BEFORE THE TASMAN DISTRICT COUNCIL
(COMMISSIONER HEARING)

In the matter of	Applications for resource consents to establish a Motorsport and Recreation Park (Land Use Consent RM100848; Land Use Consent RM100872; Land Use Stream Bed RM100873; Land Use Consent RM100874; Land Use Consent RM100875; Water Permit RM100876; Water Permit RM100877; Discharge Permit RM100878; and Discharge Permit RM100879)
Applicant	Adcock and Donaldson Properties Limited

STATEMENT OF EVIDENCE OF ANTHONY MACLEAN HEWITT

8 March 2012

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May it please the Commissioners:

1. My full name is Anthony MacLean Hewitt.

2. I hold the qualification New Zealand Certificate of Engineering, Post Graduate Diploma in Applied Science (Massey University), and I am a Registered Engineering Associate. I am a full member of the New Zealand Hydrological Society, and I am a full member of the New Zealand Water and Waste Association. Between the years 1967 to 1988 I was employed by the Water and Soil Division of the Ministry of Works and Development and in the years 1985 until 1988 was Manager of that Division. Since 1988 I have been in private practice as a hydrologist providing hydrological consultancy primarily in the Nelson, Marlborough and West Coast Regions through my consultancy company Envirolink Ltd.

3. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses, as contained in the Environment Court's Consolidated Practice Note 2006. This evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

4. I have been asked to prepare an evidential statement to support the opposing submission on behalf of the K and J Rowe Family Trust. I visited the site with the Rowes on 20 February 2012.

5. I have carried out numerous hydrological assessments and investigated numerous proposals in the district similar to this one. In 1983 I co-authored and presented a paper comparing water yields under various vegetative cover for a suite of catchments at Kikiwa. These catchments are also on the Moutere Gravels formation, similar to the Stanley Brook Catchment. I was also involved in the Representative River Basin programme run by the then Ministry of Works in the 1970's and 80's which targeted detailed hydrological record collection in nominated catchments in the region. The Stanley Brook Catchment was one of these, resulting in there being considerable flow and rainfall data available for this catchment. The main monitoring site was at Barkers approximately 6km downstream of the Applicant's site, which ran from 1970 to 1994. Map appended.

6. I have analysed 37 years of rainfall recordings from a station in the lower valley. A summary of this data is presented below.

Table 1: Monthly rainfall (mm)

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Min	0	0	0	0	0	14.6	0	21.8	19.2	18.6	17.1	11.2	532.9
Ave	70.9	58	89.1	119	124	113.2	127.3	120.2	99.6	105.7	97.1	92	1213
max	185	158	236	306	231	251	280	239	236	256	303	233	1627

7. While this record is taken from the lower valley, it is evident from other records that average rainfall does not vary significantly across the catchment. Tapawera (Tapawera2, as used by Ms Ambury in her evidence) receives about 1100mm on average, and Kohatu 1250mm (Highfield). What is significant is that for all of the summer and autumn months, zero rainfall can be expected. In 1973 only 61mm of rain fell between 26 December (1972) and 20 April, including 49 consecutive days with no rain at all.

8. I attach a map showing Stanley Brook and Tapawera 2 rain gauge locations.

9. While the main focus of the Representative River Basin hydrological investigation was continuous flow monitoring at Barkers, flow gaugings were also taken from various points in the catchment. Included was a gauging site just upstream of Moulders Road, near the northern end of the subject site. I have obtained five flow measurements taken at this site, and by comparing these with Barkers flows I have computed various flow statistics for the stream at the subject site. These are set out below.

Table 2: Estimated flows for Stanley Brook at Moulders Road

Mean Annual low flow (l/sec)	Median flow (l/sec)	95% flow (l/sec)	75% flow (l/sec)	Mean annual flood (cumecs)	10-year flood (cumecs)	50-year flood (cumecs)
6	69	2	22	27	47	65

10. It is important to note that the correlation technique is limited by the number of comparative gaugings, and the timing of these. The gaugings at Moulders Road only spanned the years 1971 and 1972, and significantly did not include the drought of 1973, commonly regarded as a 1 in 100 year drought. However, referring to the above table, my calculation projects an average annual low flow at the site of 6 l/sec, and

projects that for 95% of the time (346 days per year on average) the flow would be at or above 2 l/sec (about the flow I estimated was at Moulders Road on the 20th February). Similarly for 75% of the time (274 days per year on average) the flow would be at or above 22 l/sec. Based on the limited number of flow gaugings, this is a provisional estimate of the surface flow regime I would normally expect at the subject site. However in reality the variability of the alluvial gravels is such that during very low flow periods much of this flow can disappear into the gravels where they are thickest, and will often re-appear in some reaches along the stream as more impervious bed materials are encountered, or in deeper channels where underlying gravels are thinner. This is a feature of flows in Moutere Gravels, and I saw numerous examples of this on my site visit. For these reasons I would term the stream intermittent rather than ephemeral. Below are two photographs which illustrate this point.

