

BEFORE THE BOARD OF INQUIRY

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a Board of Inquiry appointed under section 146 of the Resource Management Act 1991 to consider an application by Mighty River Power Limited for resource consents to construct, operate, and maintain a wind farm at Turitea.

MEMORANDUM OF COUNSEL FOR MIGHTY RIVER POWER LIMITED

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INTRODUCTION

1. Since the recommencement of the Turitea Wind Farm hearing, a number of questions have been raised that required a response from Mighty River Power's expert witnesses. These include:
 - Dr Salinger;
 - Professor Craig;
 - Mr W. Shaw; and
 - Mr Brown.

Dr Salinger

2. During questioning of Dr Salinger, a number of issues were raised regarding rainfall data, standards of error, and the locations of the weather stations and modelling locations used in his evidence in chief.
3. Dr Salinger has provided a response to the questions he was asked during his appearance before the Board.

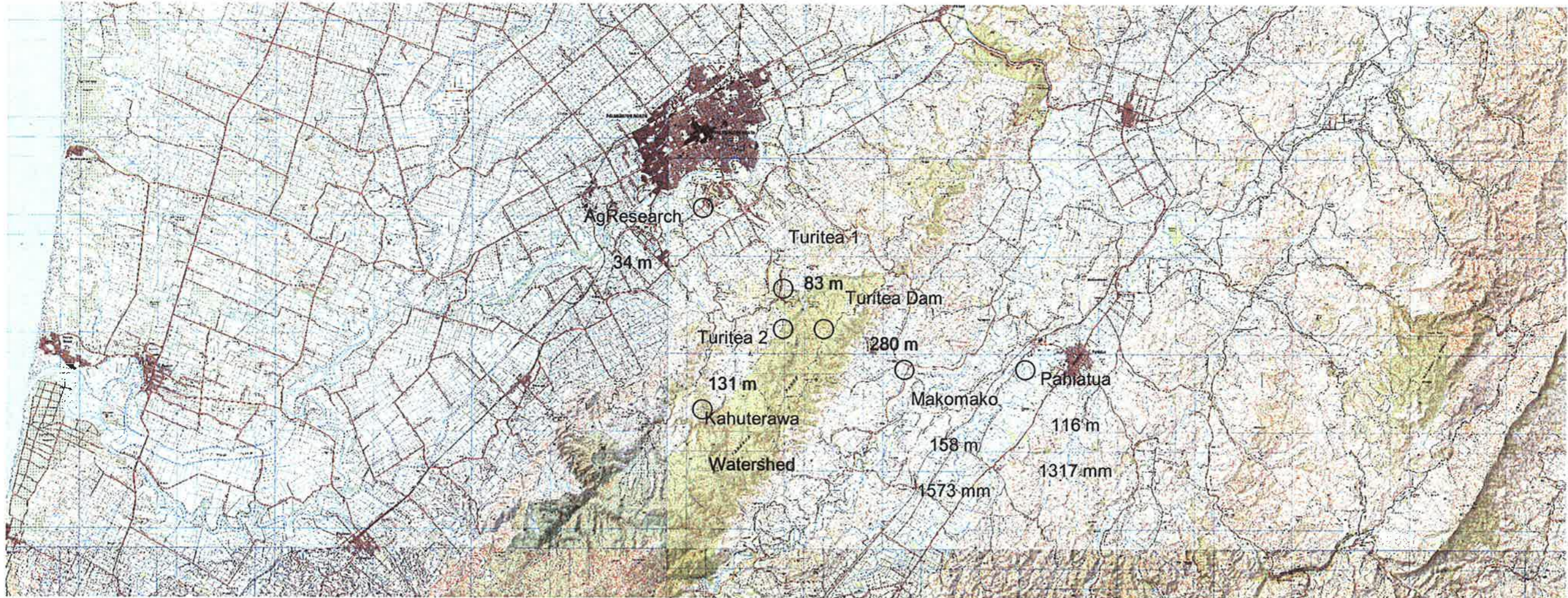
Location of Rainfall Monitoring Sites

4. In Table 1 Dr Salinger provides a list of the rainfall monitoring stations referred to in his evidence. The grid references have been converted to be consistent with those used in the HIRDS table in his evidence. The locations are mapped on Figure 1. An additional station has been used to derive high intensity rainfall rates from automated records: Pahiatua.

Table 1. Rainfall stations used to estimate rainfall for the proposed Turitea Windfarm area. * Longer term rainfall monitoring.

Station	Network No.	Latitude °S	Longitude °E	Elevation (metres)	Source
AgResearch*	E05363	40° 23'	175° 37'	34	NIWA
Turitea 1	E05463	40° 25'	175° 40'	83	NIWA
Turitea 2	E05464	40° 26'	175° 40'	131	NIWA
Turitea Dam		40° 26'	175° 53'	280	PNCC
Makomako*	D05471	40° 28'	175° 44'	158	NIWA
Kahuterawa Watershed	E05463	40° 28'	175° 37'		NIWA
Pahiatua	D05481	40° 27'	175° 49'	116	NIWA

Figure 1. Rainfall stations used to estimate rainfall for the proposed Turitea Windfarm area.



