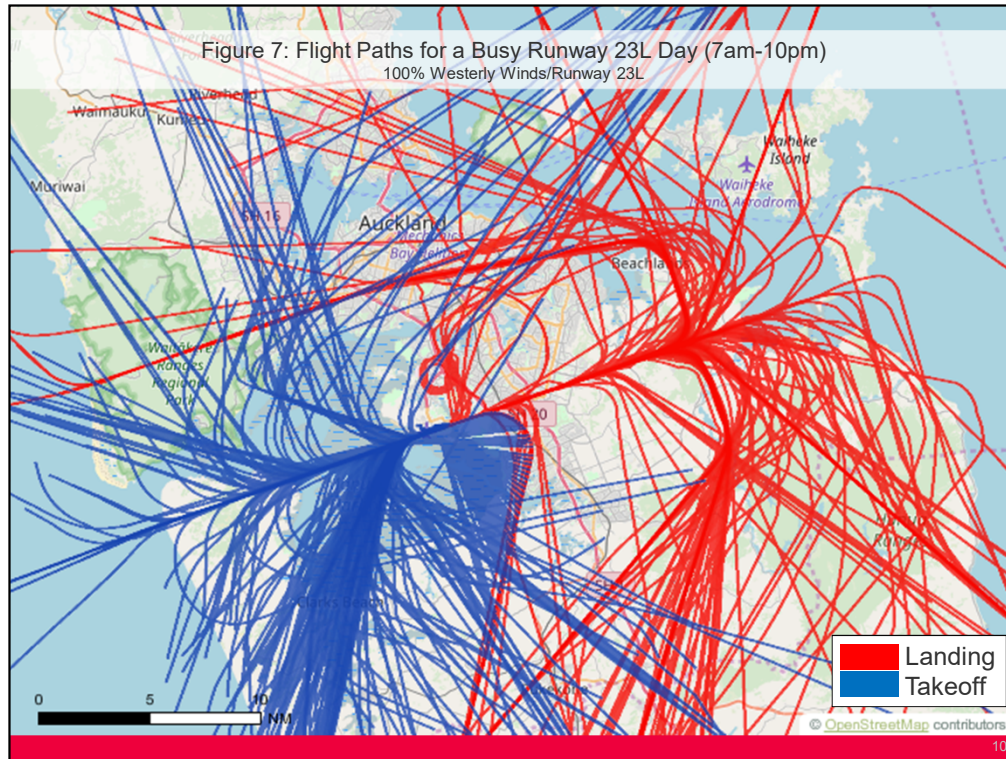


Figure 7 shows the daytime (7am-10pm) flight paths for Friday 5 July 2019, the busiest day in the three month period May 2019 to July 2019 when Runway 23L was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage during this day was Runway 23L (westerly) 100%.

There were 484 daytime flights on this day.

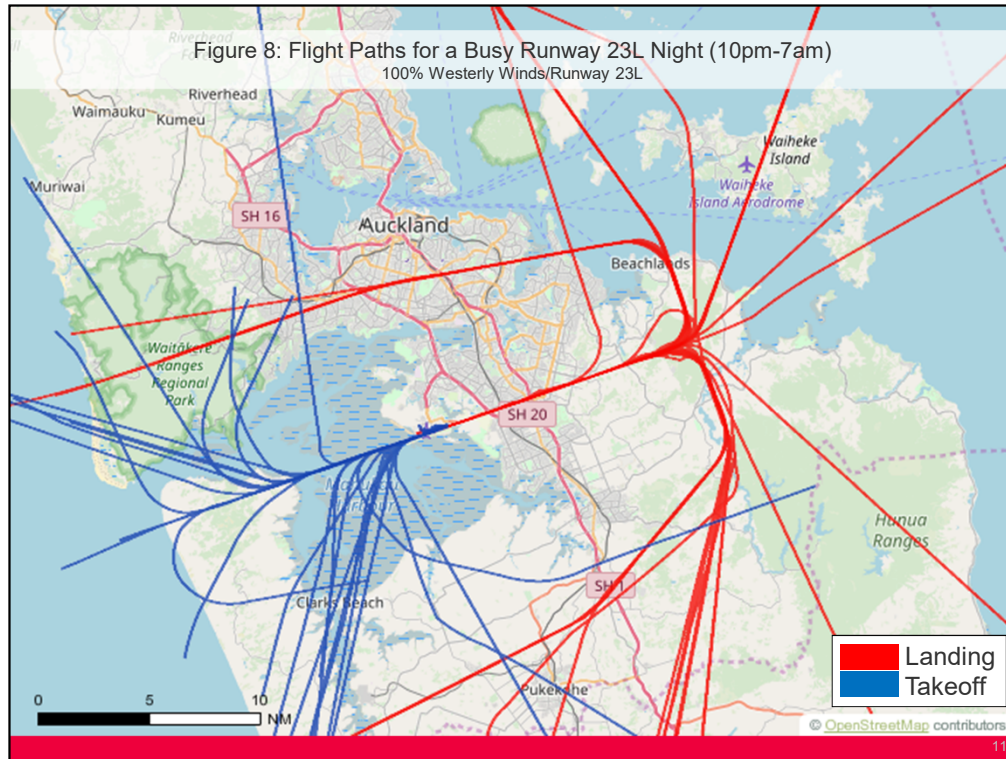


Figure 8 shows the night-time (10pm-7am) flight paths for Friday 5 July 2019, the busiest night in the three month period May 2019 to July 2019 when Runway 23L was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage during this night was Runway 23L (westerly) 100%.

There were 66 night-time flights on this night.

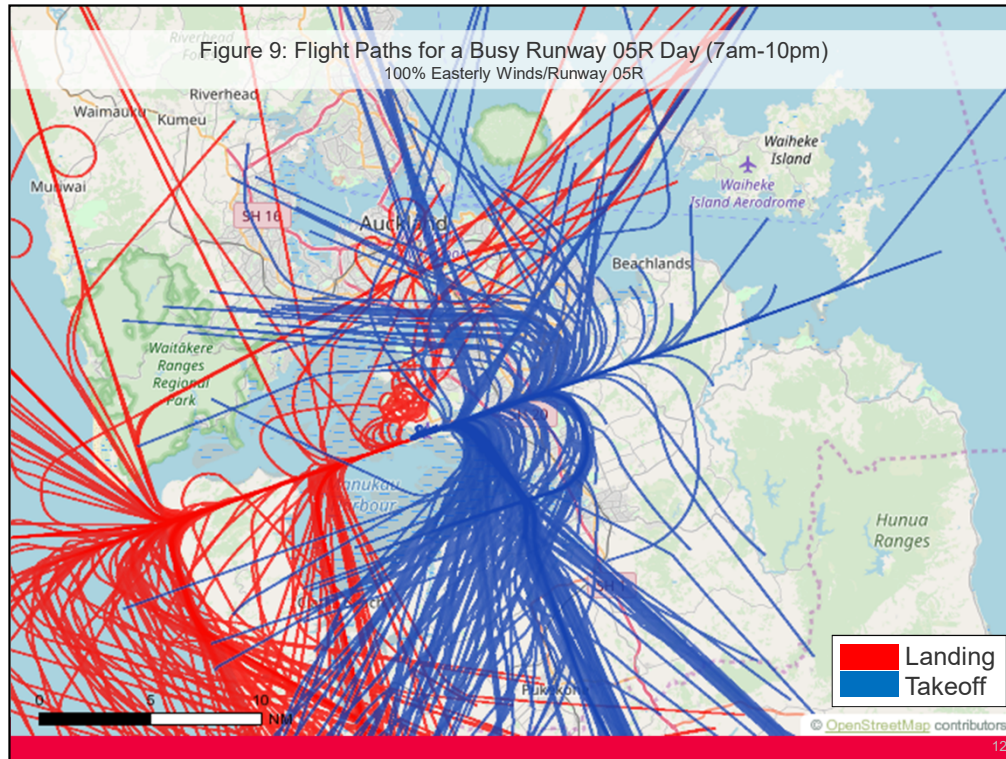


Figure 9 shows the daytime (7am-10pm) flight paths for Friday 26 July 2019, the busiest day in the three month period May 2019 to July 2019 when Runway 05R was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage during this day was Runway 05R (easterly) 100%.

There were 487 daytime flights on this day.