Moulders Road Ford. Estimated flow 2 l/sec.

Lower end of subject property, stream dry.

11. I estimate the flow on the day at Moulders Road Ford to be about 2 l/sec. The Motueka at Woodstock flow was around 12 cumecs, slightly above the mean annual low flow (MALF). This tends to confirm that my low flow projections in Table 2 are somewhat high.

12. With reference to the flood estimates, I have calculated these on an adjusted unit area basis by applying a ratio of catchment areas [$(CA^{m}/CA^{B})^{0.8}$]. The catchment area above Barkers is 81 km^2 and above Moulders Road is 31.2km^2. The catchment is comparatively low yielding in terms of both flood flows and low flows, partly due to the moderate rainfall intensities, but also because of the effect of the pines covering the flanks of the valley which are well documented to cause reduced summer flows in Moutere Gravels catchments (TRMP 30.0.4.2 refers to this issue).

13. In summary I believe the greatest error of estimate lies with the low flows, while the flood estimates should be more reliable. This is because low flows are dependent on localised factors other than rainfall, such as geology and soil type, whereas floods are more directly related to rainfall, and rainfall is known to be relatively uniform over the catchment. Land use, in this case plantation forest, will impact on both low and high flows, but particularly the low summer flows. In view of this the above low flow estimates are provisional at best, and would require further monitoring.

14. I believe the groundwater and surface water flows are fully interconnected, and quantitatively, to take from one in low flow conditions would be effectively to take from the other. TRMP Policy 30.1.3.11 requires that the connection between ground and surface water be fully accounted for. I take this to mean information, including testing, is required to understand this relationship to enable the sustainability of any proposed takes to be assessed. To my knowledge no such testing has been carried out in this catchment, and indeed there are no such records held by Tasman District Council (J Thomas, pers comm.).

The Application

15. I have read the application document as prepared by Viastrada, agent for the Applicant, focusing only on the water sections which I consider to be within my area of experience and qualifications. I understand that the Applicant will require water for the following proposed activities:

- Lake for water ski-ing, cable wake boarding and jet ski-ing;
- Second lake, and unknown number of ponds, for amenity and for fire fighting water supply;

- Dust suppression on car parks and on access road 2 hours before and during events in "dry conditions" (see proposed condition 8(b) and Application page 88);
- Caretaker's house;
- Camping (15 camp sites) - kitchen and ablution facilities (toilets are a separate item below);
- Accommodation (19 accommodation buildings capable of housing 6-8 persons each according to the application, providing a total of 114-152 persons maximum, but only 4 beds each according to Mr Quickfall's evidence, which would be a total of 76 persons);
- Restaurant, bar and 200 person conference facilities;
- Museum/Corporate boxes, Clubrooms, 20 private pit buildings (which will all require toilets);
- 4 commercial buildings plus office (see RC02);
- Trauma Centre;
- Toilets (initially Port-A-Loos, then replaced by permanent structures serviced by 9 individual on-site wastewater treatment systems, plus a decentralised reticulated wastewater system for the accommodation/commercial uses, but with Port-A-Loos brought in for larger events);
- Toilet facilities for concert/events area (none specified on the Plans – the nearest is the Campground showers and WCs shown on Plan RC08);
- Miscellaneous minor water demand eg: associated with pit stop/vehicle facilities, barbecue facilities, and possibly also for open air picnic venue;
- Stock water (although I understand from Mr Quickfall's paragraph 48c this is to be sourced from small scale dams "if necessary");
- Water required for track cleaning (eg to remove dust and pine pollen from racing surfaces).

16. My overall impression is that the water assessment is deficient in background information, making it difficult to objectively assess the hydrological aspects of the proposal. I give my reasons for this in relation to the various aspects as below.

Lakes

17. The proposal outlined in the application seeks to construct a series of ponds and lakes for water activities. Page 19 describes two main lakes, one 50,000 m^3 x 3m deep for jet skiing, and another 22,000m^3 of unspecified depth, but presumably shallower. The lakes are to be lined (P25) and water permits are sought to divert flow from the stream or pump groundwater from a bore(s) at up to 1.05 l/sec to fill and maintain the lakes (P34). It is not clear what the proposed diversion rate is, the application stating '*the lakes will be replenished by groundwater recharge (via a bore) and from diversion of Stanley Brook when it is flowing'*. There are references elsewhere suggesting the diversion rate may only be 1.05 l/sec whether from bores or diversion. Having read Mr Quickfall's evidence I understand the Applicant no longer proposes to fill or recharge the lakes from groundwater and that they will both be fed entirely from the 1.05 l/sec maximum diversion of the Stanley Brook Stream.