High Intensity Rainfall Rates

5. In response to a question from Mr Low, Dr Salinger has provided the standard errors in the high intensity rainfall rates calculated by HIRDS version 2 software listed in his evidence for the two sites is given in Table 2.

Table 2. Rainfall intensity error rates, in millimetres for various average recurrence intervals (ARIs) for durations from 10 minutes to 72 hours (3 days).

Turitea Dam: Latitude 40° 26' S, Longitude 175° 53' E

Standard errors of rainfall depths (mm)	Duration									
	10m	20m	30m	60m	2h	6h	12h	24h	48h	72h
ARI 2	0.6	0.8	1.0	1.3	1.7	2.6	3.3	4.3	5.2	5.7
10	1.1	1.4	1.7	2.1	2.6	3.9	4.9	6.8	8.1	8.7
20	1.3	1.7	2.1	2.5	3.0	4.4	5.6	7.9	9.4	9.9
30	1.5	1.9	2.3	2.8	3.3	4.7	6.0	8.6	10.1	10.7
40	1.6	2.1	2.5	3.0	3.5	5.0	6.3	9.1	10.7	11.2
50	1.7	2.3	2.7	3.1	3.6	5.2	6.5	9.5	11.1	11.7
60	1.9	2.4	2.9	3.3	3.8	5.4	6.7	9.8	11.5	12.0
70	2.0	2.5	3.0	3.4	3.9	5.5	6.9	10.2	11.8	12.3
80	2.0	2.6	3.1	3.5	4.0	5.6	7.0	10.4	12.1	12.6
100	2.2	2.8	3.3	3.8	4.3	5.9	7.3	10.9	12.6	13.1
125	2.4	3.1	3.6	4.0	4.5	6.1	7.6	11.4	13.2	13.6
150	2.6	3.3	3.8	4.2	4.7	6.3	7.8	11.9	13.6	14.0

Turitea South: Latitude 40° 30' S, Longitude 175° 39' E

Standard errors of rainfall depths (mm)	Duration									
	10m	20m	30m	60m	2h	6h	12h	24h	48h	72h
ARI 2	0.7	1.1	1.3	1.8	2.4	4.2	5.4	6.7	8.1	9.3
10	1.2	1.9	2.2	2.9	3.6	6.3	8.0	10.5	12.6	14.1
20	1.5	2.3	2.6	3.4	4.2	7.1	9.1	12.2	14.5	16.1
30	1.7	2.5	2.9	3.7	4.5	7.7	9.8	13.3	15.7	17.3
40	1.8	2.8	3.2	4.0	4.8	8.1	10.2	14.0	16.6	18.2
50	2.0	2.9	3.4	4.2	5.1	8.4	10.6	14.7	17.3	18.9
60	2.1	3.1	3.6	4.4	5.3	8.6	11.0	15.2	17.9	19.5
70	2.2	3.2	3.7	4.6	5.5	8.9	11.2	15.7	18.4	20.0
80	2.3	3.4	3.9	4.8	5.6	9.1	11.5	16.1	18.9	20.5
100	2.5	3.6	4.1	5.0	5.9	9.4	11.9	16.9	19.7	21.3
125	2.6	3.9	4.4	5.4	6.2	9.8	12.4	17.7	20.5	22.1
150	2.8	4.1	4.7	5.6	6.5	10.1	12.8	18.3	21.3	22.8

6. The 2-year average recurrence interval (ARI) daily intensity standard error ranges from 4 to 6 mm, and the 10-year ARI standard error from 7 to 10 mm in the south. Comparable 3 day standard errors range from 6 to 9 mm for a 2-year ARI, to 9 to 14 mm for a 10-year ARI. The shorter duration intensities, up to 2 hours range from 2 to 3 mm.
7. The standard errors estimated by HIRDS indicate a relatively high level of confidence in the estimates of high intensity rainfall across the proposed wind farm area.

8. Dr Salinger has noted that another method was used to calculate high intensity rainfall intensity rates, from automatic rain gauge data. Automated gauges collect rainfall information continuously and allow the estimation of average recurrence intervals from breakpoint data. The breakpoint format of rainfall data, which records the rain rate and the times when it changes, implicitly provides high time resolution rainfall information in a highly compressed form. These can be then used to calculate the actual high intensity rainfall intensities for any duration without the artificial division of 23 hour periods, or estimated from daily rainfall data.

Table 3. Rainfall intensity rates, in millimetres for various average recurrence intervals (ARIs) for durations from 10 minutes to 72 hours (3 days) for AgResearch, Palmerston North from automatic gauges.

