

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a Board of Inquiry appointed under s146 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

REBUTTAL EVIDENCE OF WILLIAM BRUCE SHAW

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INTRODUCTION

1. My name is William Bruce Shaw. My qualifications and relevant experience are set out in my evidence in chief. I confirm that I have prepared this rebuttal evidence in accordance with the Environment Court Code of Conduct for Expert Witnesses (July 2006).
2. I am providing this rebuttal evidence to comment on and respond to some of the primary evidence presented in respect of these applications that relate to ecological matters. In particular, I will comment on the evidence of:
 - Emeritus Professor John Flenley;
 - Mr Jeffrey Baker (Palmerston North City Council);
 - Dr Paul Blaschke (for Palmerston North City Council);
 - Isobel Gabites (for Friends of Turitea Incorporated and Tararua Aokautere Guardians Incorporated); and
 - Dr Gillian Rapson.

NEW ZEALAND BIODIVERSITY STRATEGY

3. In Paragraph 84 of his evidence, Mr Baker notes that the ongoing losses of New Zealand's indigenous biodiversity, as correctly identified in the New Zealand Biodiversity Strategy (2000), is a matter of national concern. I assisted in the compilation of that document, along with Dr Blaschke.
4. However, while declines of indigenous habitats and species are still occurring and are of concern, since the compilation of that document there are indications of biodiversity recovery, at least for some threatened taxa. This improvement has led to recent changes in the rankings for particular species in the latest revision of the avifauna rankings (Miskelly *et al.* 2008). Of note in these revised rankings is the reclassification of species such as kereru (NZ pigeon) now classified in the 'Not Threatened' category. These changes are occurring as a result of successful active management of threatening processes, particularly predation. Intensive control of predators (possums,

rats, mustelids, and cats) is a key component of the EcoPark initiative proposed for Turitea, which will be of huge benefit to a diverse range of indigenous fauna.

PROPOSED ONE PLAN AND RARE HABITATS

5. In Paragraph 87 Mr Baker correctly notes that “parts of the Turitea Reserve qualify as a threatened habitat for the purpose of Schedule E” of the Horizons Regional Council’s Proposed One Plan. However, what he fails to mention is that these particular habitats within the Reserve (wetlands at Browns Flat and tawa-dominant forest in the lower catchment) are not going to be directly affected by the development of the Turitea Wind Farm. This is due in part to the specific design of the Turitea Wind Farm to avoid these areas, including the removal of potential turbine sites in tawa-dominant forest, sites adjacent to wetlands at Browns Flat, and the alignment of the transmission line to avoid tawa forest.
6. At Paragraph 4.28 of his evidence, Dr Blaschke states that the “loss of sensitive or rare habitats may be significant, especially if there are multiple large wind farms, which is the case here.” The current proposal does not involve the loss or destruction of sensitive or rare habitats, as shown by the specific avoidance of habitats listed as rare and threatened in the Proposed One Plan in the design of the Turitea Wind Farm. The Wind Farm will result in very significant positive benefits associated with the EcoPark, including intensive predator control (as noted above), further indigenous revegetation, and potential recreational enhancement.

NATIONAL SIGNIFICANCE AND AVOIDANCE OF EFFECTS

7. In his evidence, Mr Baker states that, if a site is significant under Section 6(c) of the Resource Management Act 1991 (RMA), it warrants protection as a matter of national importance and that “avoidance of effects is required”. This statement infers, very strongly, that no effects can be contemplated in a significant natural area. This is a very strong interpretation, and would preclude any development in privately-owned significant natural areas or in natural areas administered by local and central government. This is clearly unreasonable, and indeed contrary to the wording and purpose of the RMA. It is also clearly wrong, given the many developments in New Zealand’s national parks and other natural areas.

8. Further, the statement by Mr Baker also fails to acknowledge that a proposal can actually offer positive effects. This is particularly concerning and highlights a base misunderstanding of the importance of weighing both positive and adverse effects under the RMA, especially in respect of ecological matters. In adopting this approach, Mr Baker fails to recognise the proposed mitigation, which includes the revegetation of 75 ha of current and former pine forest, which would be directly attributed to the existence of the Turitea Wind Farm. He also places no weight on the potential benefits of proposed intensive ecological management, as part of the EcoPark, to restore and improve the health of indigenous vegetation, habitats, and species.

ECOLOGICAL SIGNIFICANCE OF THE SITE

9. In Paragraph 7.7, Dr Blaschke states that “the values of these terrestrial and aquatic habitats are clearly such that they reach the threshold for significance under Section 6(c) of the Resource Management Act”. This is a very all-encompassing statement that makes no distinction between the various vegetation and habitat types in the Reserve.
10. These habitat types are of varying quality, in terms of indigenous vegetation and values for indigenous fauna. The highest value sites are the tawa-dominant forest, aquatic habitats (based on the evidence of Dr Coffey), and the wetlands at Browns Flat (albeit degraded). These sites are all recognised and accorded a degree of protection by provisions in the Proposed One Plan, and in the design of the Turitea Wind Farm. In broad terms, all remaining large tracts of indigenous vegetation in New Zealand can be considered to be ecologically significant as they trigger key criteria for representativeness, size, diversity, relative naturalness, and rarity. The horopito-dominant vegetation has ecological values but is of lesser significance. It is, however, part of a very large tract that extends southwards along the Tararua Range, and this larger tract can be considered to be significant in terms of Section 6(c) of the Resource Management Act.
11. However, as I have already noted in relation to the evidence of Mr Jeff Baker, a degree of significance does not imply absolute protection. As also noted in the evidence of Dr Rapson, the horopito-dominant vegetation has developed as a result of severe degradation of former rata/kamahi forest by possums and other introduced animals. It will require very intensive management to restore this particular forest type to its former state. Horopito-dominant vegetation that has developed as a result of pest animal

