

## **APPENDIX 3: Acoustic Assessment (Hegley Acoustic Consultants)**



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# **PROPOSED TE KOWHAI AIRPARK**

## **LIMMER ROAD, TE KOWHAI**

## **ACOUSTIC DESIGN REPORT**

**Report No 17167.1**

**Prepared for:**

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Te Kowhai Airpark*

*April 2018*

**Prepared by:** .....

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## **1. INTRODUCTION**

Te Kowhai Aerodrome is a grass runway airfield that has been operating on its site in Limmer Road for a number of years. The aerodrome was recently sold and the new owners wish to develop Te Kowhai Airpark (TKA) on the associated land to the south of the runway. TKA would consist mainly of residential lots providing aircraft enthusiasts the opportunity to live in an area with direct access to their aircraft and a runway. The majority of the residential sites are large lots that can accommodate a hangar as well as a dwelling. Each hangar has direct access to a taxiway and the runway beyond, as well as separate road access for the dwelling. There are existing hangars on site which, while they would be available to those living at TKA, would most likely be used by non-residents. A commercial precinct is also proposed for aircraft related activities such as maintenance, light manufacture and administration. This area would be an expansion of the activities that currently exist on site. Figure 1 shows a site plan of the proposal.

This report provides an assessment of the noise from the taxiing aircraft and the commercial activities to demonstrate that it is practicable for TKA to operate in a functional manner that will result in reasonable noise levels to the surrounding environment. The report addresses noise effects to sites outside to the airpark leaving any effects within the airpark to be managed by TKA.



Figure 1. Proposed Te Kowhai Air Park

## 2. ASSESSMENT CRITERIA

This section develops suitable criteria for noise from the proposal and begins with reference to the noise rules of the District Plan (DP) and the Draft Proposed District Plan (DPDP).

### 2.1. District Plan Noise Rules

The TKA sites, and all surrounding sites are zoned Rural in the District Plan. Rule 25.17 requires:

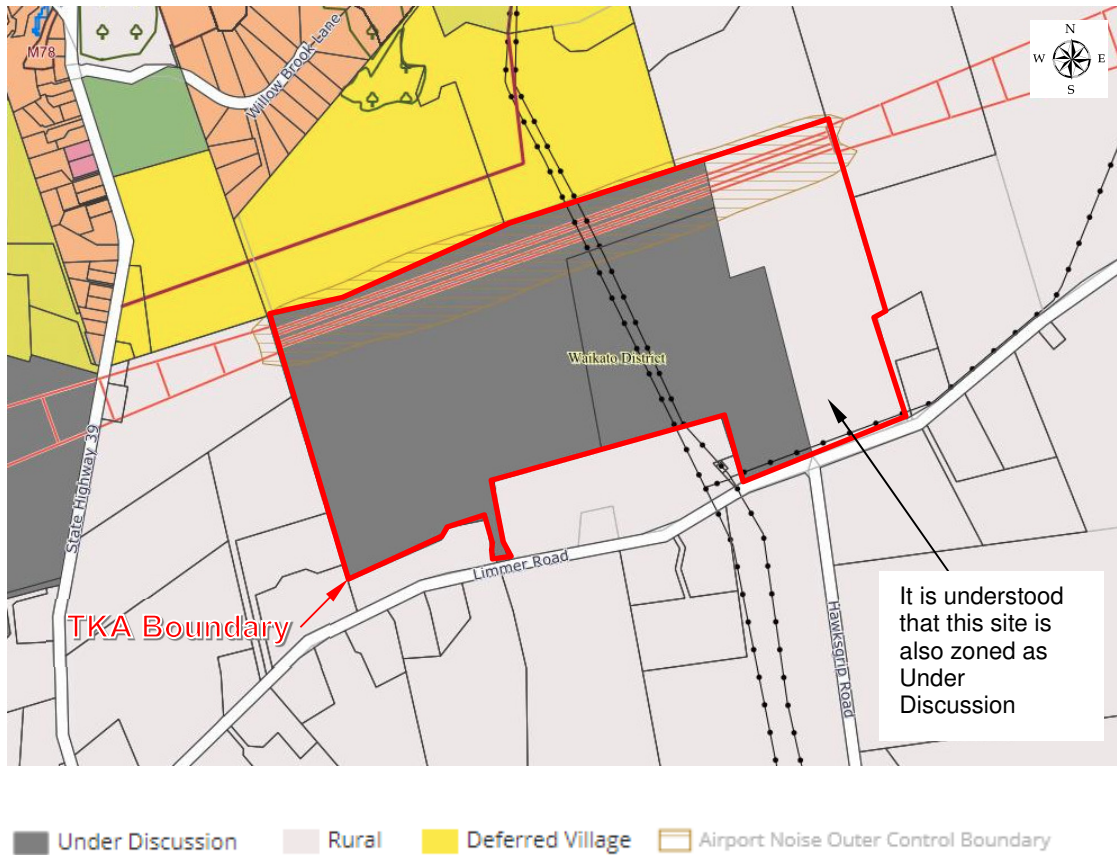
*Any activity is a permitted activity if it is designed and conducted so that noise from the activity measured at any other site does not exceed:*