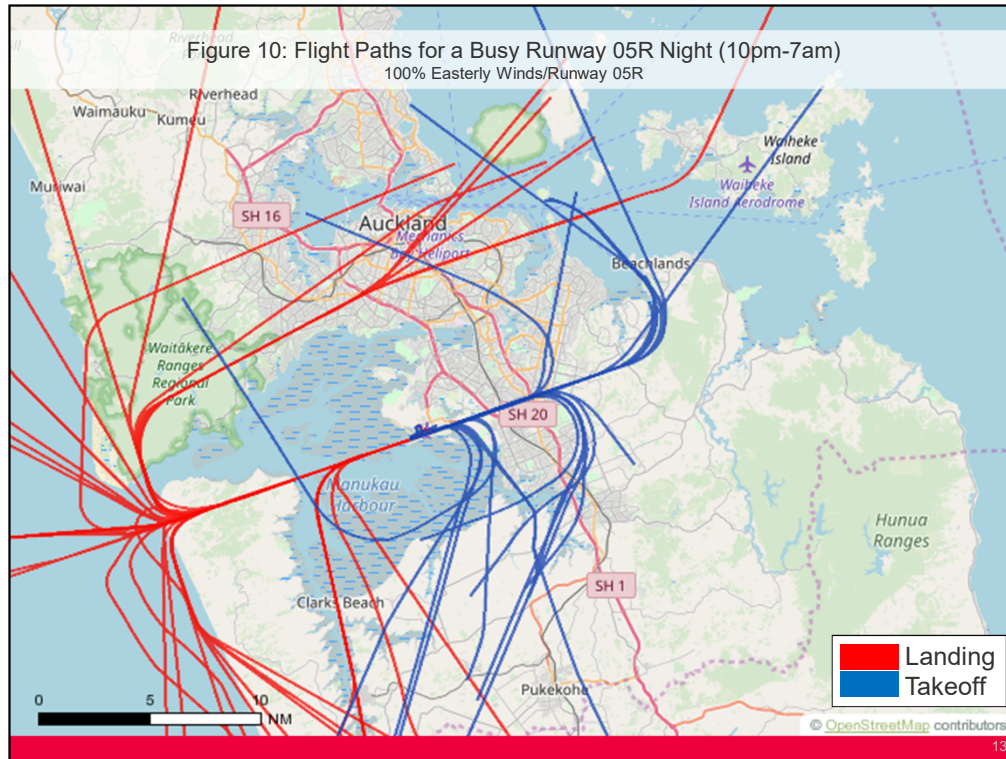
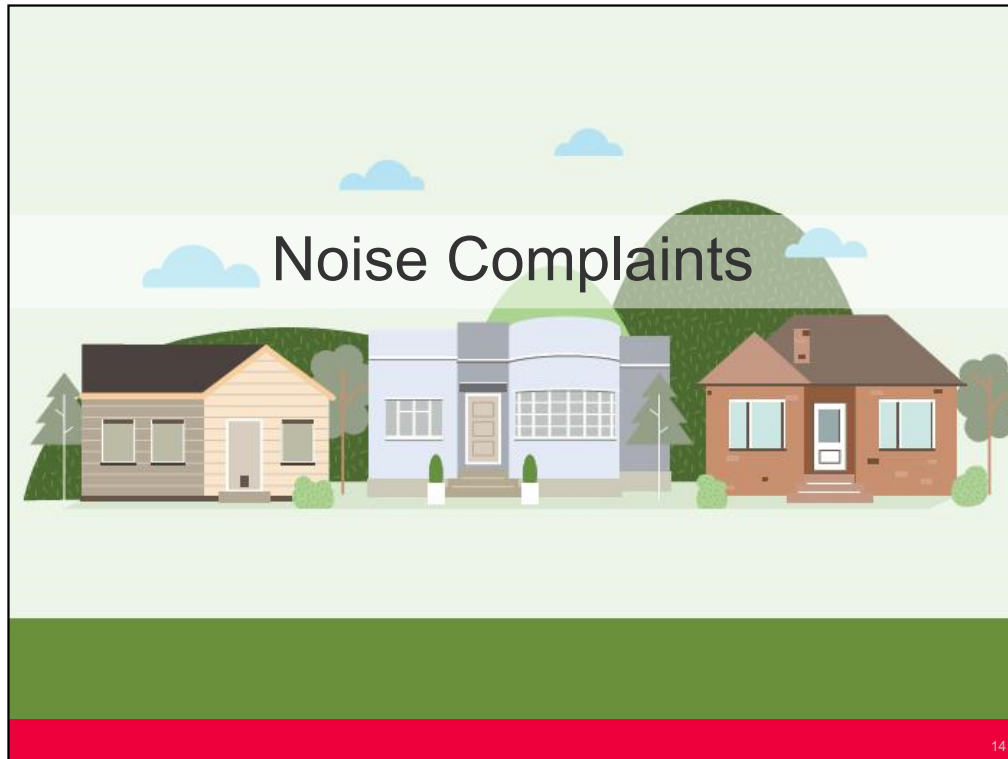


Figure 10 shows the night-time (10pm-7am) flight paths for Friday 26 July 2019, the busiest night in the three month period May 2019 to July 2019 when Runway 05R was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage during this night was Runway 05R (easterly) 100%.

There were 75 night-time flights on this night.



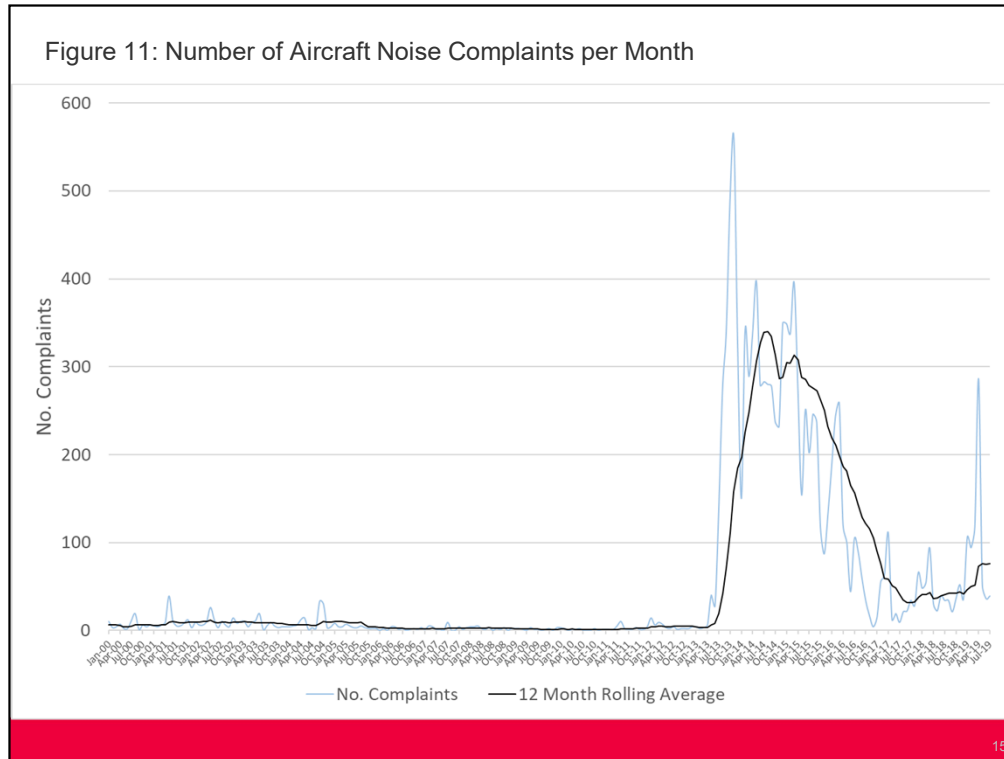


Figure 11 shows the total number of aircraft noise complaints made per month since the year 2000 (blue line) and the 12 month rolling average (black line).

Aircraft noise complaints were low up until 2013 when the number of complaints increased from about 2 per month to a peak of 560 in November 2013 and have decreased steadily since then.

This increase in complaints coincided with the 2012/13 SMART trials where community awareness to noise was heightened.

The number of noise complaints in the three month period May 2019 to July 2019 has increased from 95 to 126 when compared to the same period last year.

Table 3: Summary of Noise Complaints

	May	Jun	Jul	M-J	F-A	N-J	A-O
Number of Complaints	51	36	39	126	498	194	91
<i>Specific</i>	37	30	33	100	440	169	61
<i>Generic</i>	14	5	4	23	53	23	24
<i>Question</i>	0	1	2	3	5	2	6
Number of People Complaining	18	15	15	51	51	33	38

Note: One person made 36% (45) of the complaints for the three month period. This person was located in Papatoetoe.

Table 3 shows a breakdown of the noise complaints in the three month period May 2019 to July 2019 with the previous three quarters shown for reference.

A particular person, may have made several complaints over time. These individual complaints could have been regarding one specific aircraft operation or a more general complaint which does not reference a specific aircraft operation.

There are two types of general complaints, 'generic' and 'question'. The first relates to people lodging a general complaint about aircraft noise rather than a specific event, the second relates to people enquiring to ask for information about aircraft noise or management of noise. We therefore refer to:

- The number of 'complainants' (no. of people who complain),
- The number of 'generic' noise complaints (e.g. "there was more aircraft noise last night")
- The number of 'question' noise enquiries (e.g. "can you tell me more about how noise is managed at the airport")
- The number of 'specific' event complaints (e.g. "the 6:25pm flight was noisy")

There were a total of 126 complaints in the three month period May 2019 to July 2019, 79% related to specific aircraft events, 18% were generic complaints and 2% were question enquiries. One person made 36% (45) of the complaints for the three month period.

The number of complaints between May 2019 to July 2019 was lower than the

complaints received in the previous quarter (February to April).

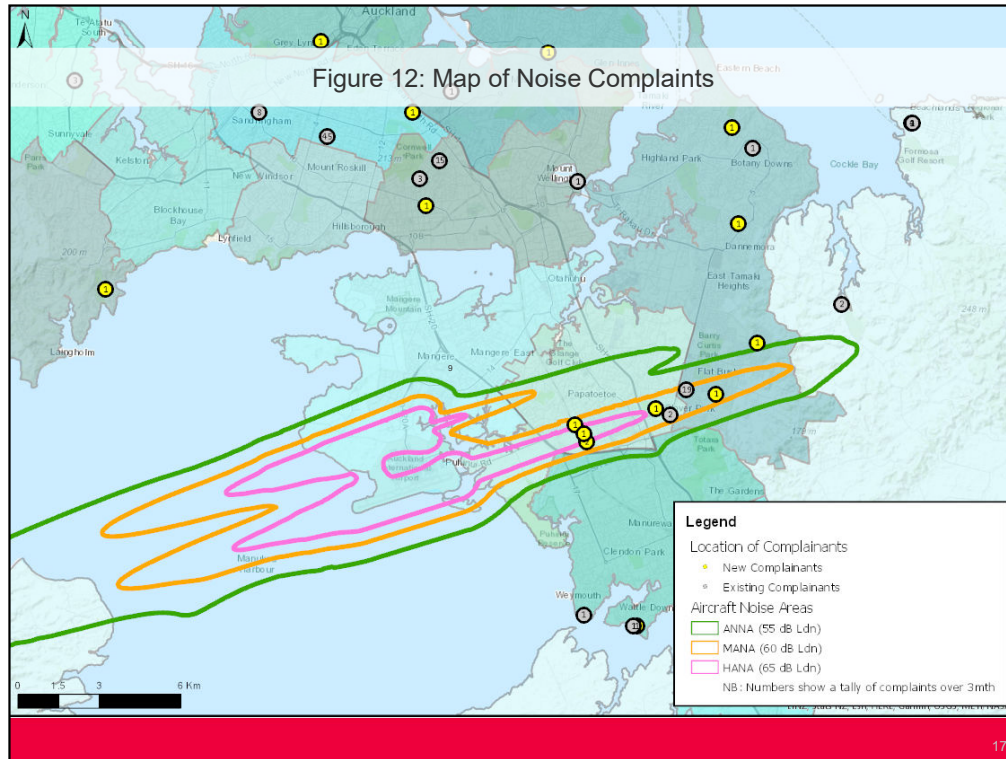


Figure 12 shows a map with the location of each complainant.