Palmerston N		Data period 1946-2000									
Rainfall depths (mm)											
Average Recurrence Interval											
(y)	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	
2	6.7	10.2	12.1	16.5	23.1	37.0	46.6	57.5	67.5	72.7	
5	9.3	14.3	16.6	21.8	29.7	46.3	58.9	75.5	88.1	92.8	
10	11.1	17.0	19.6	25.2	34.0	52.4	67.1	87.4	101.8	106.1	
20	12.7	19.6	22.4	28.5	38.2	58.3	74.9	98.8	114.9	118.9	
30	13.7	21.1	24.1	30.4	40.6	61.6	79.4	105.3	122.4	126.2	
50	14.9	22.9	26.1	32.8	43.6	65.9	85.0	113.5	131.9	135.4	
60	15.3	23.6	26.8	33.7	44.6	67.4	87.0	116.5	135.2	138.7	
70	15.6	24.1	27.5	34.4	45.5	68.6	88.7	118.9	138.0	141.5	
80	16.0	24.6	28.0	35.0	46.3	69.7	90.1	121.1	140.5	143.8	
90	16.2	25.0	28.5	35.5	47.0	70.7	91.4	122.9	142.6	145.9	
100	16.5	25.4	28.9	36.0	47.6	71.5	92.6	124.6	144.6	147.8	

Standard errors of rainfall depths (mm)											
ARI											
(y)	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	
2	0.3	0.5	0.6	0.6	0.8	1.1	1.5	2.2	2.5	2.5	
5	0.5	0.7	0.8	0.9	1.2	1.7	2.2	3.2	3.7	3.6	
10	0.6	1.0	1.1	1.3	1.6	2.3	3.0	4.4	5.1	4.9	
20	0.8	1.3	1.4	1.7	2.1	2.9	3.9	5.7	6.5	6.3	
30	0.9	1.4	1.6	1.9	2.4	3.3	4.4	6.4	7.4	7.2	
50	1.1	1.7	1.9	2.2	2.7	3.8	5.1	7.3	8.4	8.2	
60	1.1	1.7	1.9	2.3	2.8	4.0	5.3	7.7	8.8	8.6	
70	1.2	1.8	2.0	2.3	2.9	4.1	5.5	8.0	9.2	8.9	
80	1.2	1.9	2.1	2.4	3.0	4.3	5.7	8.2	9.4	9.2	
90	1.2	1.9	2.1	2.5	3.1	4.4	5.8	8.4	9.7	9.5	
100	1.3	2.0	2.2	2.5	3.2	4.5	6.0	8.6	9.9	9.7	

9. In respect of Tables 3 and 4, Dr Salinger notes that these:

“provide high intensity rainfalls, and error estimates, from the AgResearch and Pahiatua sites. The 2-year daily intensity falls are 58 +/-3 mm at both sites, and the 10-year ARI fall ranges between 87 +/- 6 mm at AgResearch to 73 +/- 4 mm at Pahiatua. This compares with from 62 mm to 100 mm for the 2-year, and from 85 mm to 137 mm for the 10-year ARI fall from HIRDS. Comparable 3 day averages from breakpoint data range from 73 to 80 +/- 3 mm for a 2-year ARI, and 106 +/- 5mm to 97 +/-7 mm for a 10-year ARI. The HIRDS estimates for

Turitea area are 85 to 145 mm for a 2-year ARI, and 113 to 192 mm for the 10-year ARI fall.”

Table 4. Rainfall intensity rates, in millimetres for various average recurrence intervals (ARIs) for durations from 10 minutes to 72 hours (3 days) for Pahiatua from automatic gauges.

Pahiatua		Data period 1993-2002									
Rainfall depths (mm)											
ARI	Duration										
(y)	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	
2	6.0	8.8	11.1	15.4	21.0	35.4	46.4	57.8	70.4	79.5	
5	7.8	11.8	14.7	20.6	25.5	40.8	54.8	66.8	83.3	90.2	
10	8.9	13.8	17.2	24.0	28.5	44.4	60.3	72.8	91.9	97.3	
20	10.0	15.8	19.5	27.2	31.4	47.8	65.6	78.5	100.1	104.1	
30	10.7	16.9	20.9	29.1	33.1	49.7	68.7	81.8	104.8	108.1	
50	11.4	18.3	22.6	31.4	35.1	52.2	72.5	85.9	110.7	113.0	
60	11.7	18.8	23.2	32.3	35.9	53.1	73.9	87.4	112.8	114.7	
70	12.0	19.2	23.7	33.0	36.5	53.8	75.0	88.6	114.6	116.2	
80	12.2	19.5	24.1	33.6	37.0	54.4	76.0	89.7	116.1	117.4	
90	12.4	19.9	24.5	34.1	37.5	55.0	76.9	90.6	117.4	118.6	
100	12.5	20.1	24.8	34.6	37.9	55.5	77.7	91.5	118.7	119.6	

Standard error of rainfall depths (mm)											
ARI	Duration										
(y)	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	
2	0.5	0.9	1.1	1.5	1.3	1.6	2.5	2.7	3.8	3.2	
5	0.8	1.3	1.6	2.3	2.0	2.4	3.7	4.0	5.7	4.8	
10	1.0	1.8	2.2	3.1	2.8	3.3	5.1	5.5	7.8	6.5	
20	1.3	2.4	2.9	4.0	3.5	4.2	6.5	7.0	10.0	8.3	
30	1.5	2.7	3.2	4.5	4.0	4.7	7.3	7.9	11.3	9.4	
50	1.7	3.1	3.7	5.2	4.6	5.4	8.4	9.1	13.0	10.8	
60	1.8	3.2	3.9	5.4	4.8	5.6	8.8	9.5	13.6	11.3	
70	1.9	3.3	4.0	5.6	5.0	5.9	9.1	9.8	14.1	11.7	
80	1.9	3.4	4.1	5.8	5.1	6.0	9.4	10.1	14.5	12.0	
90	2.0	3.5	4.3	5.9	5.2	6.2	9.6	10.4	14.9	12.4	
100	2.0	3.6	4.4	6.1	5.4	6.3	9.9	10.6	15.2	12.7	