impacts extends over a large tract in the northern Tararua Range and the southern Ruahine Range. This latter area in particular includes a tract of vegetation that extends more than 20km or so along the Range (Dr C. Bycroft, Wildland Consultants Ltd, pers. comm.). The loss of up to 25 ha of horopito-dominant vegetation, accompanied by revegetation of 8ha of this area (post-construction) and the additional revegetation of 75 ha of existing and former pine forest with indigenous cover is more than adequate mitigation. I note that the loss of up to 25 ha of horopito-dominant vegetation is c.2.3% of the c.1,100 ha of horopito-dominant vegetation in the Reserve and c.0.7% of the total Reserve. It is also only c.0.8% of the area of similar vegetation in the northern Tararua Range and only c.0.17% of the wider extent of similar vegetation in the northern Tararua and southern Ruahine Ranges. (I also note that the 75 ha of indigenous revegetation would comprise more than 6% of the 1,100 ha of horopito-dominant vegetation in the Reserve.)

12. In Paragraph 13 of her evidence, Ms Gabites also considers that all the native vegetation within the proposed Turitea Wind Farm site has high ecological significance and wildlife habitat value. While all vegetation has ecological merit as habitat for fauna, and as vegetation in its own right, it is incorrect to say that all vegetation has equal ecological value. Areas with greater plant species diversity, and better structure (canopy, sub-canopy, diverse shrub and ground tiers), are generally thought to have higher values. Furthermore, areas that are heavily modified (e.g. as a result of severe browsing by introduced animals) are generally thought to have lower ecological values. At Turitea, the tawa-dominant forest in the lower catchment is of particularly high value, but this area is to be avoided, as noted above.
13. In Paragraph 46 Ms Gabites states categorically that the presence of threatened species such as falcon, kereru, *Brachyglottis kirkii*, *Raukaua edgerleyi*, means that the Reserve is of national significance. This statement is clearly excessive, somewhat emotive, and is not reinforced by any substantive information. The only threatened species with a high national ranking ('Nationally Vulnerable') known to be using the site regularly is the bush falcon, and it is not clear if they are breeding within the boundaries of the site. None of the other species, even prior to the recent reclassification of the threat rankings, were considered to be nationally significant (i.e. not nationally critical, nationally endangered, or nationally vulnerable).

14. Furthermore, plant threat classifications have recently been revised and as such only one plant species observed at Turitea is currently considered to be threatened: *Brachyglottis kirkii* (now classified as 'At Risk-Declining', earlier threat classification 'Chronically Threatened-Serious Decline'). Raukawa (*Raukaua edgerleyi*) was previously classified as 'Chronically Threatened-Gradual Decline', but is no longer considered to be threatened.
15. All other plant species mentioned as possibly falling within development areas associated with the construction or operation of the Turitea Wind Farm are not threatened. Cuttings have been taken of *Brachyglottis kirkii*, to help increase its population within the Reserve. If *Brachyglottis kirkii* plants do fall within a development area then they could potentially be transplanted. *Brachyglottis kirkii* has also been noted to occupy at least one location well away from the development area, as an epiphytic shrub. No other threatened species were recorded in the evidence of Dr Rapson.
16. Other plant species mentioned by Ms Gabites are *Raukaua anomalus*, *Chionochloa conspicua*, *Olearia colensoi*, podocarps (miro, Hall's totara), mountain cabbage tree, raukawa, tawa, rewarewa, and horopito scrub. None of these species are classified as threatened (as per de Lange *et al.* 2009).
17. Accordingly, I consider that the range of species present in the Reserve does not justify a ranking of national significance. It is certainly of local and possibly regional significance as it supports local and regionally-threatened species (also some habitats (e.g. tawa-dominant forest)), some of which are recognised in the Proposed One Plan as being regionally significant.

ECOLOGICAL SIGNIFICANCE ASSESSMENT

18. In Paragraphs 47 and 48 of her evidence, Ms Gabites provides her flowchart system for an ecological evaluation and ranking, which I consider to be overly simplistic and fundamentally flawed. In this flowchart, Ms Gabites provides no distinctions between ages of disturbance, vegetation character (i.e. composition), representation of vegetation (of different types) on different landforms, soils, or hydrological regimes, or in different climates. Even the title of the flowchart is problematic, in that it only applies to "old native vegetation (a continuum)". 'Old' is not defined, and nor is 'continuum' (is it a continuum in time or spatially, or both?). The flowchart also takes no account of other

factors commonly considered in significance assessments, such as size, connectivity, and ecological context. Applying the flowchart, it appears that virtually any site that has had native vegetation on it in the long term would be ranked as being significant, regardless of size or composition. On this basis, I suggest that the hierarchy of significance presented in the flowchart, from 'significant' to 'highly significant' to 'of greatest significance' has no rational basis and is misleading. As an aside, I do note that the flowchart specifically recognises sites where "vegetation composition is highly skewed towards unpalatables", which is clearly the situation for all of the horopito-dominant vegetation at Turitea. As noted in my evidence in chief, I have had nearly 30 years' experience with significance rankings, and have developed and published ranking systems that have been applied on a national and regional basis for at least 20 years.