Each point represents the location of a person who complained in the three month period May 2019 to July 2019.

The colour of the point represents whether it was an existing complainant (grey - someone who has complained before) or a new complainant (yellow - someone who hasn't complained before).

The numbers on top of each point give the number of complaints made by each person in the three month period May 2019 to July 2019.

The complaints are spread all over Auckland. Two complainants in Torbay and Drury are not shown in the map.

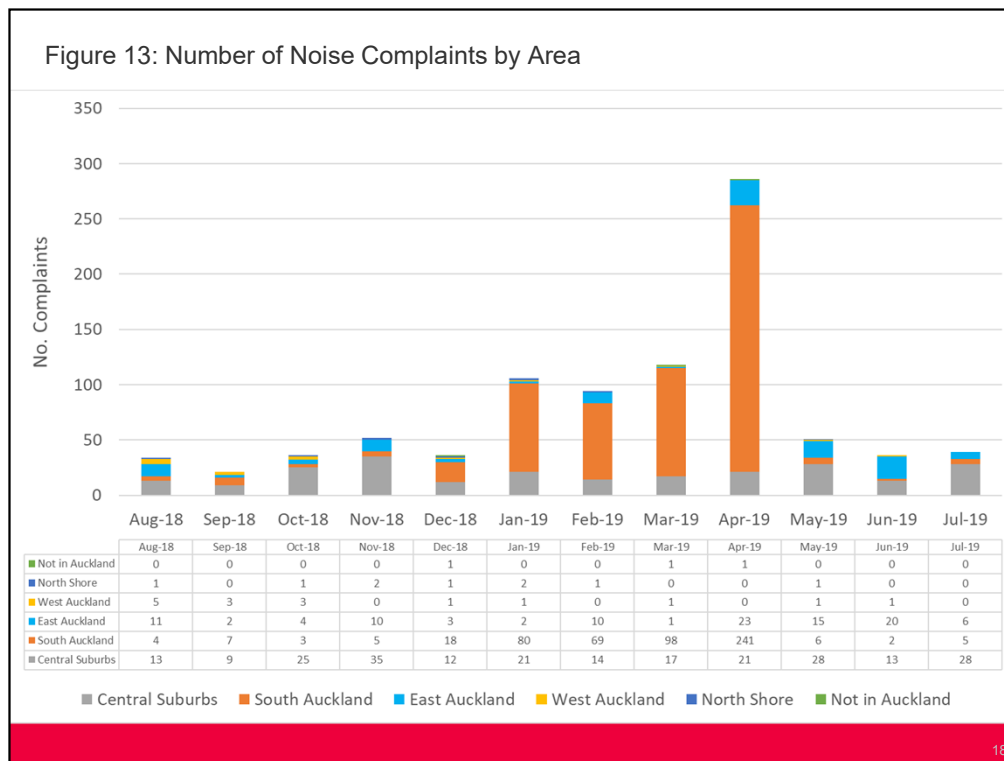
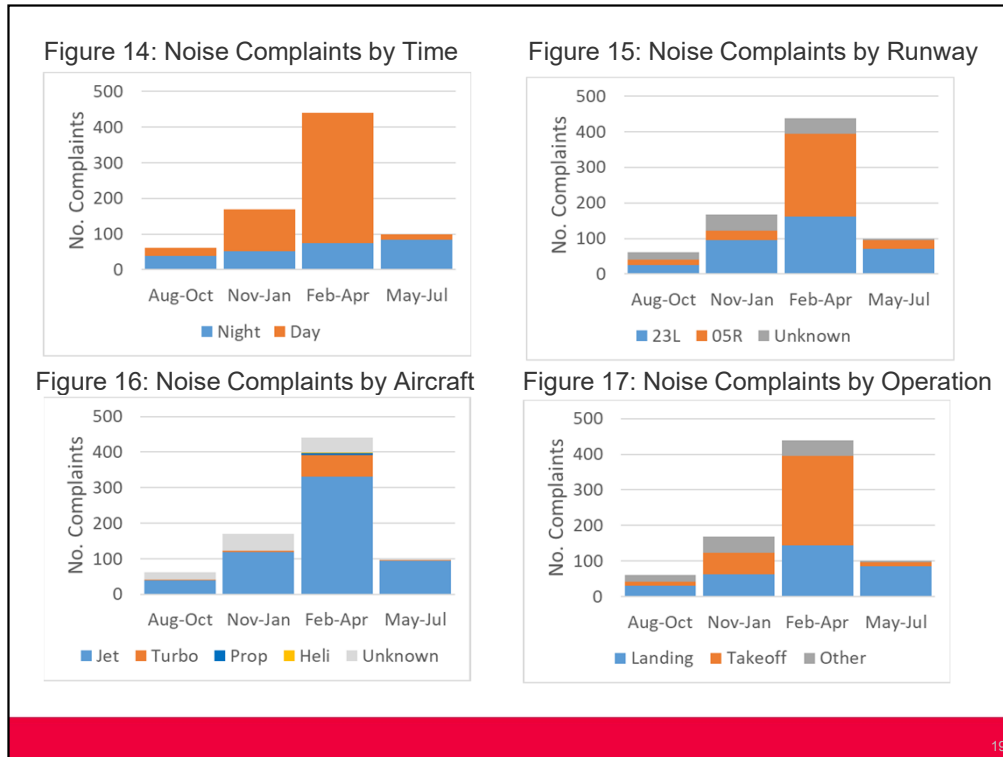


Figure 13 shows the number of complaints made by people residing in different areas of Auckland over the past 12 months.

The complaints in the three month period May 2019 to July 2019 were mainly from The Central Suburbs and East Auckland.

A list of which suburbs fall into each area is provided in Appendix C.



Figures 14-17 show a breakdown of the ‘specific’ aircraft noise complaints made in the three month period May 2019 to July 2019 and the three quarters preceding.

Night-time flights made up 67% of the complaints in the three month period May 2019 to July 2019. The majority of complaints related to jet arrivals on runway 23L.

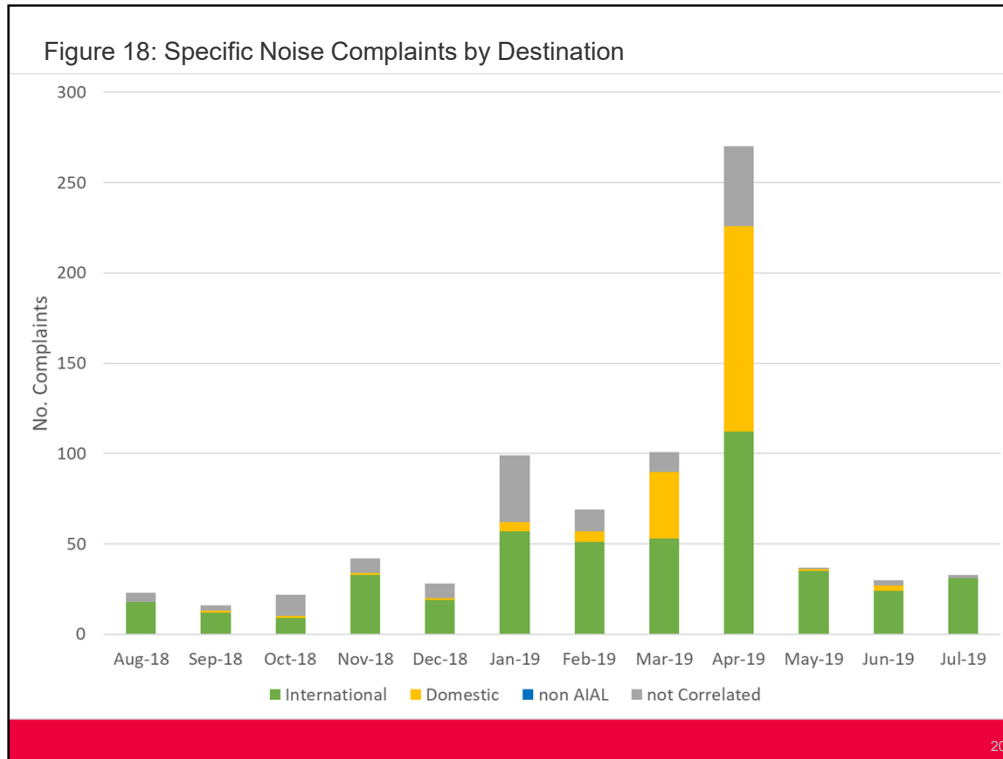


Figure 18 shows the number of specific aircraft complaints made about international and domestic flights over the past 12 months.

The complaints in the three month period May 2019 to July 2019 were mainly regarding international flights.

Note that a number of specific aircraft complaints were not matched with a flight.