10. The breakpoint data give high intensity rainfall rates that are slightly less than those derived from HIRDS although the Pahiatua values are closer. Both these sites receive less rainfall than the proposed Turitea Wind Farm area. The automated data analysis is based on breakpoint data, i.e. from actual rainfall intensities. These rainfall intensities calculate rates below those estimated by HIRDS.
11. The automated data analysis is based on breakpoint data i.e. from actual rainfall intensities. These rainfall intensities calculate rates below those estimated by HIRDS. Dr Salinger and Mr Levy have discussed this matter and agree that the rates produced in Dr Salinger's original evidence are the appropriate ones to use, and that these are confirmed by the rainfall intensities derived from automated data. Accordingly, from the catchment area, the relevant rainfall intensity, and the runoff coefficient (reflecting land cover), a design flow rate is determined.

Dr Salinger's Conclusions

12. Errors in the estimation of high intensity rainfall rates are relatively small, and range from 4 to 6 mm for 2-year ARI daily rates, to 7 to 10 mm for 10-year daily ARI rates.
13. High intensity daily rainfall rates have also been calculated using breakpoint data from automated rain gauging sites at AgResearch and Pahiatua. As both these sites are outside the proposed Turitea Wind Farm area, with lower annual totals, the rates calculated are slightly lower than those estimated in from HIRDS and daily data. This confirms that the rates given in the tables of his evidence are relevant for the area, and the most appropriate to use for design.

Professor Craig

14. Dr Cookson's submission re-introduced a large amount of the evidence that had previously been circulated by Ms Gabites and not accepted by the Board. It raised a number of questions relating to New Zealand Falcon behaviour and nesting. Her Honour also noted that she had reviewed Dr Fox's 1977 University of Canterbury thesis of regarding the New Zealand Falcon. Mighty River Power's avian expert, Professor Craig has reviewed Dr Cookson's representation, the transcript of his presentation to the Board, and Dr Fox's thesis, and has also telephoned Dr Fox to discuss his thesis.
15. In paragraph 8 of his representation, Dr Cookson raises the issue of displacement and using a figure from Pearce-Higgins et al. (2009) shows that a 500m displacement circle around each proposed turbine site results in a wall effect that creates blind alleys for birds. It is also important to note that the study quoted by Dr Cookson says the following. *"Two of the three raptors also showed significant turbine avoidance extending to at least 500m and 250m from the turbines for Buzzard and Hen Harrier respectively"*. Professor Craig's understanding is that Hen Harriers are only displaced by 250m not the 500m claimed by Dr Cookson. Moreover, he considers that the study shows that the density within this area will be reduced, not that the birds do not use the area or cannot use the area. Professor Craig notes that the study states that "breeding density of Hen Harriers may be reduced within a 500m buffer by 15 – 53%". Professor Craig considers that the qualifier in this sentence, along with the range of reductions and the fact that Falcons are not Harriers, suggests a somewhat unrealistic extrapolation by Dr Cookson.
16. Professor Craig also notes that there is considerable literature on displacement effects of birds. He states that Madders & Whitfield (2006) (Ibis 148, 43 – 56) give estimates of sensitivity to displacement for 20 species of raptor. He further considers that Falcons & Kestrels, which are more like the New Zealand Falcon than the Hen Harrier quoted by Dr Cookson, have "Low" sensitivities to displacement. Professor Craig believes that comparisons with Buzzards are totally inappropriate as these are large soaring raptors and lack the attack skills of Falcons. Madders & Whitfield further report that for 3 published studies no displacement effect was observed for Hen Harriers. In Professor Craig's opinion, these factors suggest that Dr Cookson's Figure 2 is unrealistic and not relevant to Turitea and Falcon.

17. Professor Craig considers that the overwhelming implication of displacement is that birds, especially nesting birds, often avoid the immediate vicinity of turbines. The resultant effect is that the likelihood of collision mortality is also greatly reduced.
18. In addition, Professor Craig has reviewed the comments made by the Judge raised regarding Dr Nick Fox's thesis, especially that regarding the soaring height of New Zealand Falcons.
19. The reference to the soaring heights of New Zealand Falcons is found at page 151 of Dr Fox's 1977 thesis, in a list of hunting strategies. Dr Fox noted that falcon hunting by contour hugging was "*seen on many occasions*". Professor Craig considers that this indicates that when hunting, the birds are hunting by following the contour of the tree tops or the ground contour, *and as such will not be flying at the height of the rotor blades*.
20. Dr Fox's thesis also reports that the New Zealand falcon also hunt by soaring, and that such behaviour is "*seen very often*" up to heights of 1000m but "*usually between 50 - 200m*". He qualifies this with the comment that "*in hill country, of course, the height is very variable*", showing it is much lower over ridges.
21. He notes that "*soaring is used in 2 ways: i) to intercept high flying prey crossing gullies and ii) to observe vulnerable prey on the ground*". He also notes that New Zealand Falcon hunt by walking on the ground.
22. Professor Craig's reading of this is if New Zealand Falcon are soaring then they are most often between 50 - 200m, but that this is difficult to interpret for a wind farm. This is because it appears that New Zealand Falcon are mainly doing this to attack prey caught in the air crossing valleys, not to catch prey at this height above ridges, which is where turbines are put. Dr Fox's comment about the differences in hill country implies that soaring is much lower over ridges. Indeed, Professor Craig notes that photos of Dr Fox's study area later in the thesis show that 200m above the ground is still below ridge height.
23. Further in Figure 8.8, Dr Fox shows that female New Zealand Falcons do not defend their nest area even to the height of the ridge, and that males only fly as high as 70m over ridges, but more over valleys.
24. Professor Craig has contacted Dr Fox to discuss his thesis, and notes that Dr Fox stated (Dr Fox 17 March 2010, pers. comm.) that Falcon soar on thermals, and will fly to the heights that these allow. Typically, they stop in the lee of the ridge and hence do not allow soaring at any height above a ridge.
25. Professor Craig notes that Dr Fox is the main proponent of putting falcons into vineyards where turbines are used to move air to avoid the problems of frost. Accordingly, he considers that if turbines pose a problem for New Zealand Falcon, then Dr Fox is actively promoting putting his preferred bird of study at risk. In Professor Craig's opinion, Dr Fox is a very passionate advocate for the New Zealand Falcon and Professor Craig considers that Dr Fox would not mix the two if he thought that the turbines would pose a problem to the falcons. As a result, Professor Craig does not