19. Further, while it is correct for Ms Gabites, in Paragraph 48, to indicate that evaluation of significance is not a simple issue, it is incorrect, to state that "ecological districts have been superseded by Ecodomains (or LENZ units) as a comparative framework". LENZ units are another additional spatial tool now available for the assessment of spatial representation of indigenous vegetation and habitats, and have been used by Horizons Regional Council as the basis of spatial analysis of the representation of indigenous vegetation in the region (which did not recognise horopito-dominant vegetation as being of any particular significance). Ecological districts are still used by many ecologists (and in various statutory plans) and will continue to be a useful spatial framework. While I recognise the validity of the concepts listed by Ms Gabites (connectivity, vigour, diversity, resilience) she nonetheless fails to recognise the importance of relative scarcity. It is important to retain large representative examples of indigenous vegetation and habitats, but it is also particularly important to retain natural features and species that are rare (including naturally rare), threatened, or restricted to localised occurrences; i.e. scarce. Scarcity is recognised internationally as a key criterion in the assessment of ecological significance.
20. In Paragraph 49, Ms Gabites infers that my assessments do not take account of factors such as 'state of flux' and 'disturbances', which is not correct. For the nearly 30 years I have been undertaking assessments of ecological significance, I have taken account of successional sequences and have accorded a high priority to the protection of

vegetation in early stages of successional development where little else remains (which is not the case at Turitea).

21. Ms Gabites goes on to rank “the mosaic of associations through Turitea” as being of “greatest significance and highly significant” at Paragraph 50 of her evidence. I consider this to be very problematic for the reasons set out above in relation to her flowchart. Ms Gabites makes no distinction between the different vegetation types in the Reserve, and she is clearly ignoring the rankings recognised in the Proposed One Plan with respect to particular vegetation and habitat types.
22. I note that, overall, Ms Gabites (Paragraph 51) supports my ecological rankings (with one proviso). Nowhere in my evidence do I state that a ‘high’ or ‘very high’ ranking implies no development, and no areas qualified as ‘exceptional’ (any sites that could qualify in terms of this criterion, associated with tawa-dominant forest, have been removed from the layout). The mitigation package presented (including the indigenous revegetation of 75 ha) is specifically to address loss of indigenous vegetation, particularly at sites with higher rankings.

ECOLOGICAL HISTORY OF THE SITE

23. Ms Gabites describes wide-scale degradation of tall forest that formerly covered “mid-upper altitude slopes” in the Horowhenua and Palmerston North Districts in Paragraph 34 of her evidence. I concur with her assessment, but also note that such degraded horopito-dominant vegetation also occurs widely north of the Manawatu Gorge, in the southern Ruahine Range and is directly related to the absence of sufficient pest control in these areas at a critical phase in the 1950s. I agree that the current pest management in Turitea Reserve is beneficial and has probably arrested further decline, but I am not aware of any evidence to indicate a return to previous forest structure or condition. This will require even more intensive pest control, sustained over many decades.
24. In Paragraph 35, Ms Gabites goes on to state that degradation by pests reduced the original forest cover at Turitea to a low turf only 50 years ago. Horopito is, as the main species that has replaced that turf, in relative terms very browse-tolerant, which is why it is now dominant. In the absence of nearly complete removal of browsing pests, horopito will remain dominant for a very long time.

25. In Paragraph 37, Ms Gabites notes that spurs that were grassland 50 years ago (c.f. in Paragraph 35 she considers that these spurs were also 'turf' 50 years ago) have developed into shrubland but that the height of the broadleaf (*sic*) cover appears to have remained unchanged. This means that it is very unlikely to need to trim or top any vegetation to protect wind flows and reduce turbulence around turbines.
26. Ms Gabites further considers (Paragraph 38) that the present canopy is not secondary growth but this contradicts her statements in Paragraph 35, where she notes that much of it was "turf" only 50 years ago. The replacement of turf with horopito-dominant woody vegetation after removal of the original forest cover by pest animals (and fire) is in fact a secondary succession. The present vegetation bears little resemblance to the original cover.
27. Ms Gabites notes that emergent miro appears to have lost reproductive vigour. These miro trees were left standing in the open when the original forest collapsed due to browsing impacts, and many species lose vigour when exposed suddenly. It is difficult to understand how reproductive vigour of miro can be judged from just a few visits that probably didn't coincide with the fruiting season of miro. Miro and other podocarps also have markedly different fruiting levels from year to year.
28. In Paragraph 39 Ms Gabites states that the high number of species recorded at Turitea (which I consider to be a typical number) indicates a high level of ecosystem integrity. I do not consider this to be correct. Rather than indicating a high level of ecosystem integrity, relative numbers can also indicate that a variety of ecosystem types are present, which is the case at Turitea (e.g. forest, scrub, wetlands, lakes, streams). As I have commented in relation to the evidence of Dr Rapson, the level of floristic diversity recorded along the ridge reflects the relative amount of search effort in this particular area and I also consider the species complement and numbers to be typical of this vegetation type.
29. In Paragraph 13, Ms Gabites states that regeneration following disturbances has progressed with a high level of ecological integrity, albeit slowly in the windy and wet conditions prevailing. However, succession is progressing at different rates, with vegetation being more advanced in valleys and gullies than on the ridges. Forest in the valleys will not be affected by the development of a wind farm. Comments made by Dr Rapson, at Page 6 of her evidence, indicate that the vegetation on the ridges

historically consisted of northern rata/kamahi forest, which collapsed in the 1950s due to possum, goat and deer browsing (particularly possums), and I agree with this assessment. Therefore, the succession on the ridges cannot be considered succession with a high level of ecological integrity, as the integrity was severely compromised by animal impacts causing the demise of northern rata/kamahi forest.

