

RESOURCE CONSENT HEARING REQ.596300 – AUPOURI AQUIFER WATER USER GROUP CONSENT APPLICATIONS FOR GROUNDWATER TAKES FROM THE AUPOURI AQUIFER

Affected Person Status

Owner: Ivan Stanisich & Ian Fulton Partnership

Property: 13 Heath Road, Waiharara – Secs 88, 90 Blk VII Opoe, SD Lot 2 DP 502295

Resource consent: take groundwater – Consent AUT.036868.01.01

Bore: Consent – 036870.01 Grid reference – 1618376E 6129421N

Submitters Qualifications and Experience

Bachelor of Agricultural Science, Massey University, majoring in agricultural engineering and soil science (pedology, soil & water management)

Twenty-five years professional experience in agricultural engineering, environmental mine rehabilitation, soil and land use capability survey, soil conservator / land management, and environmental management. This has included detailed soil chemical and physical characterization for soil surveys and mine rehabilitation research programs, full suite of soil moisture monitoring (gravimetrics, capacitance, TDR and neutron probe), irrigation and drainage system design.

Employers – Northland Regional Council, West Australian Department of Agriculture, Northern Territory Department of Lands, Planning & Environment, Rio Tinto (formally Alcan), Carter Holt Harvey, Sino Gold – China.

Co-authored two West Australian Department of Agriculture publications – *Land Resources of the Northam Region (ISSN 1033-1670)* and *Soils of the Northam Advisory District (ISSN 0729-0012)*, plus co-authored a number of soil chemistry and environmental journal papers in *Australian Journal of Soil Research*, *Journal of Environmental Management* and *The Journal of Environmental Quality*.

Fourteen years Far North avocado orchardist, plus contract orchard manager / consultant.

1 Introduction

This document is supporting information to our original submission on the Aupouri Aquifer Water User Group (AAWUG) consent applications for groundwater takes from the Aupouri Aquifer.

2 Water Allocation

The two components that determines the volume of water being applied for by the AAWUG consent applicants are canopy area and the water requirements of the particular crop being irrigated, in most cases avocados.

2.1 Calculating Canopy Area

For pasture the canopy area is straight forward as the whole area is irrigated, but for horticultural crops using micro sprinklers or drippers it is not as straight forward as only the crop area is irrigated, and areas such as headlands within blocks and shelters are not irrigated.

Unlike the kiwifruit industry with Gold 3 and other cultivar licensing, the avocado industry has yet to formerly define a methodology to calculate “canopy area”. But saying this, New Zealand Avocado Industry Council (NZ Avocado) reports a number of parameters (production, orchard gate returns etc.) per hectare. Each individual orchardist specifies their orchard’s canopy area to NZ Avocado during annual export registration, but there is no consistent methodology being used across the industry.

Prior to the recent Motutangi-Waiharara Water Users Group (MWWUG) issued consents and the AAWUG consent applications, canopy area was generally referred to as the area of the orchard the avocado trees occupy and is basically the area of the orchard that is irrigated. Canopy area was measured either by:

1. Number of trees by their planted spacing i.e. standard high-density planting of 5m by 3m has a 15m² foot print per tree that equates to 667 trees per canopy ha or conventional planting of 8m by 7m has a 56m² foot print per tree that equates to 178 trees per canopy ha; or
2. GPS mapping the edge of the canopy of each orchard block (similar method to the kiwifruit industry).

Depending on block size and width of headlands, canopy area works out to be 70 to 80 % of orchard area.

Now with the recent MWWUG issued consents and the current AAWUG consent applications, most of the applicants are stating all the land on their property that is suitable for orcharding is canopy area, this can include tracks, drains, buildings and laydown areas etc. However, some of the applicant’s stated canopy area is only the area occupied by the avocado trees and excludes headlands, drains, tracks, buildings and load out areas etc.