1. 50dBA ( $L_{10}$ ), 7am to 7 pm any day, and
2. 45dBA ( $L_{10}$ ), 7pm to 10pm any day, and
3. 40dBA ( $L_{10}$ ), and 65dBA ( $L_{max}$ ) at all other times.

The District Plan makes no reference to NZS 6801:1991 'Measurement of Sound' or NZS 6802:1991 'Assessment of Environmental Sound'.

### 2.2. Proposed District Plan Noise Rules

Waikato District Council has recently released a draft of the proposed update to the District Plan. It is understood that the DPDP contains an error and that the entire TKA site is, in fact, zoned as Under Discussion. TKA is surrounded by rural zoning with the exception being part of the northern boundary which is Deferred Village. Figure 2 below shows the proposed zoning.



**Figure 2. Erroneous Zoning Map of Draft Proposed District Plan**

The DPDP provides no rules for noise from activities within an area Under Discussion. The Deferred Village zone adopts the rural zone noise rule, which is shown below:

*Noise generated by any activity is permitted if the activity is designed and conducted so that noise measured within the notional boundary of a dwelling on any other site does not exceed:*

*50dB ( $L_{Aeq}$ ), 7am to 7pm everyday, and*

*45dB ( $L_{Aeq}$ ), 7pm to 10pm everyday, and*

*40dB ( $L_{Aeq}$ ), 10pm to 7am the following day, and*

*65dB ( $L_{Amax}$ )<sup>1</sup>, 10pm to 7am the following day.*

<sup>1</sup> Technically this should be the  $L_{AFmax}$  (not  $L_{Amax}$ ). As it is assumed that this drafting error will be corrected in later versions of the Draft, this report uses the correct  $L_{AFmax}$  descriptor.

**Note:**

*Noise levels shall be measured in accordance with the requirements of New Zealand Standard NZS 6801:2008 “Acoustics - Measurement of Environmental Sound” (NZS 6801) and assessed in accordance with the requirements of New Zealand Standard NZS 6802:2008 “Acoustics - Environmental noise (NZS 6802)”*

While there are no noise rules in the DPDP for the TKA site (Under Discussion), adopting the requirements of the rural zone provides a sensible approach. The reason for this is that those receiving the noise are all within the rural zone (which includes the Deferred Village zone) and their expectations for noise are defined by the rural zone noise rule as provided above. This assessment has been based on the rural zone noise rules applying to the activities of TKA.

### **2.3. Discussion**

The rules of the DPDP are based on those of the DP with the following updates and improvements:

- a) Updating to the more modern  $L_{Aeq}$  noise metric over the  $L_{10}$ ;
- b) Adopting the notional boundary for noise assessment rather than the site boundary; and
- c) Adopting the current editions of NZS 6801 and NZS 6802.

The preference of the notional boundary over the site boundary for assessment is that in rural areas, the site boundary can be some way from the dwelling meaning that complying at the site boundary may needlessly protect areas of vacant land. While the DPDP adopts the notional boundary, it does not appear to define it. The following is the definition used by NZS 6801:



*A line 20 meters from any side of a dwelling or the legal boundary where this is closer to the dwelling*

Essentially, the DPDP noise rule is an improvement upon that of the DP and is therefore used for the remainder of this report. It is well suited to noise from the commercial component of TKA but, in its use for assessing the effects of noise from taxiing aircraft is less obvious.

The common form of aircraft noise that is usually considered is from aircraft arriving at, and departing from, the aerodrome. NZS 6802 states that it, and therefore any rule referencing it, *“does not apply to the assessment of sound where the source is within the scope of, and subject to, the application of other New Zealand acoustical Standards... In particular, assessment of specific sources of sound including ... flight operations of fixed or rotary winged aircraft associated with airports or helicopter landing areas, ... requires special techniques that generally are outside the scope of this Standard”*. Specific Standards NZS 6805 and NZS 6807<sup>2</sup> have been developed for managing noise from both rotary and fixed wing aircraft movements. This being the case, it is clear that noise from the flights to and from Te Kowhai Airpark cannot be compared to the noise rules of the DP or the DPDP, both of which already contain mechanisms for mitigating the effects of noise from aircraft arrivals and departures<sup>3</sup>.