30. In respect of Dr Rapson's comments at Page 6, I note that northern rata and kamahi are very vulnerable, as seedlings, to selective browsing by deer and feral goats, both of which are present at Turitea. I suggest that re-establishment of the original natural canopy will not occur, even within centuries, given the current level of browsing by pest animals, even with the current pest control being undertaken by Horizons Regional Council. I also suggest that, under the current regime, horopito is likely to remain dominant for the foreseeable future. Alteration of the current regeneration trajectory/sequence will require particularly intensive sustained pest control, such as proposed for the EcoPark.

EROSION RISK

31. In Section 3 (Economic Effects), Paragraph 1, Professor Flenley is concerned about erosion risk as a result of vegetation clearance. As I explained in my evidence in chief, this is a concern, but one that can be adequately dealt with through the establishment of a new vegetation cover. It is important that a new vegetation cover is established quickly, using hydro-seeding, planting, or direct transfer, or a combination of these methods, as I have proposed in my evidence in chief. I further note that, in Paragraph 1 of section 1 of his evidence, Professor Flenley is impressed by the work of Robert Coulson (of Rural Supply Technologies (RST) Limited) with hydro-seeding and direct transfer. The work he alludes to, and the techniques Mr Coulson utilises will be included in the suite of approaches to be used for site rehabilitation at Turitea. Mr Coulson was actively involved in the direct transfer trials at Turitea.

VEGETATION CLEARANCE

32. In Section 1, Paragraph 2 of his evidence, Professor Flenley states that clearance of 25 ha of indigenous vegetation will result in the disturbance of 50 ha of vegetation ("the amount moved plus the area where it is stored"). This is not correct. Vegetation storage for direct transfer will occur either in rank pasture at Browns Flat, in farmland or in areas

that are currently exotic plantation forest, which are specifically and explicitly excluded from the 25 ha “indigenous vegetation” calculation. It may also be feasible, in places, to direct transfer from a site being cleared to a site being rehabilitated, without the need for interim storage. Professor Flenley also suggests that horopito shrubs will not survive. However, the direct transfer trials undertaken to date have indeed achieved survival of horopito.

33. Both Ms Gabites and Dr Blaschke express doubt as to the accuracy of the amount of native vegetation to be cleared from the Reserve. Minimising vegetation clearance has been a fundamental design constraint since the early stages of project development. Assessments of the footprint clearance required have been undertaken by Mr James and myself, and I am very confident that the 25 ha limit will be achieved. In any case, Mighty River Power has made a contractual commitment to PNCC not to exceed that upper limit.
34. Ms Gabites’ statement in Paragraph 16 that only 8 ha will be revegetated is incorrect. In noting this she has failed to acknowledge Mighty River Power’s proposed revegetation of an additional 75 ha of land that will either be planted or managed in such a way that indigenous vegetation establishes and becomes dominant. This additional revegetation is designed to mitigate the up to 25 ha of native vegetation clearance, mitigation that I consider to be more than adequate.
35. Ms Gabites also suggests that vegetation cleared and retained for direct transfer may be stockpiled on top of existing indigenous vegetation. That is not correct, as discussed in relation to Dr Blaschke’s and Professor Flenley’s evidence.
36. Ms Gabites suggests that additional vegetation destruction will be caused by trenching for underground cable away from access roads. However, all cable trenching will be within the boundaries (or confines) of the access roads and the service and access tracks to the turbines. No further vegetation clearance will occur for cable trenching. There is no requirement to restrict roadside vegetation growth to avoid root penetration of trenches, as incorrectly assumed by Ms Gabites.
37. Dr Blaschke, at Paragraph 4.15 of his evidence, acknowledges my description of potential edge effects, but considers that I may have under-estimated the degree of effects. My intention was not to provide a precise estimate, but rather to acknowledge

this issue (and make an allowance for it) in the consideration of the mitigation proposed for vegetation clearance. However, I do not consider that edge effects at Turitea will significantly exceed the estimate I have provided.

38. Dr Blaschke goes on to state that I have not allowed for additional losses associated with the placement of felled vegetation over standing vegetation (as attributed to Mr James at his Paragraph 6.3). I have discussed this matter with Mr James, and while there will be some placement of cleared vegetation adjacent to indigenous vegetation to be retained, it will not be placed on top of stands. The placement of this vegetation in this location also acts as a buffer, protecting these areas from wind and stormwater, thus further minimising any edge effects from occurring.
39. At Paragraph 4.16, Dr Blaschke assesses vegetation clearance for transmission pylons as being minor. I support this assessment as considerable effort has gone into placement of pylons to avoid adverse effects.

TURBINES 56-66

40. Dr Blaschke outlines his concerns in relation to the Turbines 56-66 in Paragraph 4.39 of his evidence. His concerns are expanded upon in Paragraph 5.3, where he outlines his concerns relating to fragmentation and natural character and potential clearance of a “significant area of native forest vegetation, possibly including some areas of podocarp over broadleaved or broadleaved forest”.
41. However, this assessment is incorrect, as demonstrated in Attachment WBS8 of my evidence in chief. This Attachment indicates the vegetation composition at each of these turbine sites. It demonstrates that turbine sites 56-64 are in fact horopito-dominant or contain a very significant horopito element. Turbine Sites 65 and 66 contain more developed vegetation, but it is still not comparable with the tawa-dominant forest alluded to by Dr Blaschke that is present in the lower catchment. Nevertheless, the potential effects on Turbines 56-66 are one of the key reasons for the substantial mitigation package being offered by Mighty River Power, which is entirely separate to the EcoPark initiative, and which I consider adequately mitigates the potential effects of the Turitea Wind Farm.
42. I agree with Dr Blaschke’s assessment, in Paragraph 3.13, that no tawa-dominant (podocarp/broadleaved forest) forest is to be directly affected by the wind farm

development. Dr Blaschke notes, as a proviso in Paragraph 4.12, that turbine sites 56-66 are close to secondary forest and “podocarp over broadleaved forest”. His assessment in Paragraph 3.13, that none of this vegetation will be affected, is correct. Turbine locations proposed in an earlier layout that included sites in tawa-dominant forest have been removed. Considerable effort has been made to position the proposed transmission line so that it does not affect tawa-dominant forest and minimises adverse effects on the sites where transmission pylons are to be placed.