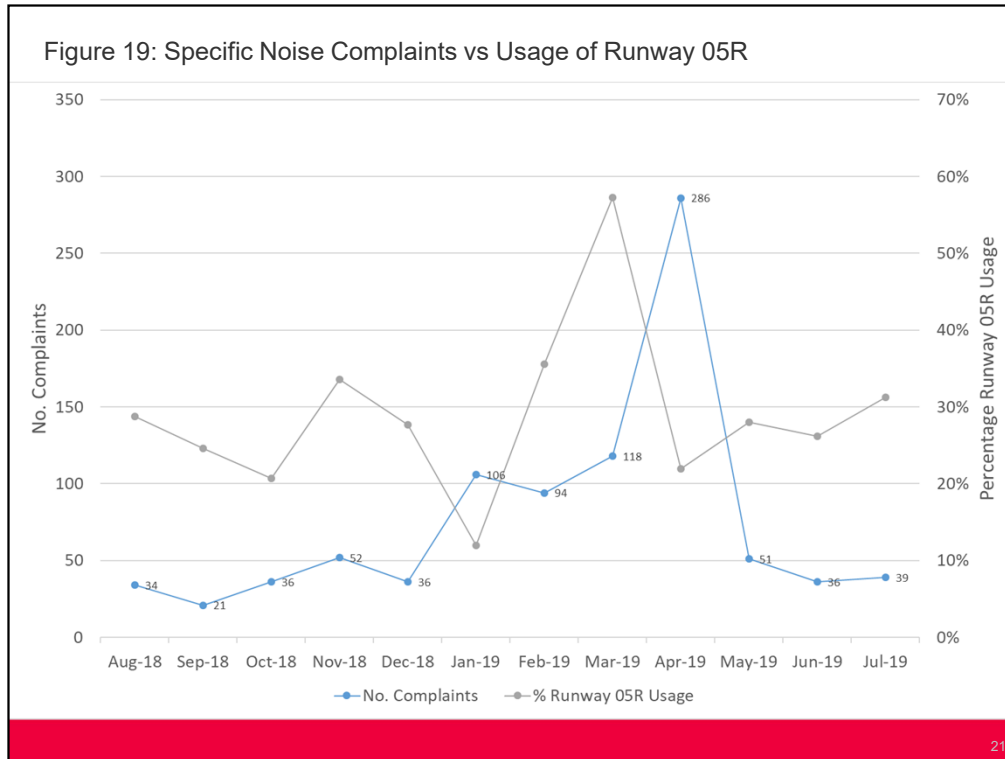


Figure 19 shows the number of specific noise complaints per month received in the past 12 months compared to the usage of Runway 05R.

In previous months there was a correlation between the usage of Runway 05R and the number of complaints.

However, due to a large number of complaints made by one person this trend is no longer obvious.

Usage of Runway 05R is associated with easterly winds which cause departing aircraft to depart to the east over populated areas instead of over the Manukau Harbour (as occurs in the predominant westerly winds).

Departing aircraft are generally louder than arriving aircraft.

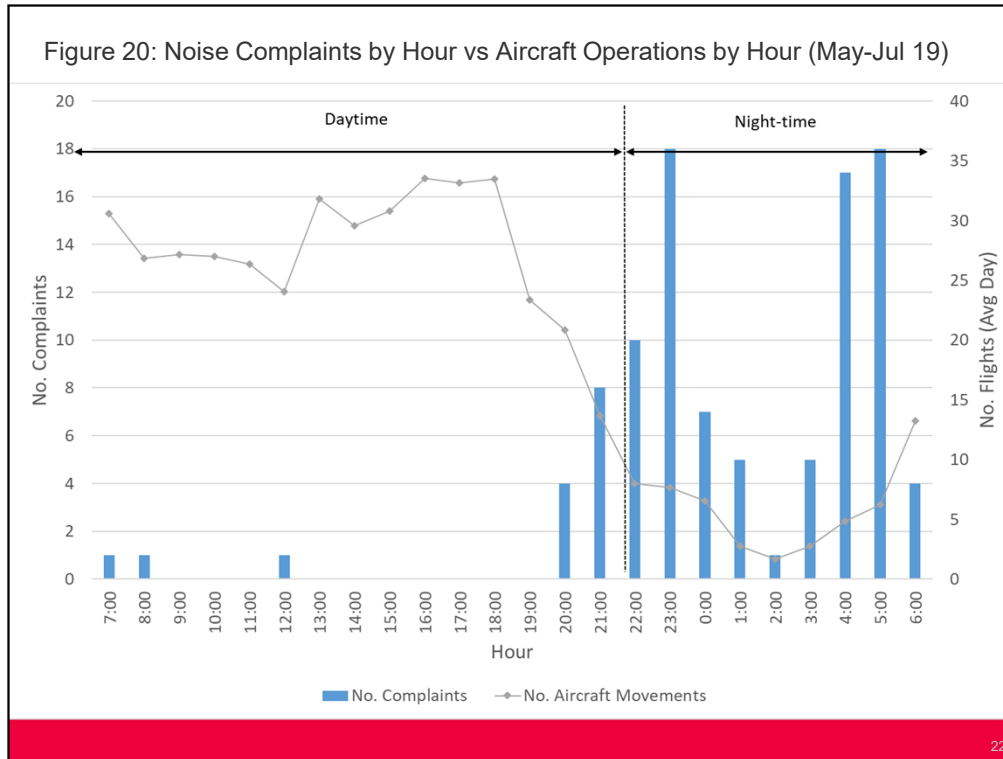


Figure 20 shows the number of specific aircraft noise complaints and the number of aircraft operations per hour.

The blue bars show the number of complaints that related to an aircraft operation in each hour of the day in the three month period May 2019 to July 2019.

The gray line shows the average daily aircraft operations that occurred in each hour of the day during this period.

The complaints were mainly at night. There is little correlation between the number of aircraft operations each hour and the number of complaints.

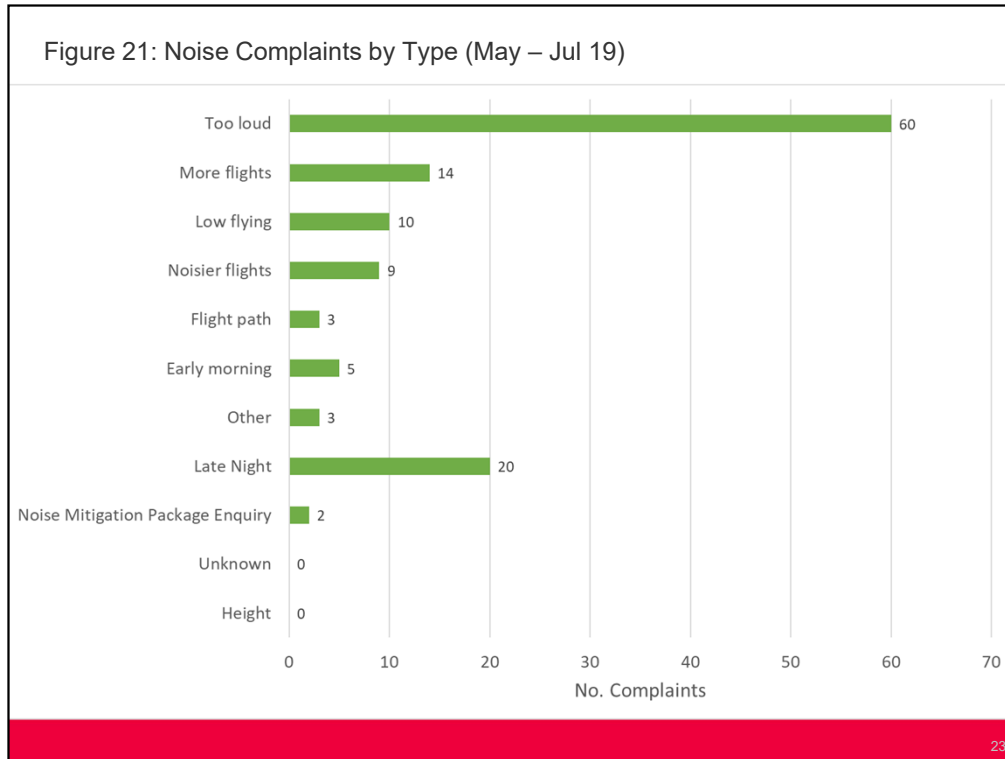


Figure 21 shows the reason for each noise complaint. This includes generic and specific complaints.

Aircraft operations being too loud was the main reason for the complaints (48%) in the three month period May 2019 to July 2019.

Late night flights and more flights were the second and third most prevalent reason. A full description of each cause is given in Appendix B.

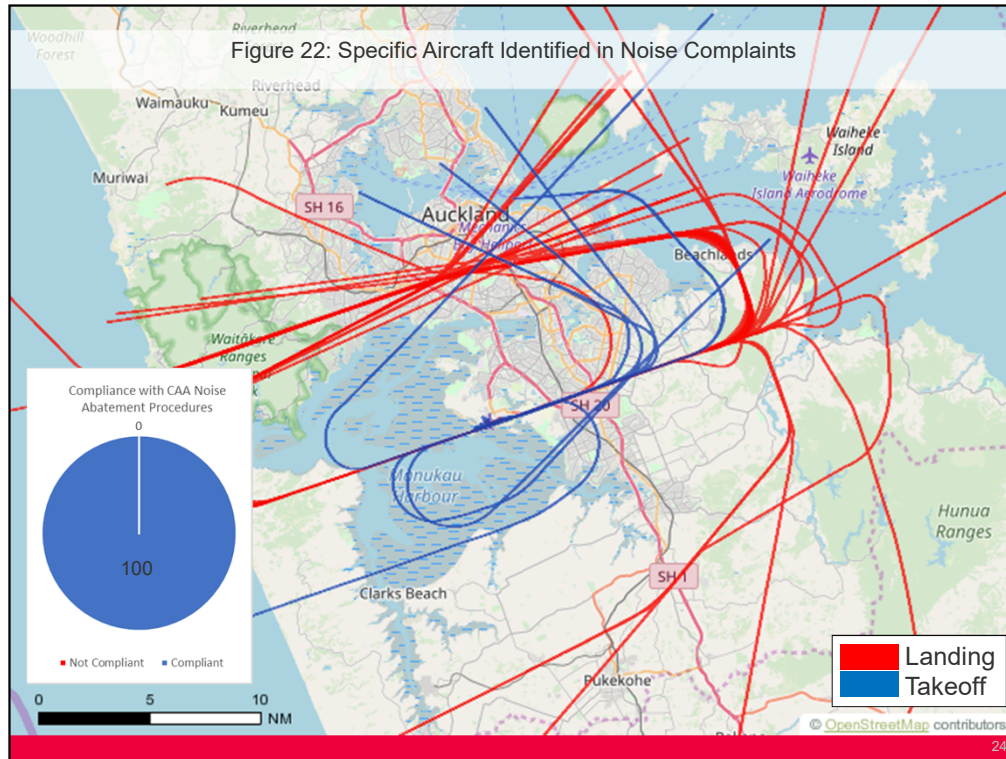


Figure 22 shows the flight paths for specific aircraft from Auckland Airport identified in noise complaints for the three month period May 2019 to July 2019.