Just as the noise from aircraft arrivals and departures cannot be considered against the DP rules, the converse is true in that taxiing aircraft cannot be added to the prediction of noise from flying aircraft. The method recommended by NZS 6805 for the prediction of aircraft noise from airfields does not allow the inclusion of taxiing aircraft.

While there is no obvious mechanism by which noise from aircraft arrivals and departures from Te Kowhai aerodrome can be combined with noise from taxiing aircraft within TKA, neither is it considered necessary to do so. Figure 2 shows the

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<sup>2</sup> NZS 6805:1992 ‘Airport Noise Management and Land Use Planning’ and NZS 6807: 1994 ‘noise management and land use planning for helicopter landing areas’

<sup>3</sup> See Appendix M of the District Plan and the Acoustic Insulation Appendix of the Draft Proposed District Plan

Outer Control Boundary (OCB) for Te Kowhai from the DPDP, which is copied from the DP. The OCB is the 55dB  $L_{dn}$  contour as a result of aircraft flights. While not directly comparable to the  $L_{Aeq}$  contour recommended by the DPDP, what is clear is that the 55dB  $L_{dn}$  contour falls well short of the southern, western and eastern boundaries of TKA where the perimeter taxiways are located. In other words, in the locations where the noise from taxiing aircraft is maximised, the noise from the arriving and departing aircraft will be minimal with no cumulative effect. The possible exception may be off the ends of the runway which is where the OCB is closest to the taxiing aircraft. These areas are relatively small and fall in the unpopulated rural zone which, given its proximity to the obstacle limitations zone off the end of the runways, will stay that way.

To the north of the runway, the OCB does extend over the Deferred Village zone. Given that the taxiways are all to the south of the runway, noise to this zone will be controlled by aircraft on the runway rather than those taxiing to it from the south, which they already do.

In summary, this assessment does not seek to alter the OCB. It considers noise from the taxiing aircraft only against the noise rules of the DPDP and does not include the noise from aircraft arriving at, and departing from, Te Kowhai aerodrome.

### **3. NOISE ASSESSMENT**

The noise assessment considers taxiing aircraft and noise from the commercial precinct separately.

#### **3.1. Assessment of Taxiing Aircraft**

##### **3.1.1. Base Noise Data**

The noise from the taxiing aircraft will depend on the type of aircraft at TKA. The aerodrome currently caters for a large Microlight contingent and this is expected to remain the dominant aircraft type at approximately 40%. An estimated 40 - 50% of aircraft will be small, private, single engine aircraft of typically four to six seats, such as the Cessna 172 commonly referred to as General Aviation (GA). The remaining

10 – 20% is expected to represent a range of aircraft, noting that there are hundreds of types of small aircraft. There is currently one Yakovlev Yak 52 aircraft at Te Kowhai which was a Russian military trainer and is currently considered to be the loudest aircraft at TKA.

While there are none at present, there is the potential for twin engine aircraft and/ or small jets to be domiciled at TKA. Again, there is a large range of each type of each aircraft available resulting in a similarly large range of potential noise levels. This being the case, it is not practicable to provide simple guidelines on how such an aircraft might be accommodated on site. It is therefore proposed that if such an aircraft is domiciled at TKA, it should be specifically assessed. While such aircraft may be too noisy to use the boundary taxiways, the effects could be mitigated by restricting louder aircraft to the internal taxiways. There is of course the potential that some aircraft would be too noisy to use TKA.

Noise from the taxiing aircraft has been calculated to the surrounding sites using measurements of aircraft as they taxied about Te Kowhai aerodrome. When selecting the aircraft to measure, the Cessna 172 and the slightly quieter Piper Cub were chosen as being representative of the typical GA aircraft expected at TKA. A Yak was also measured as an example of one of the noisier aircraft domiciled at TKA. The resulting noise data that has formed the basis of the analysis is summarised below.

**Table 1. Base Aircraft Noise Data**

<b>Aircraft Type</b>	<b>SEL at 10m</b>
Piper Cub	85dBA
Cessna 172	88dBA
Yak	96dBA

While not as common as fixed wing aircraft, helicopters are neither excluded from the current aerodrome nor would they be from TKA. Given their relative scarcity at Te Kowhai, none were available to measure. As such, analysis of their movements has been undertaken using INM, the same noise modelling software used to prepare the

air noise boundary for Te Kowhai which includes the ability to hover taxi helicopters. The analysis adopted the Robinson 22 (R22), the Robinson 44 (R44), Eurocopter (EC130) and the Squirrel (AS350) helicopters, all of which are relatively common in New Zealand.