ASSESSMENT OF HOROPITO-DOMINANT VEGETATION

43. At Page 2, Paragraph 3 of her evidence, Dr Rapson comments that “the whole reserve is considered, but the vegetation type most affected receives no specific attention”. This is not correct. Our vegetation mapping indicates that there is c.1,100 ha of horopito-dominant vegetation in the Reserve. As noted by Dr Rapson, many of the turbines are in this vegetation type and, because of that, a large amount of time was spent traversing potential turbine sites, and potential road alignments to those sites, all within horopito-dominant vegetation. Thus, most of our vegetation survey effort was concentrated in horopito-dominant vegetation. Assessments of all turbine sites (and access roads) are presented in Appendix 2 of my AEE report (Appendix D of the AEE), including all of the sites on ridges dominated by horopito.

WEED INVASION

44. On Page 6 of her evidence, Dr Rapson suggests that there has been “little assessment of the exposure of the reserve to weeds”. I disagree with this statement, although I do acknowledge that the development of the Turitea Wind Farm does increase the risk of weeds entering the Turitea Reserve. However, rather than there being “little assessment” of this issue, the mitigation proposal put forward by Mighty River Power, as outlined in my evidence in chief, includes a substantial component of weed monitoring and control. This will be essential until a closed cover of woody species is attained, and will continue to be important along road margins in particular.

PLANT SPECIES LISTS AND ADEQUACY OF BOTANICAL SEARCHES

45. Dr Rapson claims that there are problems with the key in Appendix 1 of my AEE report, noting that it is not clear what the codes used in the key mean, or how they have been applied. In response, I note that the codes used, for the sources of particular species

records, were to indicate records of species not necessarily seen by the Wildlands field survey team (all experienced field botanists).

46. On Pages 3 and 4 of her evidence, Dr Rapson outlines the addition of five indigenous vascular species (and one hybrid) and 10 exotic species (all weedy species) found during her visit to the site. She also records the bryophyte (moss) *Dawsonia superba*, which is notable for its relative size but not for its rarity. The addition of only five indigenous species, none of which is rare or threatened, does not call into question the basic reliability of the list provided in my evidence, as acknowledged by Dr Rapson.
47. Totara (*Podocarpus totara*) was recorded at the site (e.g. Page 18 of AEE report) but was accidentally omitted from the species list in Appendix 1. These types of issues are acknowledged at Page 3, Paragraph 1, of Dr Rapson's evidence, where she states:

“These interpretation problems do not affect the basic reliability of the species list compiled as, in fact, it is very hard to compile a complete and accurate list of species present in any area, as experience, search strategies, and chance all play a role in encounters.”
48. The last paragraph of Page 4 of Dr Rapson's evidence warrants comment. She makes the case, based on species records, that there is greater floristic diversity within 20 m of the ridgeline than abundance in the Reserve. I would suggest that this reflects, at least in part, that most of Dr Rapson's search effort has been focussed along the ridges, rather than taking an overall search of the Reserve.
49. While Dr Rapson's party of five spent less than one day in this area, my colleagues and I have undertaken intensive searches in the area. The search strategy used for our survey was to visit each proposed turbine site and related road, as I consider that this is where the impacts will be greatest (only three sites were not visited, all of these were in farmland).
50. As an aside, I consider that any evaluation of relative floristic diversity should include a comparison of similar vegetation/ecosystem types, which is not provided by Dr Rapson. Similar horopito-dominant vegetation is known to occur widely in the northern Tararua Ranges and in the southern Ruahine Ranges.

USE OF THE TERM 'SCRUB'

51. At Page 5, Dr Rapson criticises the use of the term 'scrub'. However, I consider that this term is appropriate, and I have used it only in its purely technical sense, as per Atkinson (1985):

Scrub - Woody vegetation in which the cover of shrubs and trees in the canopy is >80% and in which shrub cover exceeds that of trees (c.f. forest).

Shrubland - Vegetation in which the cover of shrubs in the canopy is 20-80% and in which the shrub cover exceeds that of any other growth form or bare ground. It is sometimes useful to separate tussock-shrublands as a sub-class for areas where tussocks are >20% but less than shrubs.

RAUKAUJA EDGERLEYI

52. Dr Rapson mentions the 'rare' species *Raukawa edgerleyi* at Page 5, Paragraph 5 of her evidence. However, I note that this has recently been reclassified, on a national basis, as 'not threatened' (de Lange *et al.* 2009), and accordingly, can no longer be considered to be 'rare'.

SITE DESIGN

53. In Paragraph 18, Ms Gabites suggests that, in her view, "little effort has been made to avoid potential or adverse effects". This is not correct. Five turbine sites were removed from the pre-notification layout due to potential ecological effects and a further nine have been removed since, four of which were removed to specifically address potential ecological effects. Considerable effort has also been made, in conjunction with project engineers, to reduce the vegetation footprint wherever possible.
54. Ms Gabites recognises the need to protect the Brown's Flat basin drainage systems from earthworks. However, this is already catered for in the Turitea Wind Farm design, with no turbines planned for the headwater basin.