see that Dr Fox's thesis in any way provides evidence that suggests that New Zealand Falcon are at risk from a wind farm.

Mr W. Shaw

26. At Paragraph 7 of Dr Cookson's representation, it states that "no other wind farms currently in operation within New Zealand are situated in well-developed natural ecosystems with mature indigenous vegetation". Mr W. Shaw has responded by noting that that statement does not acknowledge that other operational wind farms are located immediately adjacent to mature indigenous forest (e.g. Manawatu Gorge) and others have also been granted resource consents, with falcon present across the entire site, e.g. Central Wind near Taihape.
27. In Paragraph 8, Dr Cookson asserts that the Turitea Reserve site could become a "population sink site" if the wind farm is constructed. Mr W. Shaw comments that Dr Cookson has presented no evidence to support this contention, either of likely mortality rates from rotor strike or the relationship between increased population levels that could be attained from intensive pest management.
28. Paragraph 10 of Dr Cookson's representation refers to Mr W. Shaw's comments on the lack of observations to date of breeding falcon, and states that "he has either failed to note the breeding falcon or considered that their breeding is of insufficient merit to include in any assessment of environmental effects". In cross-examination, Mr W. Shaw stated that there could be resident (i.e. breeding) birds present.
29. Further, Mr W. Shaw's response notes that:

"if we had observed breeding birds prior to the hearing that certainly would have been included in our reporting, although it would not have altered my assessment of the relative risk posed to falcon by the possible presence of wind turbines (there is no evidence of falcon mortality associated with falcon and New Zealand wind farms, and overseas evidence of raptor displacement is not related to species comparable with New Zealand falcon, as referred to in the further response of Dr John Craig, 17 March 2010. I have observed falcon hunting in the Reserve, and it was notable that they tended to be "contour-hugging" when doing so, i.e. following the ground/vegetation surface, within 5-20 m of the surface. This is the type of pattern I would expect in a generally windy environment such as Turitea."
30. In Paragraph 12 of his representation, Dr Cookson refers to possible lizard records for the Reserve, and there will be lizard species present, as acknowledged in Mr W. Shaw's evidence. Mr Shaw has noted that he has not yet located any lizards at more than 50 Artificial Cover Objects established in the Reserve to assess lizard presence. He further notes that lizards are undoubtedly at very low numbers, which is now typical for much of the New Zealand mainland.
31. Overall, Mr W. Shaw has concluded that while the record of breeding falcon in the Reserve is of interest, there is no information presented in Dr Cookson's evidence that would lead him to alter the conclusions of his evidence presented to the Board.

Mr Brown

32. Mr Brown was asked a question on 16 March regarding why he had determined that turbine zones 132 and 133 should be removed. He has reviewed his original assessment of the proposed turbine zones, and revisions through to February 2010, and has stated that the turbine zones were proposed to be deleted for two reasons.
33. Firstly, they were identified as being prominent to dominant form a range of viewpoints and 'on-the-ground' vantage points, including Public Viewpoints 04 (Turitea Rd), 06 (Aokautere Drive) and 11 (Awapuni Racing Club), together with RVPs 2 (Pacific Drive), 07 (the right hand side of the view from Orams Rd), 16 (Greens Rd) and 22 (Pacific Drive). The consistent manner in which these turbines were identified as being prominent to dominant was regarded as exceptional, compared with other turbine zones comprising part of the Turitea project.
34. Moreover, in some specific views – from around Aokautere Rd and Turitea Rd especially – it was considered that Turbines 132 and 133 would intrude into views of the main water catchment and its bush area viewed above and beyond the main catchment dam. Although the level of intrusion would not be inordinate in itself the combined impact on the natural values of the water catchment and forest area caused by this imposition, together with awareness of their location on a middle ground ridge (as opposed to the more remote ridgeline around South Range Rd) was of concern.
35. As a result, Mr Brown has concluded that it was the accumulated effects associated with turbine zones 132 and 133 that led to their deletion from the revised wind farm proposal, rather than any single impact in relation to one or more individual viewpoints.