### 3.1.2. Surrounding Sites considered in the Assessment

TKA has a number of residential neighbours that have been considered in the assessment, as shown in Figure 1 and identified in Table 2.

**Table 2. Dwellings considered in the Assessment**

Site (Fig 1)	Address	Comments
1	202 Limmer Road	Closest unmitigated dwelling considered in the assessment
2	212 Limmer Road	Rural dwelling
3	214 Limmer Road	Rural dwelling
4	176 Limmer Road	Closest southern dwelling to TKA.
5	158 Limmer Road	Rural dwelling
6	98A Limmer Road	Closest dwellings to TKA
7	98B Limmer Road	
8	639 Te Kowhai Road	Rural dwelling
9	703A Te Kowhai Road	Most distant rural property from TKA

### 3.1.3. Neighbour Signoff

Initial analysis indicated that noise walls would be required to screen many of the neighbouring sites to comply with the adopted noise criteria. While the noise walls are advantageous for acoustics, they can result in a number of adverse effects such as shadowing, restricting views and access to TKA, which some owners expressed an interest in. As a result, the surrounding neighbours were consulted with to develop the most appropriate solution for TKA. The following was agreed upon:

**Table 3. Neighbour Signoff**

Site (Figure 1)	Agreement
1 and 2	No noise limit between 7pm and 10pm.
3	The noise limit between 7pm and 10pm has been raised from 45dB $L_{Aeq}$ to equal the day time limit of 50dB $L_{Aeq}$ .
4	It was initially understood that the owner of this property had provided full written consent. However, as that consent had not actually been obtained at the time that this report was written, the approach taken has been to proceed on the basis that full consent will be gained. A backup position is also identified should consent not be gained from this owner to demonstrate that the TKA project remains viable without it.
5	Due to its distance from TKA, the owner of site 5 has not been specifically consulted with.
6 and 7	Provided full written consent.
8 and 9	Due to their distance from TKA, the owners of sites 8 and 9 have not been specifically consulted with.

Where owners have given full written consent, the effects of noise are not considered further. The resulting mitigation to the surrounding neighbours is discussed in the following section.

### **3.1.4. Mitigation and s16**

During the preliminary design, a number of mitigation options were discussed, both in terms of controlling noise to the adopted criteria and to minimise noise from the site in accordance with Section 16 of the Resource Management Act, which requires that:

*Every occupier of land ... shall adopt the best practicable option to ensure that the emission of noise from that land ... does not exceed a reasonable level.*

The mitigation options, and their outcomes, are described below.

### *INTERNAL LAYOUT*

The first mitigation option considered was the layout of TKA as options were investigated to internalise the taxiways to maximise the distance to the neighbouring dwellings. This contributed to the layout now proposed in Figure 1.