The red lines indicate arrivals, the blue lines indicate departures.

There were 100 noise complaints that related to specific aircraft during this period. All 100 of these operated out of Auckland Airport – the 100 Auckland Airport aircraft events have been reviewed and all of them complied with the Civil Aviation Authority Noise Abatement Procedures.

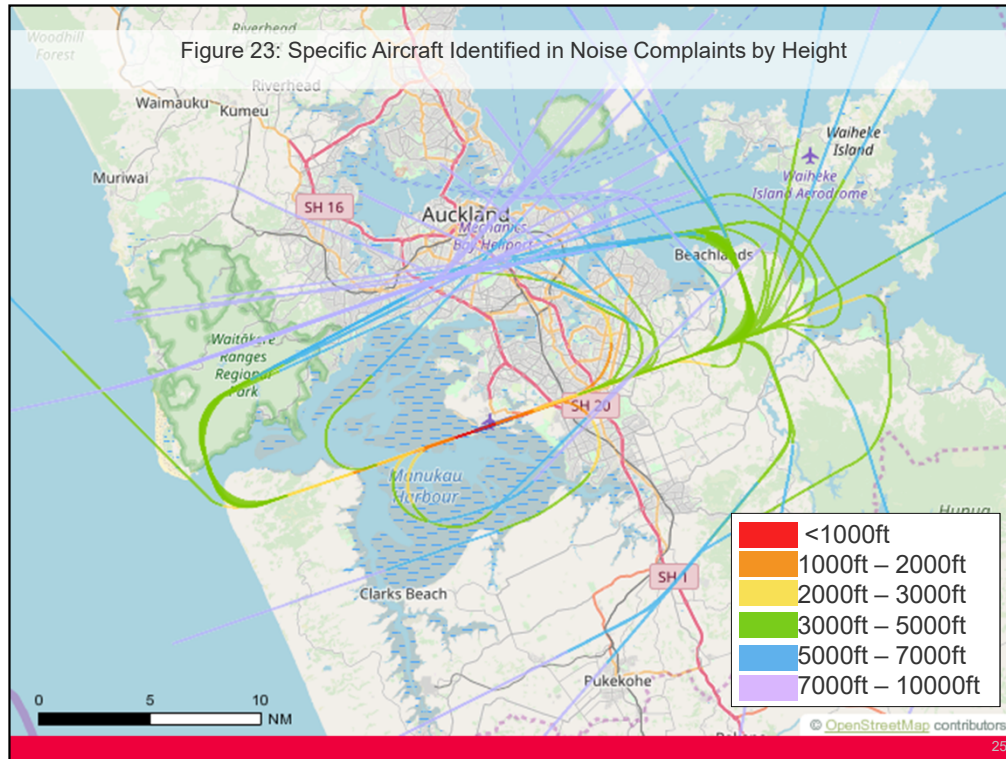


Figure 23 shows the flight paths for the 100 specific aircraft identified from Auckland Airport in noise complaints for the three month period May 2019 to July 2019. The flight paths are shown in terms of altitude.



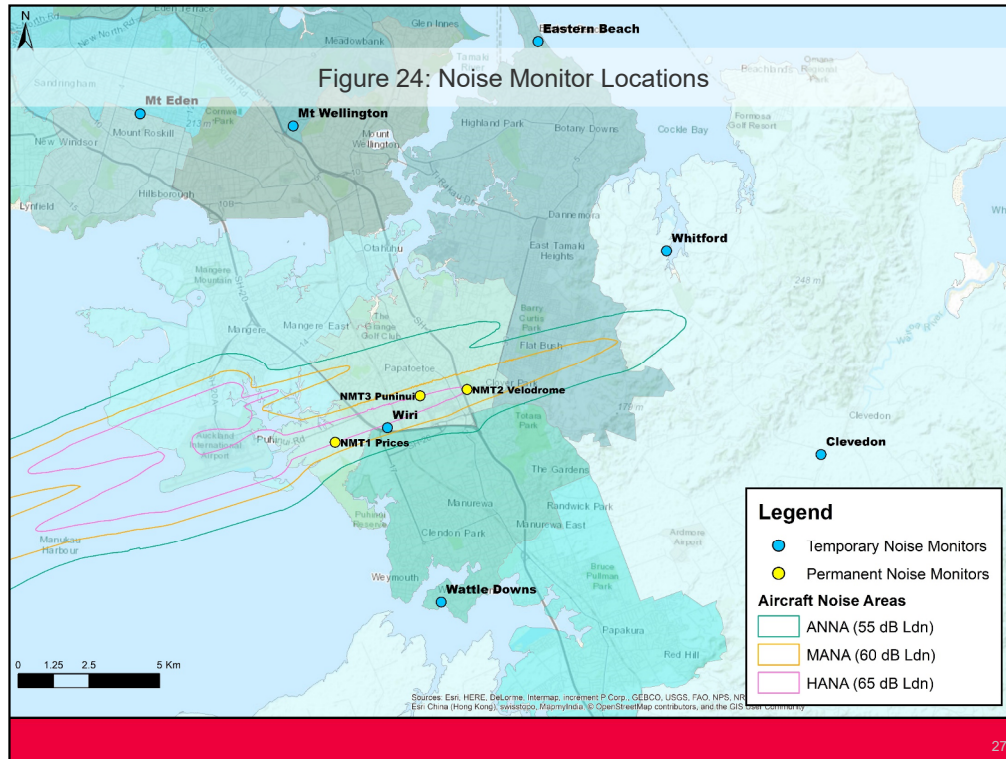


Figure 24 shows the location of Auckland Airport's three permanent and seven temporary noise monitors.

All of the permanent noise monitors are located on the outer boundary of the HANA which is set at 65 dB L_{dn} for future aircraft operations.

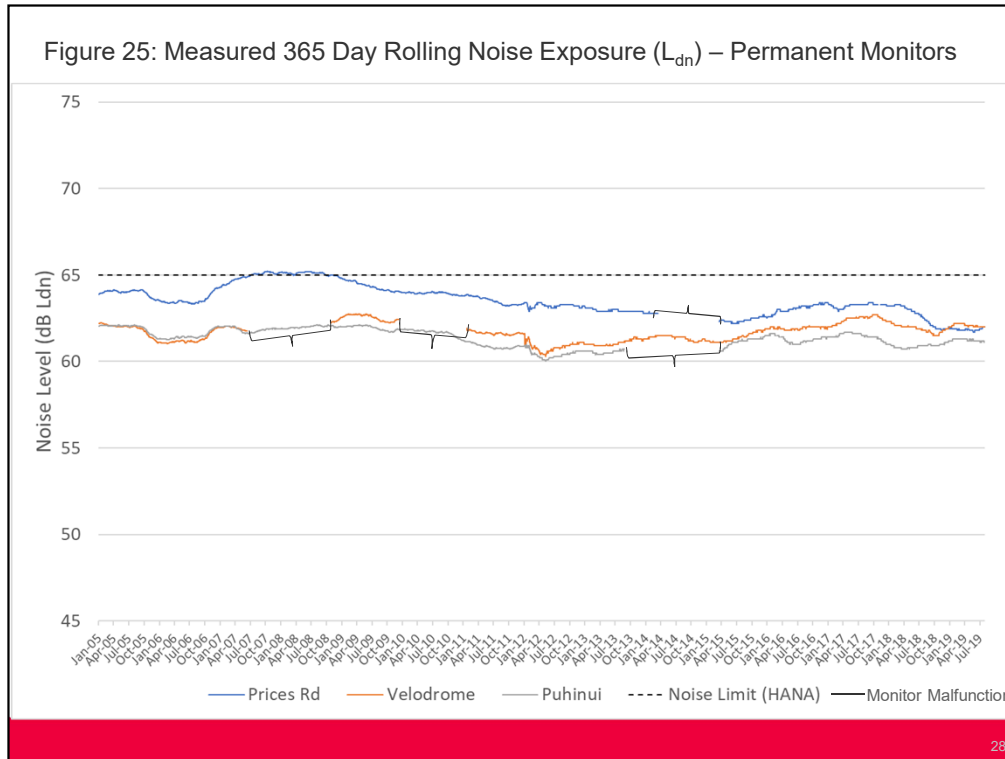


Figure 25 shows the rolling 365 day Noise Exposure (L_{dn}) at the permanent noise monitors since January 2005.

The noise limit in the District Plan is 65 dB L_{dn} (rolling 365 day) at the boundary of the HANA.

The rolling 365 day L_{dn} is the average L_{dn} noise level over 365 days calculated each day and is the overall average L_{dn} for the 365 days preceding and including the day of the calculation.

For example the point for 31 December 2005 represents the average L_{dn} noise level from 1 January 2005 to 31 December 2005.