Micro-Siting Explanation

Wind Farm Layout:

36. The layout of the Turitea Wind Farm incorporates two possible turbine layouts, located within the proposed 105 turbine zones. The two respective layouts are designed to accommodate the primary turbine variants being considered by Mighty River Power, being the:
 - (a) Vestas V90 3MW turbine, with a rotor diameter of 90m; or
 - (b) Siemens 2.3MW turbine, with a rotor diameter of 82m
37. Within the 105 turbine zones, Mighty River Power proposes to construct up to 96 of the 3MW variant or 104 of the 2.3MW variant. The total installed capacity of the wind farm will be 239-288MW depending on final turbine selection.
38. The difference in the total number of 3MW machines versus the 2.3MW machine is due to the greater spacing required for the larger rotor diameter of the 3MW machine.
39. The individual zones provide for placement of either turbine type. In the circular-shaped zones, either type of turbine can be placed in the same location. Where an elongated zone is shown, there are different intended locations for each type of

turbine. However, if the 3MW turbine is selected, not all turbine zones will be able to be used due to the necessary separation distances.

40. The 1:2000 drawings (February 2010) presented to the Board provide further detail as to the intended siting of turbines within the proposed turbine zones, and how the layouts differ. For example, Sheet 39 of 105 provides for the construction of three 3MW turbines (in zones 0016, 0018 and 0019 – as shown as the turbine locations depicted) or four 2.3MW turbines (in zones 0016, 0017, 0018 and 0019).
41. The 1:2000 drawings highlight the 3MW layout and demonstrate that the larger of the two variants can be constructed within the proposed roading and infrastructure layout.
42. Maps 3 and 4 in the Mighty River Power map-book also identify the two different layouts, as proposed prior to the redesign being undertaken.

Micro-siting:

43. Micro-siting is a practice by which the final location of a turbine can be adjusted within a turbine zone, and the turbine location within that zone. Its purpose is to allow a turbine to be moved to better address site specific circumstances that may be identified during the detailed design phase.
44. Examples of where the ability to micro-site a turbine may prove value include areas:
 - (a) where unknown archaeological/cultural discoveries are made;
 - (b) where vegetation removal or potential ecological effects could be further reduced;
 - (c) where the efficiency of construction could be improved; and
 - (d) where geotechnical issues could be improved through an adjustment to the turbines location.
45. As described in its application documentation, Mighty River Power has sought the ability to micro-site turbines +/-50m of the proposed turbine location within the turbine zones identified in the Turitea Reserve, and +/-75m of the proposed turbine location for zones on pasture land (recognising the lower degree of sensitivity in siting turbines on pasture land versus vegetated areas).

Co-ordinates

46. Co-ordinates have been provided to various parties to allow modelling and mapping of the wind farm (including the photomontages). The co-ordinates represent a single point in a turbine zone, being the centre point of that zone, rather than the intended locations of turbines within those zones, as this may change during the detailed design phase. The co-ordinates do not differentiate between different turbine models and therefore identify 105 single point locations, although in practice, this number of turbines will not be built.

Revised Photomontage RVP23

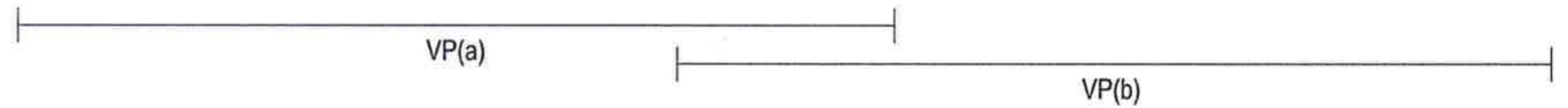
47. The Board has requested that photomontage RVP23 be updated to reflect the changes to the Turitea Wind Farm proposal following the redesign. This has been completed by ERM and a copy of the montage, along with a comparative view, is attached to this memorandum.



K R Price

Counsel for Mighty River Power Limited

24 March 2010



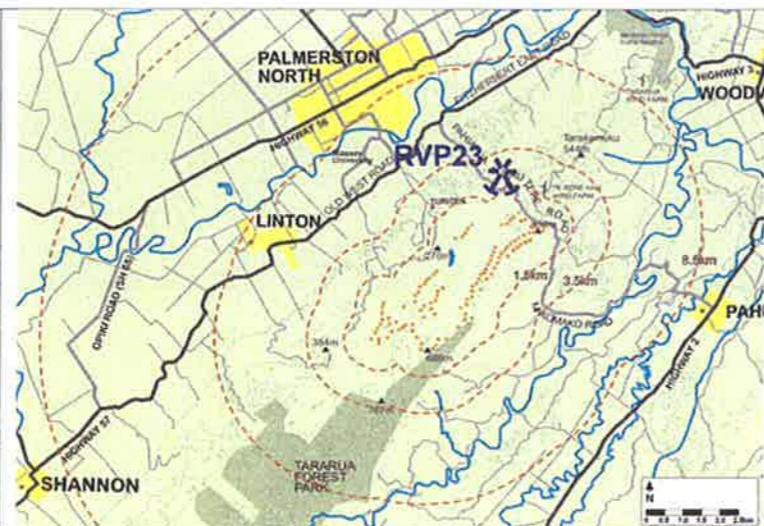
ORIGINAL PHOTOGRAPH



PHOTOMONTAGE

LOCATION

GPS Coordinates: 2739107, 6086811, E176m
 Distance to nearest turbine (WT95): 2.5km southeast
 Field of view: 186° horizontal