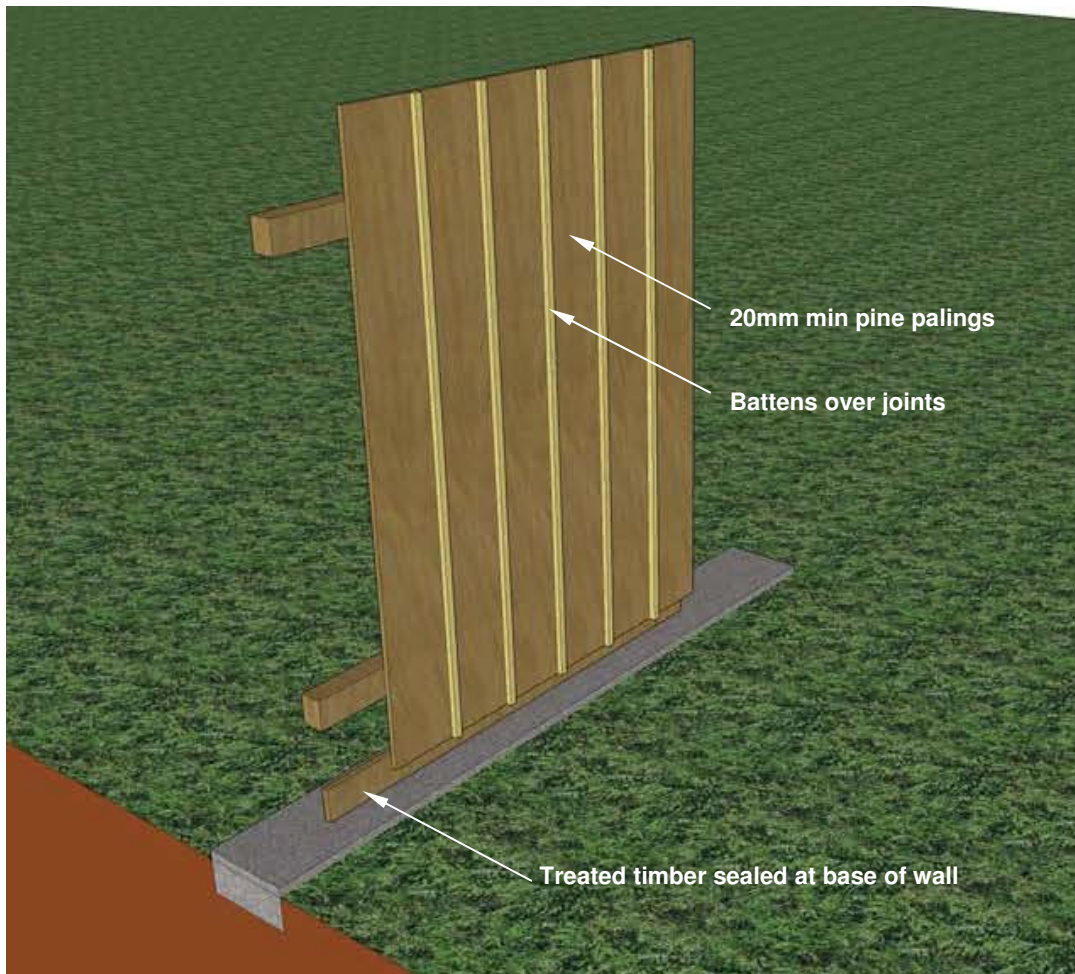
### *NOISE BARRIERS*

Barrier mitigation was also considered as they would provide noticeable reductions in aircraft noise to most of the neighbouring dwellings. In general, the design team considered that use of barriers in a flat, rural landscape should be avoided where possible due to their visual dominance. The use of barriers, including their positive and negative effects, was discussed with the surrounding neighbours all of whom preferred no barriers. Table 3 records the specific agreements reached with each neighbour. The following design has proceeded on this basis with the potential exception of Site 4. During the design phase it was understood that this owner would provide full written consent to TKA and the following design was prepared on the basis of no noise barriers to screen this property. However, at the time that this report was finalised, a signed agreement had not been provided. While the owners of TKA remain positive about reaching an agreement, this report has considered a backup option that would allow TKA to operate as intended should consent not be forthcoming. This option includes a 2.5m high barrier to screen Site 4 from aircraft on the taxiway that would extend the full length of the southernmost boundary of TKA as shown in Figure 3. This barrier may need to be set in from the boundary to satisfy any height to boundary rules of the DP and DPDP.



**Figure 3. Proposed Noise Barrier Backup Option for Site 4**

To be effective, the barrier must be constructed from a material with a surface density of  $10\text{kg/m}^2$  or greater. Suitable materials consist of 20mm pine palings, 9mm fibre cement sheet or 20mm plywood. Concrete and masonry are also suitable as is bunding. There must be no untreated openings in the wall, including at the base and if timber palings are used, they must be butted together with battens placed over the joints to control openings forming as the palings dry and shrink. Suitable construction details are shown on Figure 4 below.



**Figure 4. Suitable 2.5m High Timber Noise Barrier detail**

#### *OPERATIONAL LIMITATIONS*

The following operational limitations will be implemented by TKA which will aid with the control of noise from the site:

- a) Aircraft will not idle beyond standard start up and operating procedures or be run up in any area other than Precinct A (the runway) or B (the Commercial Precinct);
- b) There will be no night time taxiing. Any aircraft that arrive at Te Kowhai between 10.00pm and 7.00am the following day will park outside of the



aerodrome hangars or on the apron outside of the existing terminal building, as they would at present. Occupants would then make their way to their dwelling before retrieving their aircraft the following day;

- c) In Precinct C (Figure 1), only microlight or GA aircraft of up to six seats will use the boundary carriageway;
- d) Other aircraft would require a specific noise assessment prior to using TKA to determine their suitability for TKA and any mitigation that might be appropriate for them, such as limiting which taxiways they can use. This requirement excludes Precinct A, which will continue to operate as it currently does and the commercial Precinct B;
- e) Should helicopters visit TKA, they will be limited to Precincts A and B and the airside overlay (Figure 1) immediately south of the runway. If the helicopters are to be hangared elsewhere, they could then be towed to their hangar while the occupants made their own way to their dwelling. Helicopters will not taxi on site, other than the areas identified above, and are therefore not considered further; and