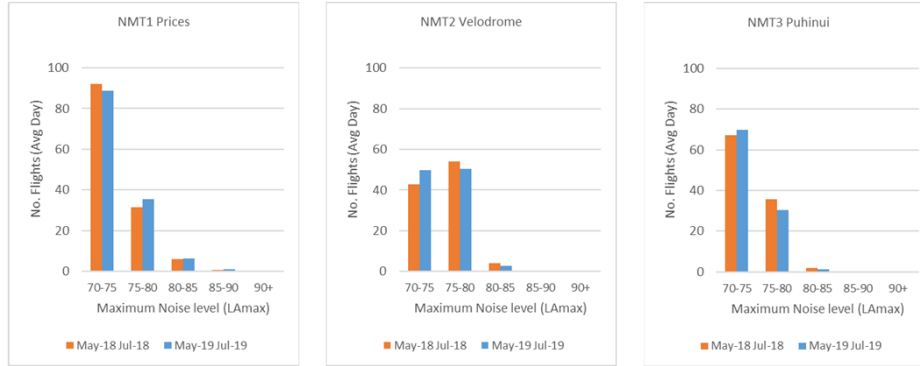
The rolling 365-day L_{dn} was below the 65 dB L_{dn} noise limit in the three month period May 2019 to July 2019.

The noise levels in the three month period May 2019 to July 2019 have decreased by 0.5 dB at Prices Rd and increased by 0.2 dB at the Velodrome and at Puhinui compared to the same quarter last year.

The noise levels in the three month period May 2019 to July 2019 are 1 to 3 dB lower than in 2007/2008 when noise levels were highest.

A change in noise level of 1 to 2 dB is not generally perceptible to the human ear.

Figure 26: Number of Aircraft Noise Events in Each Noise Band
Permanent Monitors (L_{Amax} – Maximum Noise Level)



NB: Aircraft noise events over 70-75 L_{Amax} start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

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Figure 26 shows the average daily number of aircraft that overflow each permanent noise monitor in each noise band in the three month period May to July in 2018 (Orange bars) and 2019 (Blue bars).

L_{Amax} is the maximum noise level experienced as an aircraft overflies a monitor. The permanent noise monitors receive 101-131 events above 70 L_{Amax} per day.

Table 4: Correlation of Aircraft Operations with Captured Noise Events
Permanent Monitors

	NMT1 Prices	NMT2 Velodrome	NMT3 Puhinui
Total Aircraft Operations	19,998	13,575	14,620
No. Aircraft Operations Captured by Monitors	15,721	9,789	13,152
Correlation	79%	72%	90%

NB: Generally a correlation of >80% is considered reasonable. The aircraft that are missed are the lower noise level events and will not have any effect on the overall noise level. The lower correlation at Prices Rd and the Velodrome is due to noise events not being captured for a week at each monitor.

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Table 4 shows the number of aircraft that flew in the vicinity of each permanent noise monitor and the number of aircraft noise events that were correlated with an aircraft flyover in the three month period May 2019 to July 2019.

Generally a noise monitor is unable to pick up each and every noise event due to ambient noise, inclement weather or other factors.

This table shows how well each noise monitor is performing in correlating aircraft noise events.

The Velodrome monitor correlated a lower number of the aircraft flyovers. This is due to higher ambient noise levels in this area from State Highway 1 which mean quieter aircraft noise events are not captured.

Table 5: Temporary Noise Monitor Summary of Measured Aircraft Events

	Date Deployed	Days in Field	Measured L_{dn}	Average L_{Amax}
Mt Eden	1-Apr-15	1582	40	62
Mt Wellington	17-Apr-15	1566	40	65
Whitford	10-Jun-15	1512	41	60
Eastern Beach	11-Jun-15	1511	42	61
Wiri	4-May-17	818	60	75
Wattle Downs	23-Dec-17	585	48	67
Clevedon	10-Mar-18	508	29	58

NB: the Whitford monitor was brought in on 17 Jun 19 for calibration and is currently being relocated to another site in Whitford underneath the modified Yellow U23 Track.

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Table 5 gives a summary of the measured noise levels at each temporary noise monitor since deployment (up until 31 July 2019).

The measured L_{dn} for aircraft noise ranges from 29-48 dB L_{dn} across the various temporary monitor locations, with the exception of the noise monitor in Wiri where noise levels were 60 dB L_{dn} .

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB L_{dn} are suitable for residential development. The noise levels measured at the temporary noise monitors are 7-26 dB below the 55 dB L_{dn} New Zealand Standard, with the exception of the noise monitor in Wiri.

The noise levels measured at the Wiri noise monitor are 5 dB above the NZS 6805 guideline which is why this location is within the Moderate Aircraft Noise Area.

The average L_{Amax} ranges from 58-67 dB L_{Amax} across the various monitors with the exception of the noise monitor in Wiri where noise levels were 75 dB L_{Amax} .

The average L_{Amax} is calculated by averaging the maximum level from all of the individual aircraft noise events during the monitoring period.

The L_{Amax} differs for each aircraft operation depending on the aircraft type, type of operation etc.

Aircraft noise events over 70-75 dB L_{Amax} start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

There was less than one flyover recorded at the temporary monitors above 70 dB L_{Amax} apart from the noise monitors in Wiri and Wattle Downs which had 39 & 16 noise events above 70 dB L_{Amax} respectively.

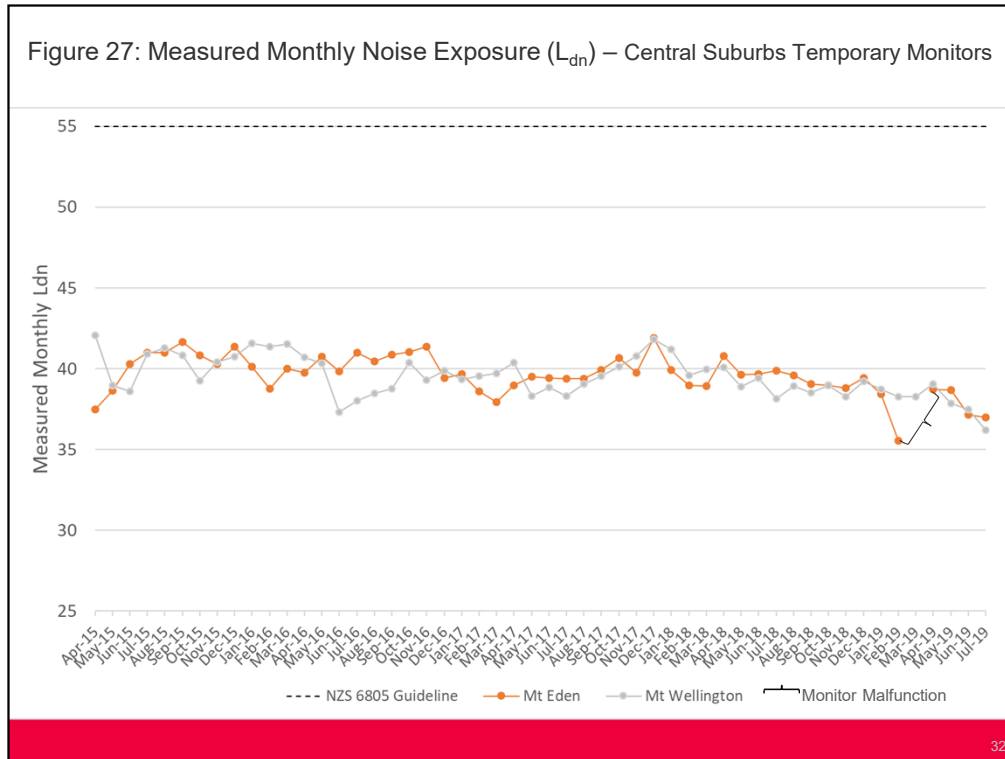


Figure 27 shows the monthly Noise Exposure (L_{dn}) trends for aircraft noise at the temporary noise monitors in the Central Suburbs since their deployment.

The L_{dn} fluctuates month on month by 6 dB at each noise monitor depending on aircraft operations, wind direction and other factors.

There are no significant trends in the data.

The measured L_{dn} for aircraft noise ranges from 36-42 dB L_{dn} per month across the Central Suburb monitor locations.

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB L_{dn} are suitable for residential development.

The noise levels measured at the temporary noise monitors in the Central Suburbs are 13-19 dB below this level.

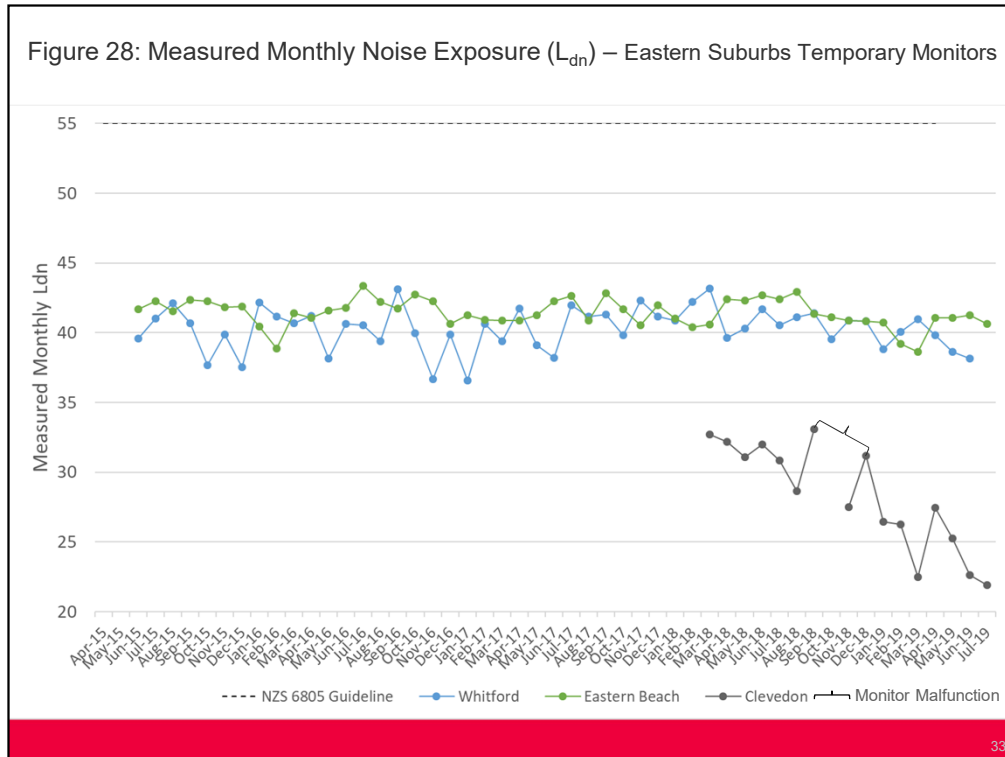


Figure 28 shows the monthly Noise Exposure (L_{dn}) trends for aircraft noise at the temporary noise monitors in East Auckland since their deployment.

