

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 ANTHONY JOHN PARSONS

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1. INTRODUCTION

- 1.1 My name is **Anthony John Parsons**. My qualifications and relevant experience are provided in Attachment 1. In summary I am a BE (Civil), graduating from Auckland University in 1962. I am a member of the Institution of Civil Engineers (UK) and the Institute of Engineers Australia and am a Chartered Engineer in both jurisdictions. I have had over 40 years' international experience in major civil and mechanical engineering construction projects as a project manager, estimator and in general management. I have been involved in a number of major projects of a similar scale to Turitea Wind Farm including Mangere Wastewater Treatment Plant upgrade (\$500 million) and Otira Viaduct in the Southern Alps. I was employed on a fixed term contract by Mighty River Power between June 2005 and February 2007 to project manage the establishment, investigation and preliminary design development for Turitea Wind Farm. I am familiar with the site and the project concept.
- 1.2 I confirm that I have prepared this rebuttal evidence in accordance with the Environment Court Code of Conduct for Expert Witnesses (July 2006).
- 1.3 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 **civil engineering design and construction and environmental management** matters. In particular, I will comment on the evidence of **Christopher David James and Graham John Levy** presented on behalf of **Mighty River Power**.
- 1.4 Specifically, I shall address the following matters:
- (a) **Civil engineering construction effects**
 - (b) **Water quality, earthworks erosion and sediment control for the project**
 - (c) **Construction Environment Management Plan**

2. CIVIL ENGINEERING CONSTRUCTION EFFECTS

- 2.1 In section 1.4 of his evidence Mr James states that Beca was commissioned in late 2005 to carry out a preliminary roading design and subsequent earthworks assessment for the project which he personally prepared. I can confirm that Beca were selected as Mighty River Power's engineers for the project after a competitive process in which experience

and track record were key criteria. Mr James' experience with wind farms was an important aspect of this evaluation and I can confirm that Beca proved to be an excellent choice and were instrumental in delivering a feasible project design meeting Mighty River Power's obligations with respect to their contract with PNCC and providing evidence supporting the Turitea Reserve Plan Change process.

2.2 Because of the challenging nature of the terrain and the PNCC contractual requirements, it was considered necessary to undertake extensive detailed evaluation and design development to confirm the viability of this project. This is not explicit or even apparent from Mr James' evidence. The process which was followed can be summarised as follows;

- Using available contour data, Garrad Hassan (specialist wind engineers) developed a turbine layout based on wind characteristics and their assessment of constructability. The turbine layout was completed based on utilising 3MW wind turbines.
- Each site was inspected on the ground to confirm constructability and to identify any issues requiring further investigation. These inspections also covered the ecology and identified certain sites which were eliminated because of the ecological value of the vegetation.
- A general site wide geotechnical and geological survey was carried out including detailed investigation of 12 representative turbine foundations and selected locations on potential roads.
- To improve the accuracy of geospatial data, site specific aerial photography was carried out at a nominal scale of 1 to 8000. From this the terrain was mapped to an accuracy of +/- 0.25m using Beca's stereoscopic mapping equipment. This mapping has allowed 1 metre contours to be generated. A control survey was also carried out on the ground. These maps were the basic design tool for the roading and turbine platform design and enabled Beca to digitally plot and optimise roading and platform layouts and accurately generate cut and fill quantities and vegetation clearance as the wind farm design developed.

- Using the maps, internal electrical reticulation and transmission layouts were also developed.

I confirm that, in my opinion, data developed in this manner will be accurate to a level consistent with a detailed design stage. This data was also used to prepare cost estimates for the business case for the development. Optimisation included the deletion of 9 of the originally proposed turbine zones and the refinement of the layout to ensure the practicability of construction of roads and turbine platforms as is described by Mr James in Sections 1.5 and 1.6 of his evidence.