Take the example of Figure 1, a small part of a recently developed high density orchard. There are six blocks of 100m by 80m, they have been planted on a 5m by 3m spacing with 8m headlands on the north/south ends and 7m headlands on the east/west sides. **The total area is 4.8ha and most of the AAWUG applicants have stated all of this is canopy area.** Each planted block has 406 trees, a total of 2,436 trees. Trees cover an area of 3.65ha and this is the area that is actually irrigated. For this example, the area of trees (irrigated area) is 76.1% of the total area.

Figure 1 – Google Earth image of recently developed high density avocado orchard blocks

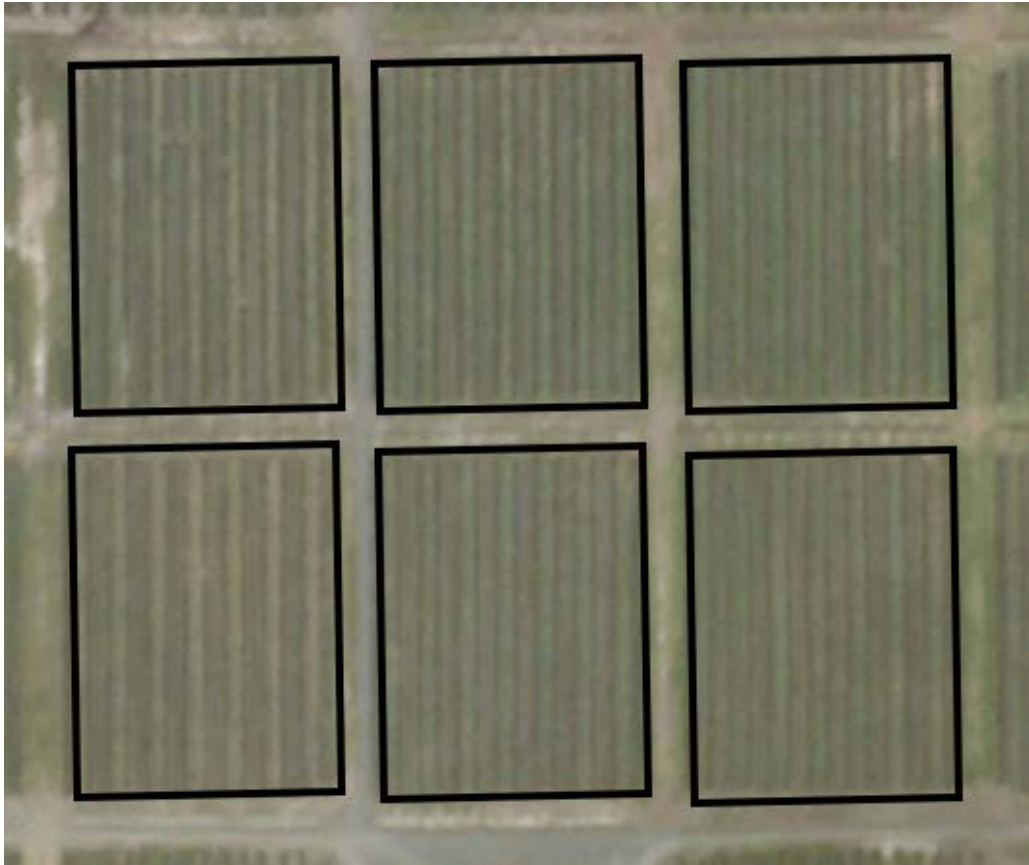


For applicants that have used only the area occupied by trees (irrigated area) as canopy area is illustrated in Figure 2. **For the same six blocks these AAWUG applicant's canopy area is 3.65ha.** The AAWUG applicants that have used this measure of canopy area are:

- APP 040601.01.01 Waikopu Avocados Ltd - 58.5ha property, 40ha orchard, 32ha canopy area
- APP.017428.02.01 Henderson Bay Avocado Ltd - 12.5ha property, 10ha orchard, 8ha canopy area
- APP.039628.01.04 KSL Ltd – 10.7ha property, 10.7ha orchard, 7.5ha canopy area

Note - there may be other AAWUG applicants that have used this method to calculate canopy area.