The L_{dn} fluctuates month on month by 5-11 dB at each noise monitor depending on aircraft operations, wind direction and other factors.

There are no significant trends in the data.

The measured L_{dn} for aircraft noise ranges from 22-43 dB L_{dn} per month across the Eastern Suburb monitor locations.

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB L_{dn} are suitable for residential development.

The noise levels measured at the temporary noise monitors are 12-33 dB below this level.

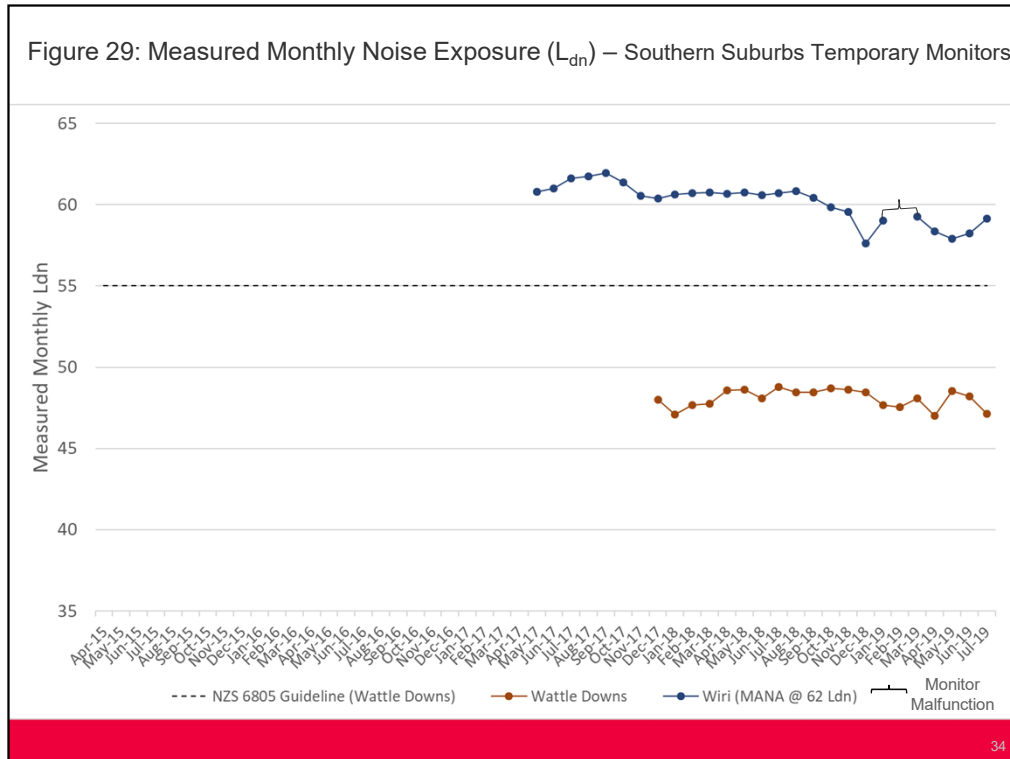


Figure 29 shows the monthly Noise Exposure (L_{dn}) trends for aircraft noise at the temporary noise monitors in South Auckland since their deployment.

The L_{dn} fluctuates month on month by around 2-4 dB at each noise monitor depending on aircraft operations, wind direction and other factors.

There are no significant trends in the data.

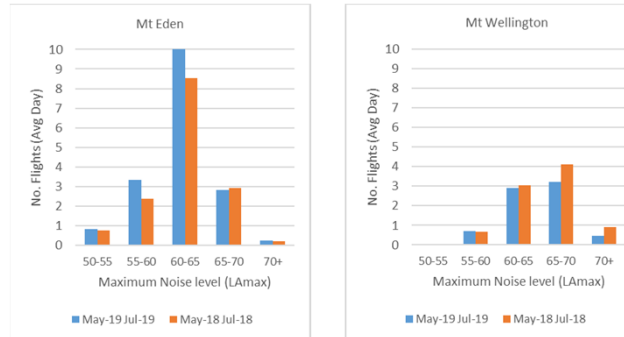
The measured L_{dn} for aircraft noise ranges from 47-62 dB L_{dn} per month across the Southern Suburb monitor locations.

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB L_{dn} are suitable for residential development.

The noise level measured at the Wattle Downs noise monitor is 8 dB below this level.

This noise level measured at the Wiri noise monitor is 7 dB above the NZS 6805 guideline which is why this location is within the Moderate Aircraft Noise Area.

Figure 30: Number of Aircraft Noise Events in Each Noise Band
Central Suburbs Monitors (L_{Amax} – Maximum Noise Level)



NB: Aircraft noise events over 70-75 L_{Amax} start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

Figure 30 shows the average daily number of aircraft that overflow each of the Central Suburbs temporary noise monitors in each noise band in the three month period May to July in 2018 (Orange bars) and 2019 (Blue bars).

L_{Amax} is the maximum noise level experienced as an aircraft overflies a monitor.

These temporary noise monitors received less than one event above 70 L_{Amax} per day.

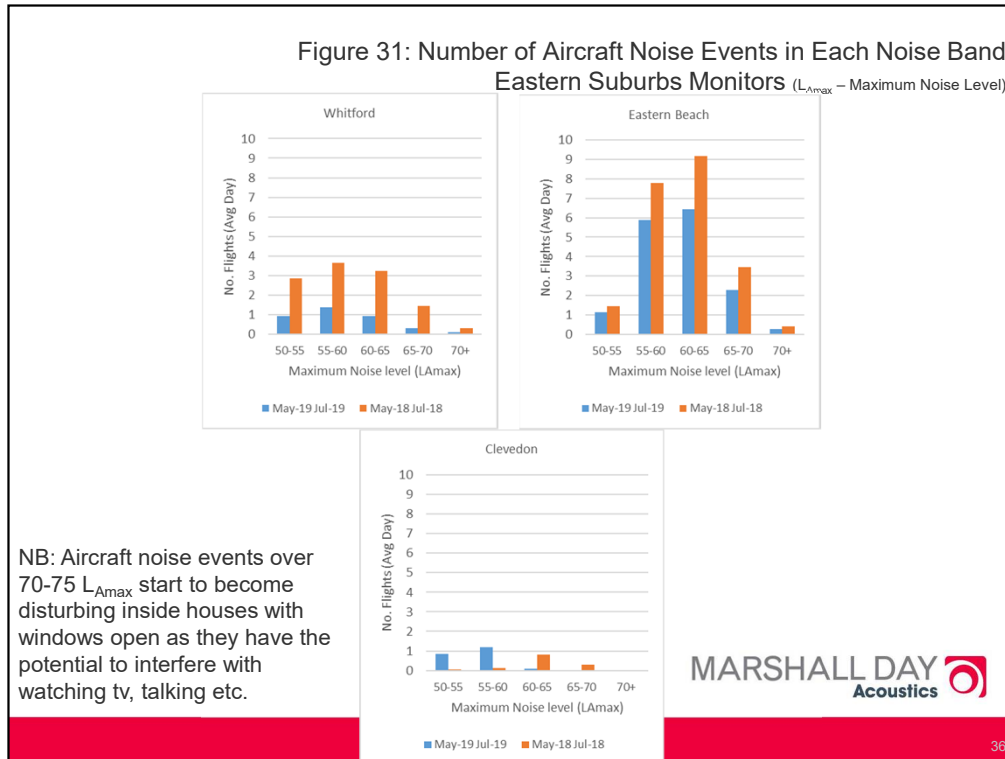
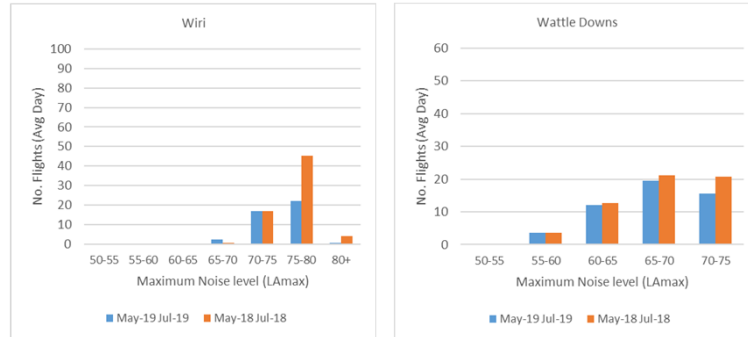


Figure 31 shows the average daily number of aircraft that overflow each of the Eastern Suburbs temporary noise monitors in each noise band in the three month period May to July in 2018 (Orange bars) and 2019 (Blue bars).

L_{Amax} is the maximum noise level experienced as an aircraft overflies a monitor.

These temporary noise monitors received less than one event above 70 L_{Amax} per day.

Figure 32: Number of Aircraft Noise Events in Each Noise Band
Southern Suburbs Monitors (L_{Amax} – Maximum Noise Level)



NB: Aircraft noise events over 70-75 L_{Amax} start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

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Figure 32 shows the average daily number of aircraft that overflow the Southern Suburbs temporary noise monitors in each noise band in the three month period May to July in 2018 (Orange bars) and 2019 (Blue bars).