FACTORS AFFECTING REHABILITATION

55. While I agree with Dr Rapson's concerns regarding vegetation clearance, these matters have been specifically addressed throughout the design of the Turitea Wind Farm, and

the proposed conditions of consent, which include the development of a revegetation plan. However, it is already evident, based on vegetation response on edges created in 2006 when a wind monitoring mast was established, that there is natural recovery of forest edges with rapid regeneration of a range of indigenous species.

56. In Paragraph 61, Ms Gabites does not recognise the most significant human-induced changes to the vegetation at Turitea to date; those resulting from fire and the release of introduced browsing animals, which have devastated the former vegetation cover. She makes no mention of the 75 ha of indigenous revegetation, or the major positive effects of intensive pest management that would result from development of the EcoPark from funding derived from the operation of the Wind Farm. This statement is further emphasised in Paragraph 62 (where she does not recognise the potential for a substantial net gain in indigenous vegetation) and she does not recognise that my assessment of the effects takes into account the mitigation package.
57. In Paragraph 71, Ms Gabites suggest that it is difficult to repair or 'heal' new edges, and illustrates this with her Figure 4 which is a site that has been cut and, to my knowledge, has not been subject to rehabilitation works. It is evident, at Turitea, that new edges in horopito-dominant vegetation created as recently as 2006 for establishment of wind monitoring masts are already undergoing natural regeneration and a 'thickening' of cover along the recently-formed edges. New edges formed as part of the wind farm development are to be subject to landform and soil rehabilitation, soil contouring, and rapid treatment by planting, direct transfer, or hydro-seeding (or various combinations of these techniques).
58. Ms Gabites considers that natural regeneration can be a slow process, especially on skeletal soils at higher altitudes, which I agree with. It is important to reiterate, however, that site rehabilitation is to involve a range of methods, including reinstatement of soil, contouring of soil surfaces to create small bunds (particularly on the edges of existing vegetation), and specific techniques selected on a site-by-site basis, including planting, direct transfer, and hydro-seeding. All sites will be treated using an appropriate rehabilitation technique and it is mischievous for Ms Gabites to infer that site recovery would be based on a period of a decade or so before natural regeneration starts to occur.

59. Ms Gabites suggests that new exposed rock cuts and batter faces will be slow to be revegetated especially because many faces will be remote from colonising species such as lichens, mosses, and light-demanding herbs. She suggests that hydro-seeding will be problematic, but does support the use of the technique as a condition of consent, a suggestion that I also support. It will be important to carefully evaluate and apply the most effective hydro-seeding methods at Turitea, including the preferential use of indigenous mosses and seeds in the hydro-seeding mixes.
60. In Paragraph 113 of her evidence, Ms Gabites proffers her view that the field trials undertaken to date have been unsuccessful. That shows a very limited view of re-vegetation trials (and the direct transfer trials). Trials are established in an attempt to learn lessons about what is likely to work and what is likely to fail. One of the key factors with planting failures at Turitea has been the impacts of hares, deer, and goats, in spite of the existing pest control programme (currently primarily targeting possums). Successful planting at Turitea is going to require a very strong focus on that aspect of site protection. Similar comments can be applied to the direct transfer trials.
61. Ms Gabites further comments on the length of time required to attain plant heights of 4-6 metres for plantings at low altitude to mitigate visual effects. My view is that large vigorous stock could be used and that height increments of up to 1 m/annum could be attained.

REHABILITATION APPROACH

62. Two of the examples cited by Dr Rapson in respect of rehabilitation proposal are not good models for comparison with Turitea. Both “The Remarkables” skifield road, and the Turoa Road, are extreme alpine environments and not comparable with Turitea. There is a good range of common species that do well along the Turitea ridge, and I do not envisage particular difficulties in establishing a vegetation cover. It is feasible, at Turitea, to re-instate topsoil and to contour the ground surface to lift wind flows and to channel stormwater flows into detention and treatment systems.
63. Dr Rapson is also critical of the possible lack of eco-sourcing in the planting trial undertaken at Turitea. However, I note that the plants used during these trials were all sourced from nurseries that had collected seed within the Manawatu and only four species came from the wider southern North Island. Eco-sourcing is important, and

wherever possible, only locally-sourced plant material will be used for planting at Turitea. Dr Rapson also suggests that root-trainer stock is better than planter bag stock for indigenous revegetation projects. I generally agree with her view, but would note the use of root trainer stock requires higher levels of site preparation, monitoring, and post-planting maintenance, all of which are to occur at Turitea. I do note, however, that the use of planter bag stock can be more successful in difficult planting sites with lower levels of site preparation and post-planting care.