- 2.3 Once the roading layouts and platform zones were fixed, the geotechnical report, supported by visual observation of materials exposed in the formation of existing tracks in the Reserve and adjacent farmland was used to develop typical batter designs for cuts and fills. I agree with the design approach adopted by Mr James. Because the ridge line in the reserve can be readily accessed at grade from South Range Road and is generally level, the existing track can be upgraded with relatively shallow cuts and minimal filling. The only exception to this is the access into and out of the saddle section which will require relatively substantial rock cuts and fills supported by gabion (rock filled baskets) retaining structures as described by Mr James in Section 4.21 of his report.
- 2.4 Road construction in farmland in the north eastern section of the development will require more substantial cuts and fills because of the contour of the terrain and is expected to have a greater depth of weathered greywacke which can be utilised for engineered fills. Roading in farmland in the south western section will follow existing farm tracks which are generally flat with gentle grades and will require minor earthworks. Access from Brown's Flat to the crest of the western ridgeline will require a long sidling cut behind the trig station hill. The road will then follow the ridge line. Turbine zones located in the Reserve away from the central spines can be accessed along spur ridgelines. While the existing access track crosses Brown's Flat, a practical alternative route to the south has been developed which eliminates the need for road construction in the ecologically sensitive Brown's Flat catchment.
- 2.5 Based on my extensive construction experience and knowledge of the site, I confirm that I agree with Mr James' opinion given in Section 2.2 of his evidence that it is perfectly feasible to construct and operate the Turitea Wind Farm proposed by Mighty River Power. Mr James confines his opinion to a civil engineering perspective. My opinion also extends

to the erection and commissioning of the turbines. The proposed design properly takes into account delivery and erection equipment constraints and requirements and provides for assembly platforms sized to meet the requirements for wind turbines of up to 3MW generating capacity.

2.6 I comment on particular aspects of Mr James' evidence as follows:

- a. Sections 3.1. and 3.2: The works described are comprehensive.
- b. Section 4.3: I agree with the statement made but note that the predominance of rock on the site may allow compacted rock fills which reduces the conditioning requirements.
- c. Section 4.4: The use of large hydraulic excavators equipped with rock buckets and rippers loading off highway haulers will minimise spillage during excavation, particularly in steep sections of the ridgeline and in sidling cuts. If required, any rock blasting will be carefully controlled to eliminate fly rock.
- d. Sections 4.5 and 4.6: I agree with the approach described by Mr James. Given the predominance of shallow cuts and rock, I expect that most cut batters in the Reserve will be set at 1H:4V. I note that, from observation of several existing high cuts in the Reserve saddle area, I expect dropouts, if they do in fact occur, are likely to consist generally of small volumes of broken rock particles 20mm to 100mm in size, easily cleaned up by maintenance crews during both the construction and operation of the wind farm. Spillage will be confined within the road alignment and, because of the predominant particle size, is unlikely to contribute much sediment. With cuts in weathered greywacke overlaying unweathered material, a combination of flatter batters in the softer material and steep batters in the stronger material is most likely to be used. This will minimise vegetation clearance and topsoil disturbance.
- e. Section 4.7: I agree with this approach.
- f. Sections 4.9 and 4.10: I agree with this approach and note it is comparable to the foundation types used for turbines on adjacent wind farms (Te Apiti and Tararua). The detailed design phase will require investigation of each foundation before, during and after excavation by a geotechnical engineer to confirm bearing capacity and resistance to overturning.

- g. Section 4.11: I agree that the underlying greywacke is likely to be suitable for conditioning as sub- basecourse for the initial levelling layer for site access roads with running surface material being imported from local commercial sources. Conditioning of the sub base material will be carried out by mobile crushing and screening plants located at spoil disposal sites. This is a common practice. While not considered at this stage, the greywacke may be suitable for commercial use, for example on farm tracks, and could be back loaded onto the aggregate delivery trucks which would marginally reduce the amount of surplus spoil to be disposed of on site.
- h. Sections 4.22 to 4.24: the turbines will be “micro-sited” within each zone depending on the final wind analysis and turbine type selected. The access and platform design has taken into account the range of locations within each zone to confirm that “micro-siting” is practicable without significantly impacting earthworks or vegetation clearance quantities.
- i. Sections 4.25 to 4:40: I agree with Mr James’ evidence for these matters.
- j. Section 4.41. The spoil disposal sites are an important part of the construction activity. I note that disposal sites identified within the Reserve have now been eliminated. All disposal sites will be subject to geotechnical evaluation, will be engineered to ensure stability (e.g. benched and drained) and will be top-soiled and re-vegetated on completion to blend into the surrounding landforms.
- k. Section 5: I agree with Mr James’ evidence and concur that the proposed staging is sensible. I reiterate, however, that this represents an indicative sequence which may be revised at the detailed design stage or through input from the contractors selected for the project.
- l. Sections 7.1 to 7.29: I agree with Mr James’ evidence in this section and am confident, from my knowledge of the methodology used and checks carried out, that the quantities tabled in this section are accurate for this design stage and understand that they include an adequate level of contingency. Data for turbine platforms and foundations are based on manufacturer’s information for 3 MW turbines which I have sighted. I confirm that the construction methodology described is practicable and standard industry practice. I note that chain diggers equipped for rock trenching and rock saws are standard industry equipment and are available in New Zealand. The

use of helicopters for the construction of transmission towers and stringing transmission lines is a standard technique for this activity in inaccessible country.