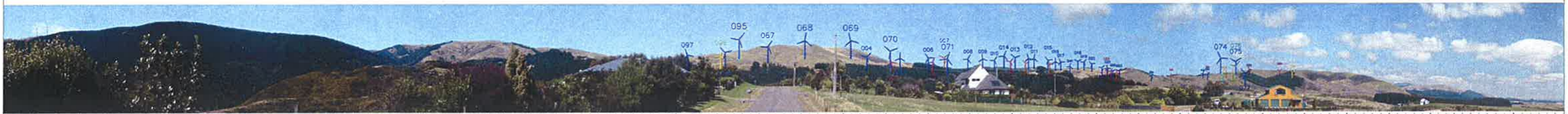


VIEWPOINT RVP23
 Harrison Hill Road
 Looking east through to southwest
 (AMENDED LAYOUT)

Project No:	0083690	Drawing No:	RVP23-01
Date:	22/03/2010	Drawing size:	A1
Drawn by:	GK	Reviewed by:	AW

TURITEA WIND FARM
 EXISTING VIEW & PHOTOMONTAGE

PREPARED FOR:
 CHANCERY GREEN & MIGHTY RIVER POWER



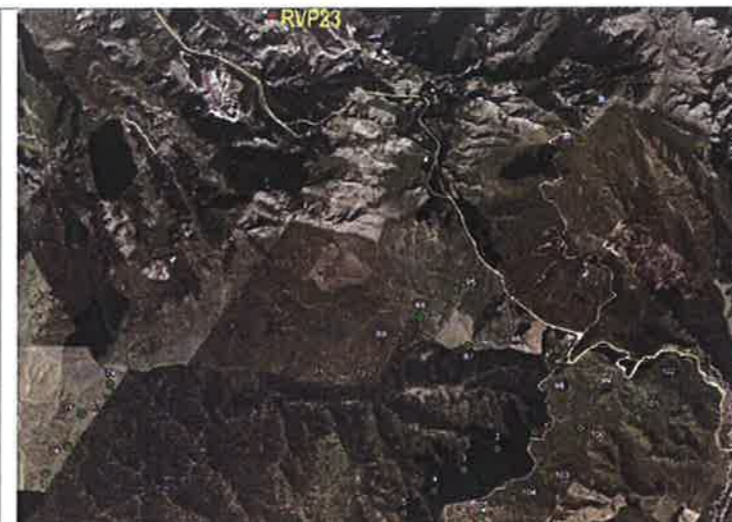
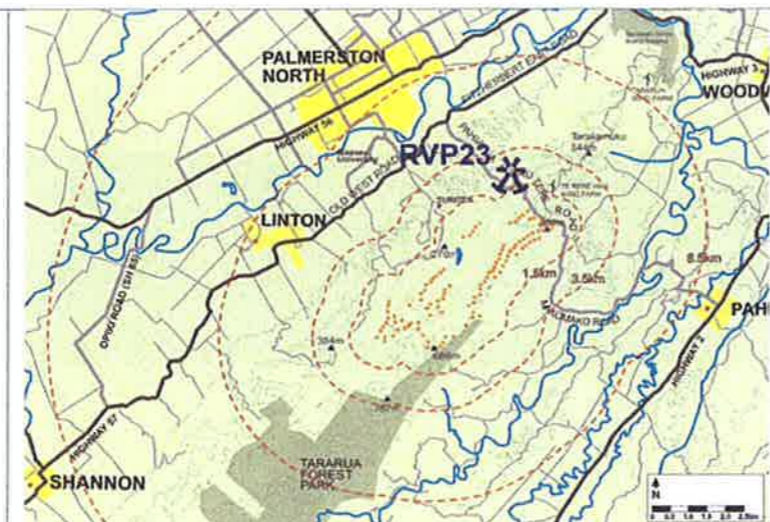
LABELLED TURBINES



WIREFRAME

LOCATION

GPS Coordinates: 2739107, 6086811, E176m
 Distance to nearest turbine (WT95): 2.5km southeast
 Field of view: 186° horizontal



VIEWPOINT RVP23
Harrison Hill Road
 Looking east through to southwest
 (AMENDED LAYOUT)

Project No: 0083690	Drawing No: RVP23-02
Date: 22/03/2010	Drawing size: A1
Drawn by: GK	Reviewed by: AW