Figure 2 – Google Earth image of recently developed high density avocado orchard blocks



Superficially there is little difference in the two methods of calculating canopy area, but when it comes to allocating water it is significant. In the above example the water allocation for the whole orchard being deemed canopy area is 31% higher than if only the area the avocado trees occupy is deemed to be canopy area

2.2 Water Requirements for Avocados

The amount of water required for avocados has been determined at about 4,000 m³ per canopy ha by various water use models, namely Spasmo, NZ Irrigation IrrCalc and Williamson Water & Land Advisory's inhouse Soil Moisture Water Balance Model. The recent MWWUG hearing decision on the reasonable and efficient water use for avocados on the Aupōuri Peninsula stated; "The fully developed orchard annual volume should not exceed 3,920 m³/canopy area in ha (equivalent to 392mm)".

The 2019-2020 severe drought almost certainly exceeded the 1 in 10-year return period that the Northland Regional Council uses to allocate sufficient water for irrigation, so it would be expected that fully developed orchards would use close to or exceed 3,920 m³ per canopy ha.

A mix of high density and conventional orchards were benchmarked. Only orchards that have mostly a full canopy and are high producing by New Zealand standards were selected. Two of the orchards have received awards in 2018 and 2019 from NZ Avocado for being the highest most consistent producing orchard in New Zealand for that year.

Property area was obtained from Far North District Council – Far North Maps GIS. Orchard area was calculated using Google Earth with all unplanted areas and unsuitable land excluded, but does include tracks, drains, buildings and laydown areas that lie within the orchard. Canopy area was calculated through personal knowledge of the orchards and / or Google Earth, and represents the area of the orchard that is irrigated. As young trees do not require the same amount of irrigation as a fully developed canopy, where young trees were present a percentage area was calculated.

Note – what is referred to as “orchard area” in this benchmarking exercise is what most of the AAWUG applicants have called “canopy area”

Results are shown in Table 1.

Water use varied from 844 to 2,522 m³ per orchard area ha and 1,160 to 3,142m³ per canopy area ha.

Orchards with low water use; consents AUT.003968.01.03, AUT.007108.01.02 and AUT.023557.01.02, are older conventional orchards that are still highly productive but do have some tree health issues. They have less than optimal irrigation coverage and are probably only irrigating about 60% of the canopy area. For these orchards, over watering can quickly exacerbate tree health issues, so as a management strategy they tend to under irrigate.

Table 1 Water use for various Far North avocado orchards from July 2019 to June 2020

Consent No.	Property Area (ha)	Orchard Area (ha)	Canopy Area (ha)	Canopy % of Orchard Area	Type of Orchard	Canopy % of young trees	Consent Volume (m ³ year)	Volume Used 2019/2020 (m ³ year)			Comments
								Total	Orchard Area per ha	Canopy Area per ha	
AUT.017559.02.01 AUT.029171.01.01	27.8	20.9	15.8	75%	High density ~650/canopy ha	5%	105,000 24,000	44,249 0	2,117	2,801	NZ Avocado award 2019 - highest most consistent producing orchard in NZ
AUT.015147.01.03	24.9	22.0	16.5	75%	Conventional ~178/canopy ha	15%	98,000	36,340	1,652	2,202	NZ Avocado award 2018 - highest most consistent producing orchard in NZ
AUT.008340.01.04	41.1	35	26.8	77%	Conventional 156 to 312/canopy ha	20%	158,520	68,078	1,945	2,540	
AUT.029109.01.02	10.6	6.6	4.5	68%	Conventional 200/canopy ha	0%	20,000	6,130	929	1,362	
AUT.023557.01.02	19.9	17.6	12.8	73%	Conventional ~200/canopy ha	10%	46,000	14,849	844	1,160	
AUT.017045.01.02	159.9	135.0	110.0	81%	High density ~650/canopy ha	0%	558,000	345,574	2,522	3,142	Consent application (APP.040362.01.01) on two titles for an additional 173,700 m ³
AUT.007108.01.02	6.9	6.9	5.2	75%	Conventional ~156/canopy ha	10%	16,740	7,739	1,122	1,488	
AUT.003968.01.03	16.1	11.5	8.5	73%	Conventional 156 to 312/canopy ha	0%	25,000	11,310	983	1,331	