### **3.1.5. Permissible Aircraft Movements**

The noise that each of the surrounding houses would experience from taxiing aircraft at TKA would depend in part on the type of aircraft using the various taxiways (of which there are hundreds of possibilities) and the numbers of each type of aircraft, which would vary by the day, time of year and weather. Given the large, and in some cases potentially unrealistic, range in noise levels that would result, a more pragmatic approach was sought for the assessment. The selected method was to determine the number of types of 'typical' and 'noisy' aircraft that could use a taxiway immediately adjacent to each dwelling considered to demonstrate that enough aircraft could be accommodated within the allowable noise limit of the adopted criteria to make TKA viable. For this, the Cessna 172 was selected as the 'typical' GA aircraft while the YAK was selected for the 'noisy' aircraft.

The following Table 4 reports the upper limit for taxiing movements adjacent to each assessment property for compliance with noise limits specific to that property. For sites 1 and 2 that limit is 50dB  $L_{Aeq}$  day time criterion while that same limit applies to site 3 as a result of a specific agreement. Sites 4, 6 and 7 are not assessed as the owners have provided written consent to the TKA, although site 4 is discussed further in section 3.1.6 below. To the remaining sites 5, 8 and 9, the 45dB  $L_{Aeq}$  evening noise limit provides the control of movements. More aircraft could use the taxiways outside of these properties during the day time (7.00am to 7.00pm) when the higher 50dB  $L_{Aeq}$  limit applies. It is noted that Te Kowhai is not lighted meaning that there are no flights while it is dark which, during the winter months, can be as early as 5.30pm.

Aircraft noise has been averaged in accordance with the requirements of NZS 6802 and, as such, both the maximum number of movements possible in a 15 minute period and the total movements over the evening period are reported in the following Table.

**Table 4. Permissible Aircraft Movements based on No Barriers and Signoffs as per Table 3**

Site (Fig 1)	Address	Upper limit of aircraft movements to comply with criteria (per 15 min/ total per period)	
		Cessna 172	YAK
1	202 Limmer Road	17 / 220	3 / 19
2	212 Limmer Road	50 / 717	7 / 54
3	214 Limmer Road	43 / 150	6 / 12
4	176 Limmer Road	Written consent provided	
5	158 Limmer Road	22 / 73	3 / 13
6	98A Limmer Road	Written consent provided	

Site (Fig 1)	Address	Upper limit of aircraft movements to comply with criteria (per 15 min/ total per period)	
		Cessna 172	YAK
7	98B Limmer Road	Written consent provided	
8	639 Te Kowhai Road	53 / 188	7 / 29
9	703A Te Kowhai Road	194 / 724	27 / 103

Table 4 shows aircraft numbers to be high enough that, without specific knowledge of the expected traffic on the taxiways, it is possible to conclude that there is sufficient capacity for TKA to operate in the desired manner. Using site 1 as an example, there could be up to 17 'typical' aircraft movements in any 15 minute period with up to 220 over the course of the day time period. There is scope for the noisier aircraft, such as the YAK to operate with up to three in a 15 minute period and 19 over the day.

In summary, with the proposed mitigation in place it is considered that it will be practicable for TKA to operate in an unencumbered manner.

#### **3.1.6. Site 4, 176 Limmer Road**

The permissible aircraft movements reported in Table 4 above based on the owner of this property providing written consent to TKA, as discussed in Table 3. Should this consent not be forthcoming, a barrier as identified in Figure 3 is proposed. With this barrier in place, the permissible movements for compliance with the 45dB  $L_{Aeq}$  evening criterion are as follows:

**Table 5. Permissible Aircraft Movements to Site 4 based on a 2.5m Barrier and No Signoff**

Site (Fig 1)	Address	Upper limit of aircraft movements to comply with criteria (per 15 min/ total per period)	
		Cessna 172	YAK
4	176 Limmer Road	16 / 54	2 / 9

Given that there are only two of the TKA Lots from which aircraft would be able to taxi past site 4, the permissible movements identified by Table 5 are considered relatively high and would essentially allow unencumbered use of the taxiway adjacent to site 4.

### **3.2. Assessment of Commercial Precinct**

The commercial precinct will be an extension of what currently occurs on site where light fabrications, aircraft maintenance and associated activities can take place. Given that the activities of this precinct will be nominally 360m from the closest existing dwelling (site 4) and well screened from it by the intervening buildings and proposed noise wall as well as being at least 100m from any future development to the north of the runway, it is considered that noise from the anticipated activities will readily comply with the adopted noise rules.