L_{Amax} is the maximum noise level experienced as an aircraft overflies a monitor.

The Wiri noise monitor receives approximately 39 events above 70 L_{Amax} per day.

The Wattle Downs noise monitor receives approximately 16 events above 70 L_{Amax} per day.



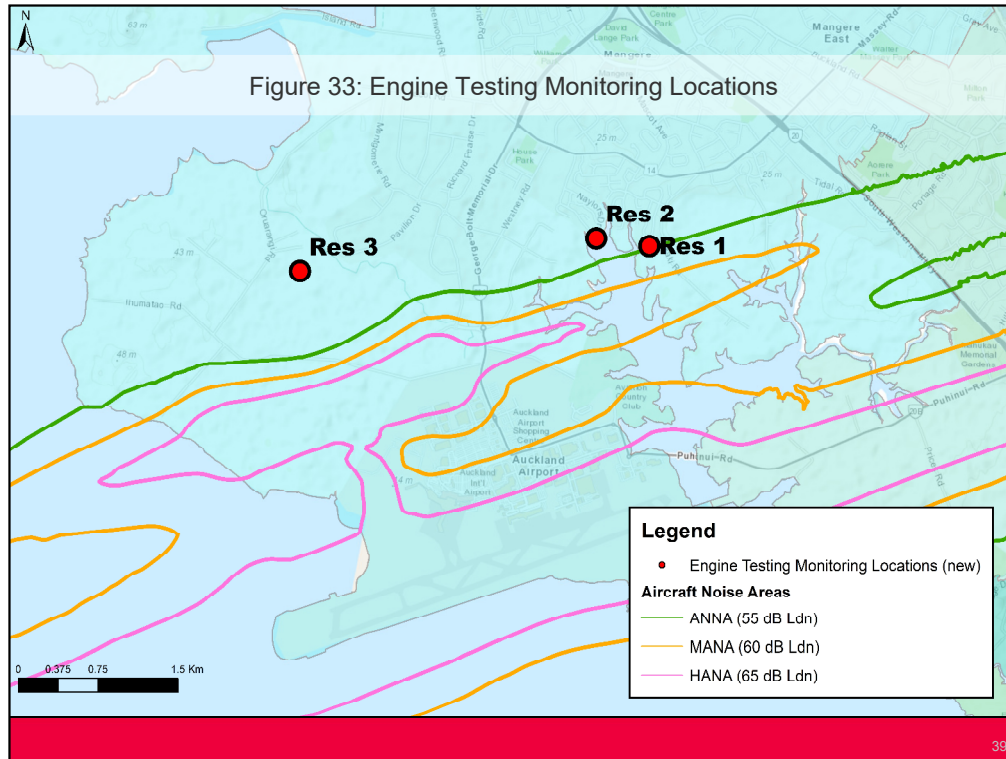


Figure 33 shows the three locations where compliance with the engine testing noise rule is calculated.

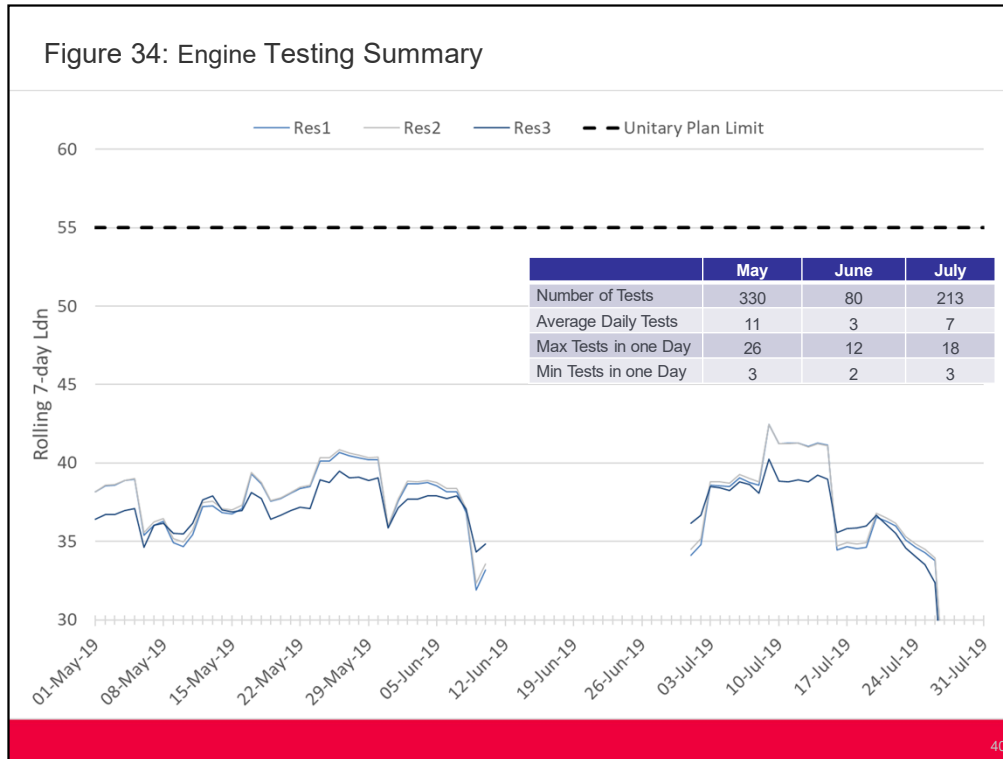


Figure 34 shows the rolling 7 day average noise level for engine testing activity at the airport in the three month period May 2019 to July 2019 .


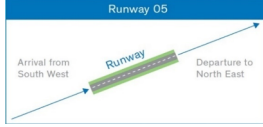
The District Plan noise limit for engine testing activity is 55 dB L_{dn} (7 day rolling).

The engine testing noise levels were compliant with the 55 L_{dn} noise limit.

The Table insert shows the maximum, minimum and average number of engine tests performed on an average day in each month along with the total number of tests completed in each month.

Note there is a gap in the data from 11-30 jun.

Appendix A: Glossary of Terminology

Term	Definition
Daytime	The period from 7:00am to 10:00pm
Night-time	The Period from 10:00pm to 7:00am
Runway 23L/Runway 05R	<div> <div>Occurs in Westerly Wind Conditions</div>  </div> <div> <div>Occurs in Easterly Wind Conditions</div>  </div>
Complaint Type	
“Specific” complaint	Complaints relating to a specific aircraft operation.
“Generic” complaint	Complaints that don’t relate to a specific aircraft operation but relate to noise in general.
“Question” enquiry	An enquiry to find out more information about noise related topics.
“Aircraft” Noise	Noise that is from aircraft operations only.
“Ambient” Noise	Noise that is from general ambient noise sources (cars, wind etc.).
	Excludes noise from aircraft operations.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
L_{dn} – Noise Exposure	The average A-weighted noise level over a day/month/year with a 10 dB penalty applied to the night-time (10pm – 7am).
L_{max} – Maximum Noise Level	The highest A-weighted noise level which occurs during an aircraft operation.
ANNA	Aircraft Noise Notification Area – Set at 55-60 dB L_{dn}
MANA	Moderate Aircraft Noise Area – Set at 60-65 dB L_{dn}
HANA	High Aircraft Noise Area – Set at 65+ dB L_{dn}

Appendix B: Noise Complaint Type

Cause	Description
Low flying	Aircraft flying at a low altitude
Too loud	Aircraft making too much noise
Early morning	Aircraft flying in the early morning
Late night	Aircraft flying late at night or overnight
Height	Aircraft flying higher or lower than usual
More flights	More aircraft operations than usual
Noisier flights	Aircraft are noisier than usual
Flight path	Aircraft flying on a different flight path than usual
Other	The disturbance is different from those listed
Unknown	Cause not stated
Noise Mitigation Package Enquiry	Enquiry relating to the Noise Mitigation Packages

Appendix C: Suburbs by Area

Suburb	Area	Suburb	Area	Suburb	Area
Alfriston	South Auckland	Manurewa	South Auckland	Randwick Park	South Auckland
Anawhata	West Auckland	Meadowbank	Central Suburbs	Remuera	Central Suburbs
Beachlands	East Auckland	Mellons Bay	East Auckland	Saint Heliers	Central Suburbs
Bucklands Beach	East Auckland	Milford	North Shore	Sandringham	Central Suburbs
Clover Park	South Auckland	Mount Eden	Central Suburbs	Shelly Park	South Auckland
Cockle Bay	East Auckland	Mount Roskill	Central Suburbs	Somerville	South Auckland
Cornwallis	West Auckland	Mount Wellington	Central Suburbs	Takanini	West Auckland
East Tamaki Heights	East Auckland	Muriwai	West Auckland	Te Atatu South	West Auckland
Ellerslie	Central Suburbs	Northpark	South Auckland	The Gardens	South Auckland
Epsom	Central Suburbs	One Tree Hill	Central Suburbs	Titirangi	West Auckland
Flat Bush	East Auckland	Onehunga	Central Suburbs	Totara Heights	South Auckland
Glendowie	Central Suburbs	Onewhero	South Auckland	Totara Vale	South Auckland
Greenlane	Central Suburbs	Otahuhu	South Auckland	Waitakere	West Auckland
Grey Lynn	Central Suburbs	Otara	South Auckland	Waiuku	South Auckland
Half Moon Bay	East Auckland	Pakuranga Heights	East Auckland	Wattle Downs	South Auckland
Herne Bay	Central Suburbs	Panmure	Central Suburbs	Westmere	Central Suburbs
Howick	East Auckland	Papatoetoe	South Auckland	Weymouth	South Auckland
Karaka	South Auckland	Point Chevalier	Central Suburbs	Whanganui	Not in Auckland
Mangere	South Auckland	Point England	East Auckland	Whangaparaoa	Not in Auckland
Mangere Bridge	South Auckland	Pollok	South Auckland		
Manukau	South Auckland				