18. There is no specified surface area of the lakes, but by applying the volume and depth of the jet ski lake, a surface area for both lakes in combination could be around 24,000m^2 (2.4 ha). Evaporative losses would need to be replenished. A conservative daily evaporation average is around 5mm per day. Over the area of the lakes this would amount to 120m^3/day, or 1.4 l/sec, more than the recharge amount applied for.

19. Moutere Gravels are known to be very difficult to seal with clay. There are likely to be leaks which will also need to be replenished, and while leakages will be returned to the stream system downstream, this will still need to be factored into the water demand.

20. I would expect dust suppression to be a major water use. I am advised anecdotally that a motocross event can require 200,000-300,000 litres track pre-soaking as well as watering during an event. It is conceivable that this would be pumped from the lake, placing further demand on recharge.

Diversion

21. Water, when it is flowing, is to be diverted through a weir structure to the lakes, from where surplus will overflow back to the river (as depicted in map RC4). It is not clear whether the through flow will occur continuously when the river is flowing, or only on an as required basis. Whilst there are considerable amounts of time when there will be good flows in the river, there are also long periods of no meaningful surface flow. It has

yet to be tested whether the sub-surface flows (those occurring just below the surface which could possibly be intercepted by a weir structure) can be accessed and utilised for lake diversion. Although my estimate in Table 2 suggests a flow of 22 l/sec or above for 75% of the time, I believe this is likely to be an over-estimate, and also includes these gravel flows which may not be accessible to divert.

22. However I now note in Mr Quickfall's evidence that the application is to divert no more than 1.05 l/sec from the stream to the lake. As calculated above this is less than the evaporation rate, in which case theoretically the lakes will never fill. By way of illustration, 1.05 l/sec is less than the normal flow from two garden hoses.

Services

23. Estimated peak water demand of 108m^3/day for a busy weekend is included in a table on page 20 of the Application. I note this is slightly over twice the value of 48.8m3 peak demand per day that Fiona Ambury uses in her evidence (paragraph 20). The Applicant has reconsidered potable water supply (Mr Quickfall's evidence) with stored roof water to be the primary source, but supplemented with bore water. Ms Ambury recommends that at least 160m3 of storage is provided on site. My concern is that even this revised storage could be depleted during two successive peak demand weekends, particularly during drought conditions, in which case the bore water of 20m3 per day would be the sole replenishment source. According to my calculations this would be insufficient to meet the demand for potable water on site for even one peak day, and would clearly be unable to be used at the same time to replenish the lake/s or for other required water uses such as dust suppression.

24. In an attempt to estimate the water balance for potable water use from roofs I have analysed demand against rainfall records making the following assumptions (based on my interpretation of the conditions suggested on page 88 of the Application and adopting 48.8m^3/day peak demand from Ms Ambury's evidence at paragraph 20):

Maximum 200 motorsports events per year at 48.8m^3/event (1 day) = 9760m^3/year.

Maximum 10 x 3-day events per year at 48.8m^3/day = 10 x 48.8 x 3 = 1464m^3/year.

Maximum 365 x 2m^3/day for 1x household + day visitors = 730m^3/year.

Total 11954m^3/year = 33m^3/day average.

Roof area 9560m^2 (based on same as total floor area (RC02))

Storage available 108m^3 (page 20 of the application).

25. I ran this 'rainfall only' scenario over the 1973 dry summer, assuming tanks were full as at 1 December 1972. Because very little rain fell after that, the storage ran dry in under 4 days.

26. Pumping from groundwater is proposed for recharge of potable water. TRMP Chapter 31 Figure 31.1A provides for up to 10m^3/day per property as a permitted activity. It is understood there are two titles involved so up to 20m^3/day could potentially be abstracted.

27. I therefore factored in 20m^3/day coming from groundwater and re-ran the analysis initially with 108m^3 of storage as proposed. This showed that storage would have run out around mid January.

28. I then reverse engineered the process, inserting various tank sizes until the demand was fully met. This showed that 1000m^3 of storage would need to be provided to adequately supply the peak potable demand of the proposal. My analysis is appended.