## **4. FUTURE PROOFING**

### **4.1. New Dwellings**

The assessment presented above addresses the existing houses only and there is the potential for future dwellings to be constructed about TKA, particularly given the Deferred Village zone to the north proposed by the DPDP (Figure 2). Should these houses be built close to TKA, there is the potential that they would receive noise levels above those adopted for the project. One method to provide long term protection to TKA would be to provide a buffer zone about TKA limiting the

construction of new dwellings. Given that the closest house, other than site 4, is in the order of 75m from the boundary of TKA, selecting such a distance would be reasonable. When removing the 20m notional boundary, this equates to 55m from the TKA boundary, which is adopted for a buffer distance. Rather than prohibit construction within the buffer area, the approach would be for new dwellings to be designed to control noise from taxiing aircraft internally.

New dwellings should be designed to meet the expectations of the adopted DPDP noise rules, which equate to an external level of 50dB  $L_{Aeq}$  at a distance of 55m from the TKA boundary. It is understood that under the DP, the dwelling set back in a rural area is 25m meaning that the upper limit a dwelling could expect at the façade (not notional boundary) is 57dB  $L_{Aeq}$ .

A dwelling façade with windows open for ventilation typically provides a 15dB reduction. Thus, during the day time, the DPDP expectation internally is for 35dB  $L_{Aeq}$ .

A rule therefore that required 35dB  $L_{Aeq}$  internally based on an external level of 50dB  $L_{Aeq}$  at a distance of 55m would satisfy the requirements of the DPDP noise rule.

A proposed buffer zone and noise rules are proposed in section 5 below.

## **4.2. Air Noise Contours**

The Air Noise contours of the DP and DPDP are used to identify the areas in the vicinity of the airport that will experience high levels of aircraft noise and where any new dwelling will have to be constructed to a standard to control external noise. The Air Noise contours are based on the usage of the runway and, should this change at some point in the future, it is recommended that the air noise contours be reviewed. This work is outside the current project.

## 5. PROPOSED CONDITIONS

Should consent be granted, the following represent the assessment presented above.

1. Noise is to be measured in accordance with NZS 6801: 2008 'Acoustics – Measurement of Environmental Sound' and assessed in accordance with NZS 6802: 2008 'Acoustics – Environmental Noise'. For clarity, NZS 6802 does not apply to aircraft activities within Precinct A. NZS 6802 shall apply to all aircraft activities outside of Precinct A.
2. The notional boundary is a line 20m from the side of a dwelling, or the legal boundary where this is closer to the building.
3. Any activity in Precinct B is a permitted activity if it is designed and conducted so that noise from the activity measured at the notional boundary of a site with the Rural Zone that is outside the Te Kowhai Airpark does not exceed:
  - a) 55dB  $L_{Aeq}$ , 7am to 10pm
  - b) 40dB  $L_{Aeq}$ , 10pm to 7am the following day
  - c) 70d  $L_{AFmax}$ , 10pm to 7am the following day

The above, does not apply to construction noise, or emergency sirens.

4. Any activity in Precincts C and D is a permitted activity if it is designed and conducted so that noise from the activity measured at the notional boundary of any site in the Rural zone outside of Te Kowhai Airpark does not exceed:
  - a) 50dB  $L_{Aeq}$ , 7am to 7pm and
  - b) 45dB  $L_{Aeq}$ , 7pm to 10pm and

- c) 40dB  $L_{Aeq}$ , and 65dB  $L_{AFmax}$  all other times

The above, does not apply to construction noise, or emergency sirens.

5. Aircraft movements on the taxiways are a permitted activity if they are designed and conducted so that noise from the activity measured at the notional boundary of 202, 212 and 214 Limmer Road does not exceed:

- a) 50dB  $L_{Aeq}$ , 7am to 10pm
- b) 40dB  $L_{Aeq}$ , and 65dB  $L_{AFmax}$  at all other times

6. Aircraft movements on the taxiways are a permitted activity if they are designed and conducted so that noise from the activity measured at the notional boundary of the remaining sites in the Rural zone outside of Te Kowhai Airpark does not exceed:

- a) 50dB  $L_{Aeq}$ , 7am to 7pm
- b) 45dB  $L_{Aeq}$ , 7pm to 10pm,
- c) 40dB  $L_{Aeq}$ , and 65dB  $L_{AFmax}$  at all other times.

Note: As a result of landowner agreement, Rule 6 does not apply to 98A, 98B and 176 Limmer Road.

7. All construction work on site shall be measured and assessed in accordance with the requirements of New Zealand Standard NZS 6803:1999 'Acoustics – Construction Noise'. Maintenance relating to the upkeep of TKA shall also be assessed against this Standard. Any maintenance activities on Precinct B shall be assessed in accordance with condition 3.