Consents AUT.017559.02.01 and AUT.029171.01.01 are for two adjoining orchards, though both orchards are currently irrigated from AUT.017559.02.01

The orchard for consent AUT.017045.01.02 has about 15ha of land that maybe suitable for development. This orchard is part of the AAWUG applicants and has a consent application (APP.040363.01.01) to take a further 173,700m³.

Discussion

Results from the benchmarking exercise of a selection of fully developed Aupouri Peninsula avocado orchards, including two of the highest performing orchards in New Zealand indicate the 4,000 m³ per canopy ha per annum is too high.

The various models use a combination of historical weather data (rainfall and reference evapotranspiration), soil physical attributes and crop coefficient to estimate the amount of irrigation required for a particular crop. The main variable in all of these models is the crop coefficient being used. As actual irrigation is so much lower than the modelled 4,000 m³ per canopy ha per annum, can only conclude the crop coefficient used for avocados is far too high.

Recently research was done to determine the water requirements for avocados in New Zealand conditions (*Water requirements for 'Hass' avocado flowering and fruit development in New Zealand thesis, Teruko Kaneko, 2016*). It was found that over the summer (irrigation season) crop coefficient for mature trees was 0.45 to 0.6, while for young trees was 0.25 to 0.30. The mature trees were 9 years old and young trees were 3 years old, and both were on a conventional spaced planting. The mature trees in the trial would be substantially bigger and have a greater canopy volume than mature trees in a high-density planting, so for high density planting the crop coefficient would be closer to the low end of the 0.45 to 0.6 range for mature trees.

For the nine orchards benchmarked the total orchard area is 256 ha, canopy area 200 ha and there is 20 to 25 ha of land that could be developed. These orchards have in total consents to take 922,260 m³ per annum, yet in a greater than 1 in 10-year drought only used 490,020 m³ or 53% of their water allocation. Even if the four orchards with low water use are excluded, the other five orchards still only used 55% of their allocation.

3 Conclusion

The definition of canopy area needs to be clearly defined.

For a 1 in 10-year drought, the irrigation requirement for avocados should be no more than:

- Orchard area – 2,500 m³ per ha; or
- Canopy area – 3,200 m³ per ha.

Nearly all existing consents, including those recently issued to MWWUG, have water allocations that are far too high. Northland Regional Council needs to put in place a mechanism or review process that allows it to reduce consent allocations if they are not being utilized, thereby freeing up water resources for further development in the Far North.

4 Specific Consent Applications

Valic NZ Ltd (King Avocado) - APP.040362.01.01

Property area – 159.9 ha
Orchard area – approx. 135 ha
Canopy area – approx. 110 ha
Undeveloped area – approx. 15 ha

Existing consent - AUT.017045.01.02 – 558,000 m³/yr

Water used 2019/2020 – 345,574 m³

Consent application - APP.040362.01.01 – 173,700 m³/yr

Current



Proposed



Question - Where is the justification for consent application - APP.040362.01.01, when Valic NZ Ltd have an existing consent (AUT.017045.01.02) for 558,000 m³/annum and only used 345,574 m³ over the 2019-20202 drought. There is only about 15 ha of land undeveloped on the property, so there is ample water available in their existing consent.

Wataview Orchards (Green Charteris Family Trust) – APP.040363.01.01

Property area – 22.1 ha
Orchard area – approx. 14.8 ha
Canopy area – approx. 12.0 ha
Protected remnant vegetation – 3.4 ha
Unplanted steep sidings – approx. 3.9 ha

Existing consent - AUT.038339.01.01 – 50,000 m³/yr

Consent application - APP.040363.01.01 – 33,750 m³/yr



Where is the justification for this consent application and why has the existing consent not been identified?