29. While this is an imprecise calculation due to unknowns such as timing of events and specific demand, it does illustrate the unreliability of roof water collection if the potable water demand is as suggested in the proposal. Based on this, unless storage of 1000m^3 can be provided, alternative sources would be required.

30. For these reasons I disagree with Mr Quickfall's evidence (paragraph 51 (a)) that *'There is sufficient reliable rainfall to harvest for the expected peak water demand on the site.'*

31. According to TRMP Chapter 31 Figure 31.1E, the allocation for the Stanley Brook Zone is 1.05 l/sec, the amount applied for, yet I am advised that this has already been allocated (N. Tyson, TDC pers comm.).

32. Mr Quickfall refers in his evidence (paragraph 48(c), page 28) to the possible use of *small scale dams* for stock water. I note that there are indeed a number of potential dam sites in tributary gullies, but many, if not most, are over 20ha at the point where they enter the Applicant's property, and thus would require resource consent.

33. My conclusion is that based on the information provided, the proposal would not appear to have sufficient water to supply either the lakes or the potable demand.

Downstream Effects

34. With no pump test data or other specific information available it is impossible to calculate the abstractive effects on the downstream environment, other than to say

that any upstream abstraction will obviously no longer be available for downstream recharge.

35. The Rowes have a domestic and stock water well near their house which is about 70m from the river. The well is 4m deep x 1.2m diameter. When I was there the static water level was approximately 1m below ground level, meaning there was around 3m of water in the well. Water is pumped to header tanks high on a nearby ridge from where it gravitates to various stock water troughs across the farm. According to figures supplied by the Rowes, their approximate daily stock water demand is 34 m^3 per day in winter, and 26 m^3 in summer, plus the house take. I understand they have had no problems supplying these rates, but have never measured the draw down to see what freeboard might be available.

36. Until specific testing has been done, and the actual abstraction rate and methods required to sustain the proposal have been verified, the potential effects cannot be accurately quantified and there remains the possibility of an adverse impact on the Rowes' ability to take stock and domestic water as a result of this application.

Officers' Report

37. I have read Mr Mackiggan's assessment in the Officers Report. Specific water allocation issues do not appear to be discussed, but Mr Mackiggan is '*confident therefore that conditions can be imposed upon the applicant to ensure that any adverse effects upon surface and ground water can be avoided, remedied or mitigated accordingly'*.

38. While I agree conditions can generally be applied to manage and control many activities in a sustainable way, and ultimately this may well be possible here, first of all there needs to be an understanding of the resource and the activities' full impact before such conditions can be applied. I do not believe there has been sufficient information on flows provided in this application.

Motueka River Water Conservation Order (MRWCO)

39. The MRWCO applies special protection to the Motueka Catchment and many of its tributaries. The Stanley Brook below Sunday Creek is listed in Schedule 2. The Order requires that any changes to flows in this reach, in combination with any other flow changes, should not alter the flows in the Motueka River at Woodstock by more than 12% (clause 8(c)). I do not have information on the current cumulative flow change status in the Motueka Catchment above Woodstock, but I would not expect this proposal to be limited as a result of this clause.

40. Clause 11(1)(a) requires that suspended solids or turbidity in the receiving waters not be altered by more than 10 mg/l of 1 NTU where the ambient concentration of suspended solids or turbidity is less than 10mg/l or 10 NTU. There are also restrictions for higher ambient levels (clause 11(1)(b)). I would expect concentrations to be below these levels most of the time in the river downstream of Sunday Creek, so river bed works will need to be managed in accordance with this clause. Restricting works to times of dry will avoid a lot of the impact, but there will be instances during flow periods where the impact of sediment will require special measures to meet this requirement.

Conclusion/Recommendations

41. Due to the groundwater and surface water flows being fully interconnected, in low flow conditions there is the potential for the Applicant's proposed abstractions to reduce the ability of the Rowes downstream to abstract their present domestic and stock water supplies from groundwater. I have therefore set out below the information, including testing, that I consider is required to understand this relationship to enable the sustainability of the proposed takes to be assessed.

42. Before the effects of the application, and for that matter the viability of the recharge components, can be properly assessed I believe the following is necessary:

42.1 A 12 month period of continuous monitoring of flows in the Stanley Brook at or near the proposed diversion site (Rabbit Gully Ford would be a suitable location). This is to strengthen the correlation with the Stanley Brook at Barkers flow record to enable a more robust estimate of the 5-year 7-day low flow to be calculated which is the benchmark flow for surface water allocation in the district (TRMP Policy 30.1.3.16).

42.2 A groundwater bore be constructed at the proposed site and tested to evaluate sustainable yield, with monitors set up downstream in the stream and in the Rowe well to make sure there is no undue interference to their well. A piezometric survey linking existing pond and well water levels to stream levels should also be provided. This would determine the longer term sustainability and effects of pumping from the ground water.