64. I am well aware of the potential problems associated with exotic grass swards and indigenous plantings, as I have been involved in successfully planting many hundreds of thousands of locally-sourced indigenous seedlings. Not all exotic grass species are 'bad' in all situations. Browntop is already well established along the entire length of the Water Catchment Access Road, where it forms a relatively open cover, inter-mixed with other species. Browntop can invade indigenous grasslands but is not an invader of woody systems, such as those present at Turitea. I am well aware of the potential for some exotic grasses - such as cocksfoot, Yorkshire fog, and tall fescue - to invade and suppress indigenous plantings but the use of browntop is suggested to establish, in this situation, a relatively benign grass cover to protect the soil and to enable future planting of indigenous species (which will require monitoring and maintenance to avoid losses to a range of threats, including suppression by other species).
65. At Page 8 - Paragraphs 2 and 3 of her evidence, Dr Rapson suggests that direct transfer may not be successful at Turitea. The trials undertaken at the site Ross and Berben (2007) concluded that the technique is a viable option at this site, subject to provisions relating to timing and the need for weed control until canopy closure is obtained.
66. At Page 8 - Paragraphs 4 and 5, Dr Rapson questions whether it is possible to undertake site restoration in a manner that produces vegetation that is "undifferentiable" from natural vegetation. My experience is that this can be achieved by utilising species that occur naturally at the site, and to match appropriate species to particular sites.
67. At Paragraph 72, Ms Gabites has selectively and incorrectly misinterpreted my evidence. Rehabilitation will occur for about 8 ha (one third) of the up to 25 hectares of indigenous vegetation to be removed. A further 75 ha of what is currently pine-forest or recently-harvested pine forest is to be revegetated using a combination of managed natural regeneration (65 ha) and planting (10 ha). This will, over time, clearly result in a

substantial net gain of indigenous vegetation in the Reserve. Ms Gabites also considers that it is a problem that such areas are “different and species-diminished” but fails to recognise that the relatively recent natural succession from turfs to horopito-dominance has involved a natural succession with a toetoe-dominant phase or that weed monitoring and control is a significant and integral component of the mitigation package being offered.

68. In relation to transmission pylons, again, Ms Gabites does not recognise the considerable effort that has already gone into the selection of a low impact route for the transmission line, including field-based traverses of the proposed alignment, with the alignment selected avoiding all taller stature forest. Also, vegetation cover where pylons are to be located is patchy, so it will often be feasible to locate the pylons in small clearings or in very low stature horopito-dominant vegetation.
69. I concur with Ms Gabites’ comments regarding an increased risk of weed invasion associated with the development of the Turitea Wind Farm. However, it is specifically to address this issue that the Mighty River Power mitigation package includes a significant annual element of weed monitoring and control. It would be reasonable to extend weed monitoring and control to be undertaken for the life of the wind farm. I do not accept Ms Gabites’ comment at Paragraph 105, that potential weed invasion represents an unacceptable level of threat as it is easily manageable with sound protocols and an adequate budget. A comprehensive weed hygiene and management plan is to be provided.
70. In Paragraphs 106-109, Ms Gabites endorses my suggested planting sequence but also comments that this approach will introduce exotic grass species into parts of the Reserve currently free of exotic species. I suggest the use of only one exotic grass species, browntop, which is already widespread in modified parts of the Reserve, such as along the Water Catchment Access Road. It is also suggested that the scale of planting required is “prohibitively expensive”. This is not correct. It is anticipated that up to 8 ha of turbine construction platforms and road margins would be planted, but some of this will be addressed by hydro-seeding and/or direct transfer. These costs are manageable and will be at the cost of the applicant.

TOETOE USE FOR SITE REHABILITATION

71. Ms Gabites further provides her observations in relation to successions on road verges and buffers along the Water Catchment Access Road, and suggests, correctly, that we can learn a lot about vegetation development by studying these sites. I agree that it is a difficult environment to revegetate, but would like to point out that other factors, some of which can be controlled, have also likely contributed to lack of regeneration in some sites, especially along the Water Catchment Access Road. These include vehicular traffic, recontouring of the road, high numbers of ungulate pests (until relatively recently), high numbers of rabbits and hares, spraying of verges and margins (including inadvertent spraying of *Brachyglottis kirkii*).
72. However, it must be pointed out that successions on these sites have developed 'naturally' (i.e. without planting). It is notable that a vegetation cover has established even on the harshest sites, and that toetoe established to such an extent that PNCC reserve managers have physically removed it.
73. I consider, in this windy environment, that toetoe is a very good cover, with many positive attributes, and should be encouraged. While Ms Gabites correctly recognises toetoe as a "primary natural coloniser" she fails to recognise that it is also a natural coloniser of turfs and that its visual prominence is a seasonal feature.
74. Toetoe-dominant vegetation does not provide many perches for birds (seed deposition is most common beneath bird perches), but it does provide good ground cover, establishment sites for woody species, and buffers the edges of woody vegetation. Toetoe is a natural part of the successional sequences at Turitea, and will in time be replaced by woody species. I consider that toetoe (and open-growing exotic grasses such as browntop) can and should be used as a positive element of a rehabilitation programme.

PINE FOREST REHABILITATION

75. In Paragraphs 32 and 33, Ms Gabites discusses the pine plantation and infers that it would be preferable that this site be converted to pasture as it would be more compatible with a wind farm. Mighty River Power will actively manage indigenous regeneration across 75 ha of this pine plantation area (by controlling weeds, including wilding pines) and will replant 10 ha of this area with indigenous species. The net result

of this mitigation will be a substantial increase in the area of indigenous vegetation in the reserve. I am somewhat mystified as to Ms Gabites' reasons for opposing opportunities to increase the area of indigenous vegetation.

76. These comments also contradict her statements in Paragraphs 91-93, and 111 of her evidence. There, Ms Gabites considers that it is better to leave the remaining pine stands to protect the indigenous species components (especially plants) within the stands. I disagree strongly as pines will persist on this site for many decades and possibly even one to two centuries. Her suggestion also appears to contradict her statements at Paragraphs 32 and 33 where she clearly recognises wilding pines as a problematic weed (any pines left at the site will continue to provide a seed source for a very wide area). It is my view that the pine stand, which is c.125 ha (including the areas already harvested), provides a very substantial restoration opportunity in itself, with potential for a very substantial increase in indigenous vegetation if the pines are removed.