TURITEA WIND FARM
 LABELLED TURBINES & WIREFRAME

PREPARED FOR:
 CHANCERY GREEN & MIGHTY RIVER POWER



ORIGINAL PHOTOGRAPH



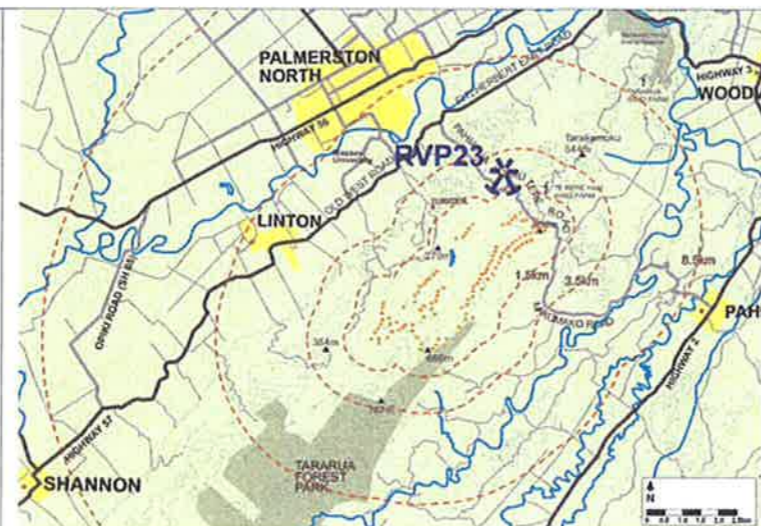
PHOTOMONTAGE

LOCATION

GPS Coordinates: 2739107, 6086811, E176m

Distance to nearest turbine (WT95): 2.5km southeast

Field of view: 60° horizontal

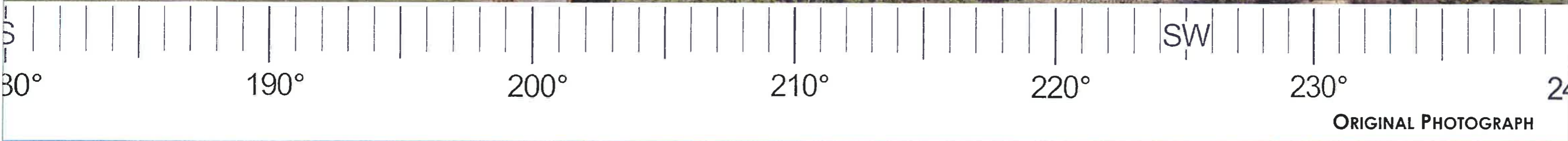


VIEWPOINT RVP23 (a)
Harrison Hill Road
 Looking southeast through to south
 (AMENDED LAYOUT)

Project No:	0083690	Drawing No:	RVP23-03
Date:	22/03/2010	Drawing size:	A1
Drawn by:	GK	Reviewed by:	AW

TURITEA WIND FARM

PHOTOMONTAGE
 PREPARED FOR:
 CHANCERY GREEN & MIGHTY RIVER POWER



PHOTOMONTAGE

LOCATION
 GPS Coordinates: 2739107, 6086811, E176m
 Distance to nearest turbine (WT95): 2.5km southeast
 Field of view: 60° horizontal



VIEWPOINT RVP23 (b)
Harrison Hill Road
 Looking south through to southwest
 (AMENDED LAYOUT)

Project No:	0083690	Drawing No:	RVP23-04
Date:	22/03/2010	Drawing size:	A1
Drawn by:	GK	Reviewed by:	AW

TURITEA WIND FARM
 PHOTOMONTAGE
 PREPARED FOR:
 CHANCERY GREENS & MIGHTY RIVER POWER



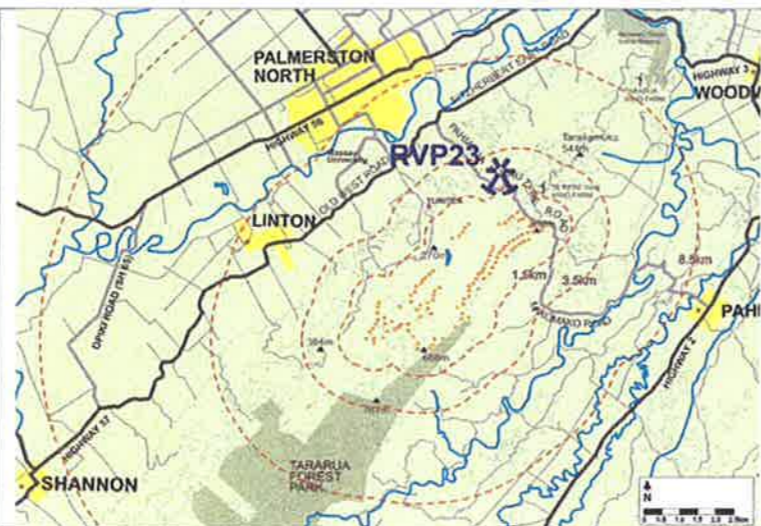
PHOTOMONTAGE - APRIL 2009



PHOTOMONTAGE - JAN 2010

LOCATION

GPS Coordinates: 2739107, 6086811, E176m
 Distance to nearest turbine (WT95): 2.5km southeast
 Field of view: 186° horizontal



VIEWPOINT RVP23
 Harrison Hill Road
 Looking east through to southwest
 (AMENDED LAYOUT)

Project No:	0083690	Drawing No:	RVP23-01
Date:	22/03/2010	Drawing size:	A1
Drawn by:	GK	Reviewed by:	AW

TURITEA WIND FARM
 EXISTING VIEW & PHOTOMONTAGE

PREPARED FOR:
 CHANCERY GREEN & MIGHTY RIVER POWER