42.3 During the course of this information collection phase, and as specific information gathering is completed, it should be possible to review the water supply aspects of the proposal which will result in a more precise assessment of the effects and sustainability of the proposal.

43. I am happy to answer any questions.

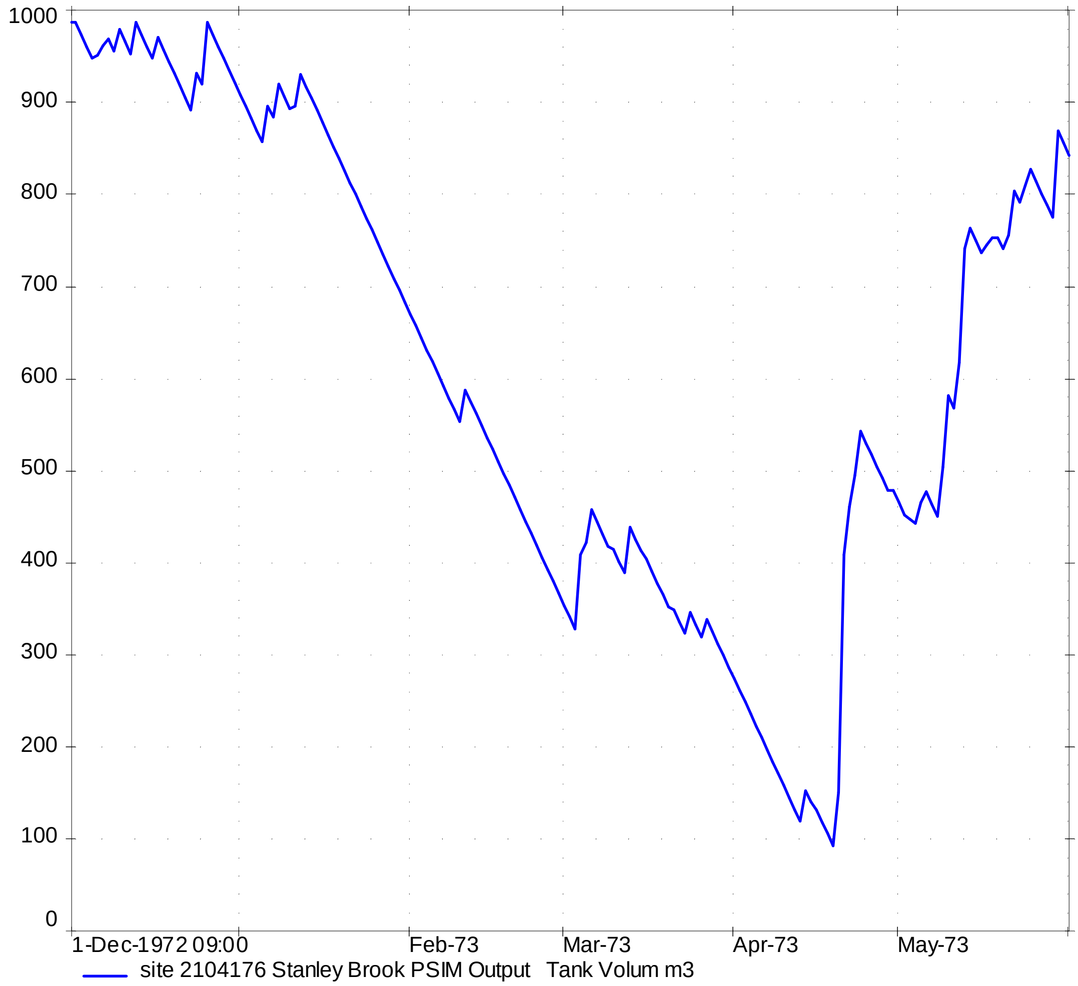
Tony Hewitt

8 March 2012

Appendix 1: Potable Water Demand vs Rainfall for Dry Season

Using rainfall data from Stanley Brook 1 Dec 1972 to 1 June 1973 **Dry Year**
Roof size=9650m2
Tank size = 108,000 L
Initial Volume = 108,000 L
Demand = 13,000L/day (20,000 L to come from groundwater)

Using rainfall data from Stanley Brook 1 Dec 1972 to 1 June 1973 **Dry Year**
Roof size=9650m2
Tank size = 1,000,000 L
Initial Volume = 1,000,000 L
Demand = 13,000L/day (20,000 L to come from groundwater)



Map showing raingauge locations in relation to Applicant property.