- m. Sections 7.30 to 7.38: It is understood that disposal sites identified within the former Reserve pine forest and Brown's Flat, described in Sections 7.32 and 7.33, will not be considered. Additional sites will be located in private land. All sites will be subjected to geotechnical review and stability design, including: drainage, benching and compaction requirements and construction will be controlled as described in Section 7.36 of Mr James' evidence. Sites will generally be located close to access roads in dry valleys and depressions adjacent to the ridge lines.
- n. Sections 7.39 to 7.44, 8.1 to 8.15, 9.1 to 9.4: I agree with the approach described by Mr James' evidence.
- o. Sections 10.1 to 10.19: In my opinion, the erosion and sediment control methodology proposed in Mr James' evidence is good engineering practice and will adequately protect the water supply from the effects of sediment and other contaminants when applied in accordance with the draft Mighty River Power project Construction Effects Management Plan. These measures will also be complemented by the natural barrier presented by the vegetation present in the ephemeral watercourses running from the ridge line into the catchment. I note that I observed the logging operation carried out in PNCC's pine forest where approximately 40 Ha of pine forest was clear felled, much of it being in the winter. This resulted in a considerable area of open ground disturbed by tracked and wheeled machinery and log hauling activities and draining into the water catchment area. The contractor's erosion and sediment controls can be said to be fairly rudimentary and certainly not up to the standard proposed for the wind farm construction phase. Yet it is understood, from observation, there was no sediment or other contamination of the water supply or water courses from this activity.

3. WATER QUALITY, SEDIMENTATION CONTROL FOR THE PROJECT

- 3.1 I have reviewed the statement of evidence of Graham John Levy dealing with this subject and agree with the approach described in his evidence. I agree that the Greater Wellington Regional Council Guidelines are appropriate and that the comparison of soil conditions and rainfall between Wellington and Turitea are appropriate as a baseline for calculation of potential sediment loads and run off. The potential impacts from construction

have been adequately assessed and prevention and mitigation methods are, in my view, in accordance with industry standards. Based on my experience, if implemented in accordance with the draft Construction Environment Management Plan (CEMP), they will exceed normal application standards for road construction projects, ensuring that sedimentation and contamination effects from wind farm construction activities will be less than minor.

- 3.2 It is noted that the CEMP allows for the involvement of the Councils in the preparation and monitoring of Sediment and Erosion Management Plans (SEMPs) and Erosion and Sediment Control Plans (ESCPs) used to implement the project works which will ensure that an appropriate standard of workmanship is consistently applied.

4. CONSTRUCTION ENVIRONMENT MANAGEMENT PLAN

- 4.1 I have reviewed the draft CEMP prepared by Mighty River Power as a model for the project and consider it to be an appropriate tool for the proper management of construction activities to ensure that environmental effects will be controlled in accordance with best industry practice. The approach adopted is to break down the project into sections and prepare SEMPS and ESCPs for each section. Mighty River Power will prepare the master CEMP and the SEMPS, using specialist environmental advisors to design the control measures. The contractors employed to carry out construction will prepare the ESCPs for their activities. These will be reviewed by suitably qualified people and approved by Mighty River Power. Draft SEMPS and ESCPs will be provided to the Councils for their review and input. Preparation of the SEMPS and ESCPS will be based on data developed from field inspections which include Council representatives. The contractors will carry out their construction activities in accordance with these plans and will be audited by daily site inspection. I consider this approach to be very thorough and in accordance with best engineering practice.

5. CONCLUSION

- 5.1 I have reviewed the evidence described in this document and am satisfied that Mighty River Power has adequately described the scope of the project and the potential effects emanating from construction activities and their mitigation, has considered potential impacts on the water supply catchment and how they will be prevented, and has prepared an appropriate model for managing the project so that effects will be less than minor.

Anthony John Parsons

5 June 2009