In addition to the proposed noise rules, there would need to be some operational rules for the management of noise from TKA. It is suggested that these should be included within the TKA body Corporate rules.

- a) Aircraft will not idle beyond standard start up and operating procedures or be run up in any area other than Precinct A (the runway) or B (the Commercial Precinct);
- b) There will be no night time taxiing. Any aircraft that arrive at Te Kowhai between 10.00pm and 7.00am the following day will park outside of the airport hangars or on the apron outside of the existing terminal building;
- c) In Precinct C, only microlight or GA aircraft of up to six seats will use the boundary carriageway;
- d) Other aircraft residing at TKA require a specific noise assessment to be undertaken to confirm they can operate in accordance with the TKA noise rules. This requirement excludes Precinct A, which will continue to operate as it currently does and the commercial Precinct B;
- e) Should helicopters visit TKA, they will be limited to Precincts A and B and the airside overlay (Figure 1) immediately south of the runway. If the helicopters are to be hangared elsewhere, they will be towed to the hangar while the occupants made their own way to their dwelling; and

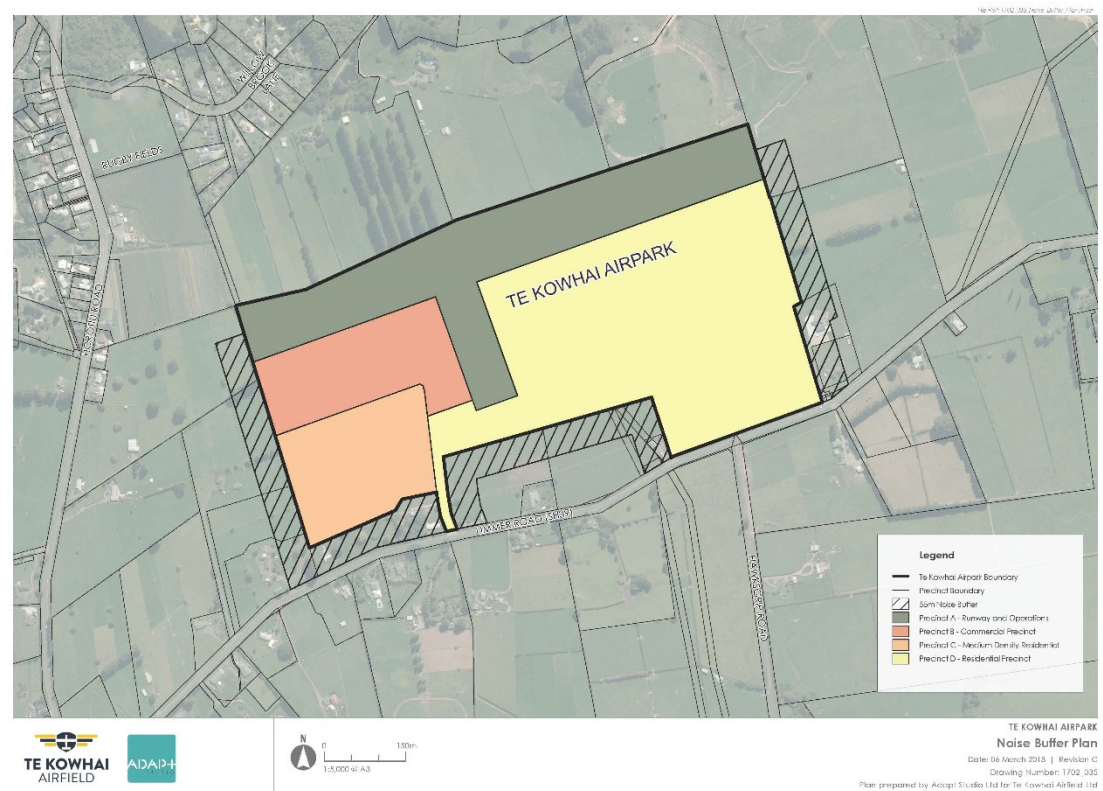
While outside of the scope of this project, Council may wish to provide the following rules in the DPDP for the long term protection of TKA.

1. New dwellings inside of the buffer zone described by a line 55m from the boundary of TKA, and shown in the figure below, shall be designed to achieve an internal noise level of 35dB  $L_{Aeq}$  in all habitable rooms based on noise from TKA being equivalent to a level of 50dB  $L_{Aeq}$  at 55m.



2. The external level of noise shall be based on the following octave band adjustments:

63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
11	5	-3	-5	-3	-9	-13



**Figure 5. Proposed TKA Buffer Zone**