BATS

77. In Paragraphs 149-153, Ms Gabites outlines various concerns in relation to bats. To date, 14 days of dusk and/or dawn surveys have been undertaken using a Stag Electronics Batbox III bat detector (a hand-held bat detector). Automatic bat boxes (produced by the Department of Conservation, 2008) have been deployed in the Reserve, with a total of 56 nights of data recorded. Sites where automatic bat boxes have been deployed include both water catchment lakes, pine-pasture boundaries, and within ridgeline horopito scrub. No bats have been detected from any of these locations. Bat boxes continue to be deployed within the Reserve.

TURITEA RESERVE AS AN EDUCATIONAL ASSET

78. In Paragraph 44 of her evidence, Ms Gabites considers that the Reserve is an "invaluable educational asset" to a University town because the vegetation has been "surveyed and monitored over 50 years". The reality is that, apart from the early observational work of Alan Esler (DSIR Botany Division) and the recent (post-2004) establishment of monitoring in the Reserve by PNCC, there appears to have been little or no active survey and monitoring work in the Reserve by Massey University. I was somewhat surprised, in 2005, to discover that Massey University appears to have done

very little work in the Reserve, in spite of it being on their doorstep. PNCC now monitors various aspects and it is proposed, if the EcoPark is developed, to intensively monitor a more diverse range of biota. Mighty River Power also intends to fund university research in the Reserve, as discussed in the evidence of Dr Craig.

ECOPARK CONTRIBUTIONS

79. In Paragraph 4.2 of his evidence, Dr Blaschke refers to the proposed EcoPark, but then appears to dismiss it due to the lack of detailed planning for this initiative by PNCC. I believe that it is important to provide the context for this statement, and outline the steps Mighty River Power has in fact taken to try to progress this proposal further. The wider integral and contractual nature of the EcoPark concept is also addressed in the evidence of Mr Chris Shaw for Mighty River Power.
80. In 2004, PNCC apparently paid for a scoping study report commissioned by Forest and Bird on options for the EcoPark (Ravine 2004). PNCC also apparently subsequently commissioned a report (McNeill 2005) that suggests that an EcoPark could provide a keystone goal for the Council's environmental well-being strategies and policies. I started work on the Turitea Wind Farm in 2005, and understood at that time that the EcoPark concept was already well-established, and formed an integral part of PNCC's plan for the development of a wind farm in the Turitea Reserve.
81. The Agreement between PNCC and Mighty River Power specifically provides for the development of the EcoPark, and details as to the financial contributions both parties are required to make towards its development. I understand that Mighty River Power has undertaken to make its necessary annual contributions to PNCC specifically for the development of the EcoPark irrespective of whether PNCC chooses to make its required payments.
82. Since 2005, I have had various discussions with PNCC staff (on behalf of Mighty River Power) and also provided an indicative annual cost for an EcoPark concept to PNCC. In mid 2008, a draft report on the concept was provided to PNCC, via Mighty River Power. However, I understand that no further work has been done by PNCC in this regard since the provision of this report. The report is provided as an Attachment to this rebuttal evidence and provides an outline of:

- Ecological management to date at Turitea.
 - Desirable ecological outcomes for Turitea.
 - An ecological restoration framework for Turitea:
 - Indigenous revegetation;
 - Control of pest animals;
 - Pest plant control;
 - Pest animal result monitoring;
 - Pest plant result monitoring;
 - Ecological outcome monitoring;
 - Dog management;
 - Reintroductions of taxa formerly present.
 - Recreation development.
 - Other stakeholders.
 - Project management and infrastructure and resource requirements.
 - Long-term commitment and sustainability.
 - Indicative costs.
 - Funding sources.
 - Other opportunities.
83. This outline of a potential EcoPark includes project establishment, development of infrastructure, employment of fulltime staff, very intensive pest control, intensive monitoring, reintroduction of taxa formerly present, and relatively large-scale indigenous revegetation. The cost for this type and level of management is many times the current level of PNCC expenditure in the Reserve, and would be in excess of \$1 million/annum.
84. Once established, a 'maintenance level' of management for this scale of biodiversity protection will be in the order of \$600,000/annum, or more.
85. In his evidence, Dr Blaschke acknowledges that the proposed Turitea Wind Farm provides a mechanism to provide significant improvements in vegetation cover and habitat condition within the Reserve. He then goes on to state, in Paragraph 4.61, that, as it is to be a Council initiative, he has "disregarded the EcoPark proposal in assessing the positive and negative ecological effects of the application."

86. This is a significant exclusion given that Dr Blaschke is assessing the relative merits of the proposal on behalf of PNCC and that they have a contractual agreement to proceed with the EcoPark if the Wind Farm goes ahead. That contract has been in place since 2005. It is notable, in Paragraph 7.26, that Dr Blaschke obviously supports the EcoPark concept and considers that “in principle this proposal [the EcoPark] has the potential to increase ecological values of the Turitea Reserve, and the wind farm project provides a mechanism for funding such efforts”.
87. It is also notable that, in spite of disregarding the considerable positive merits of the EcoPark concept, overall, Dr Blaschke does not oppose the construction (and operation) of the Wind Farm on ecological grounds.

CONCLUSIONS

88. In light of the evidence I have reviewed, I am still of the view that adverse effects associated with the construction, operation, and maintenance of the Turitea Wind Farm will be adequately mitigated and that the EcoPark (to be provided as a formal contractual commitment if the wind farm goes ahead) will provide very substantial ecological benefits.

William Bruce Shaw

5 June 2009

REFERENCE

McNeill J. 2005: Proposed Turitea Ecopark: context and opportunities. Palmerston North City Council.