

**IN THE  
MATTER OF**

The Resource Management Act  
1991

**AND IN THE  
MATTER OF**

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.

**STATEMENT OF EVIDENCE OF GRAHAM JOHN LEVY**

<b>INTRODUCTION.....</b>	<b>3</b>
<b>PURPOSE AND SCOPE OF EVIDENCE:.....</b>	<b>5</b>
<b>EXECUTIVE SUMMARY (OVERVIEW OF FINDINGS) .....</b>	<b>6</b>
<b>THE SITE AND LOCALITY / ZONE, AUTHORITY AREA CONTEXT.....</b>	<b>7</b>
<b>PROJECT ACTIVITIES THAT MAY AFFECT WATER QUALITY.....</b>	<b>11</b>
<b>ENVIRONMENTAL MANAGEMENT PLANS .....</b>	<b>16</b>
<b>EROSION AND SEDIMENT CONTROL.....</b>	<b>19</b>
<b>WATER QUALITY MANAGEMENT .....</b>	<b>26</b>
<b>COMMENT ON SUBMISSIONS .....</b>	<b>35</b>
<b>PROPOSED CONSENT CONDITIONS .....</b>	<b>41</b>
<b>CONCLUSION.....</b>	<b>41</b>

## INTRODUCTION

1. My name is Graham John Levy. I am a Technical Director of Water Resources Engineering, in the firm of Beca Infrastructure Ltd. I have 33 years' professional experience in the development and management of water resources.
2. I have a Masters Degree in Civil Engineering from the University of Canterbury, specialising in hydrology and hydraulics. I am a Chartered Professional Engineer, a member of IPENZ, a member of Water New Zealand and a member of the New Zealand Hydrological Society.
3. My field of experience relates to hydrology and hydraulics, with a particular interest in infrastructure development, and in the effects of infrastructure on the aquatic environment – rivers and lakes in particular - with an emphasis on hydrological, morphological and water quality effects.
4. Experience relevant to the Turitea proposal includes my recent work on Project Hayes where I appeared for the Otago Regional Council before the Environment Court. My role involved the review of the consent application and consent conditions with respect to erosion and sediment control and preparation and presentation of evidence to the Environment Court.
5. I have had extensive involvement in the management of stormwater runoff, both quantity and quality, from many site developments in New Zealand. These developments have included urban growth areas, highway projects, river works, irrigation projects and hydro and thermal power stations. In addition to my national experience, I have also been involved in similar projects overseas.

6. My involvement in the Turitea Wind Farm commenced in early 2006. My role in the project initially included an assessment of the potential water quality effects on the Turitea water supply catchment and the preparation of a Water Quality Monitoring Plan (WQMP). I am currently also overseeing the preparation of the draft Construction Environmental Management Plan (CEMP) for the project.
7. I am aware that in January 2009, the project design was modified by deleting nine of the originally proposed turbine zones. This evidence is based on, and reflects, that modified proposal.
8. Prior to completing my evidence, I have visited those parts of the site that are relevant to the evidence I am presenting, including the substation sites, representative examples of turbine platform locations, where roading will be built or upgraded, Browns Flat, the water supply reservoirs, and the proposed double culvert site on a un-named tributary of the Kahuterawa Stream.
9. I am authorised to give this evidence on behalf of Mighty River Power.
10. I confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses in the Environment Court Consolidated Practice Note 2006 and I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions I express. In particular, unless I state otherwise, this evidence is within my sphere of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

## PURPOSE AND SCOPE OF EVIDENCE

11. My evidence will cover the following matters, in relation both to water quality and to earthworks erosion and sediment control for the project:
  - a. A brief background of the existing environment where relevant to my evidence;
  - b. A description of project activities relevant to my evidence;
  - c. A technical discussion of the issues, potential effects and proposed mitigation (where required), covering the following:
    - i. Construction environmental management;
    - ii. Erosion and sediment control; and
    - iii. Water quality within the water supply and adjacent catchments.
  - d. Comments on submissions;
  - e. Proposed consent conditions; and
  - f. Conclusions.
  
12. In the preparation of this evidence I have considered the following project documents:
  - a. Turitea Wind Farm Construction Effects Report, prepared by Beca Carter Hollings and Ferner Ltd, August 2008 and attached to the Assessment of Environmental Effects (AEE) submitted in support of the applications as Appendix E (Construction Effects Report).

- b. Turitea Wind Farm – Water Quality Monitoring Plan, Beca Carter Hollings and Ferner Ltd, August 2008.

## **EXECUTIVE SUMMARY (OVERVIEW OF FINDINGS)**

13. Construction and operation of the Turitea Wind Farm will be implemented in accordance with industry standard environmental management procedures that will manage the works such that the effects on the aquatic receiving environment will be less than minor.
14. During the construction phase, the principal risks relate to sediment discharge. A robust hierarchy of management plans will be used to address the design, construction methodology, monitoring, reporting and remedial response such that incidents are avoided as far as practicable, and that any which do occur will be minor and effects will be appropriately remedied.
15. Other potential contaminant sources such as concrete batching, hydrocarbon storage and wastes will be managed such that they do not discharge to the Palmerston North City Council (PNCC) water supply catchment, and in most cases do not discharge at all. Hydrocarbon storage and waste management (where applicable) will occur in areas remote from waterways, and be managed in a way that avoids accidental spills as far as practicable, and if they do occur, that they are less than minor and can be readily remedied.
16. During the operational phase of the project there are minimal risks in terms of potential for contaminants to reach waterways. In particular, hydrocarbons will be banded, and the minor sanitary waste discharge will be to ground, and outside PNCC water supply catchment.

17. In my opinion, the construction and environmental management approach proposed for the project will appropriately manage effects on the aquatic environment so they are less than minor.

## **THE SITE AND LOCALITY / ZONE, AUTHORITY AREA CONTEXT**

18. The Turitea Wind Farm site is located approximately 10 kilometres to the south-east of Palmerston North city centre along ridgelines in the northern Tararua Ranges. The Wind Farm Site extends from Pahiatua Aokautere Road in the north to the northern boundary of Harding's Park to the south. The turbines of the Turitea Wind Farm are to be located largely on the main ridge line, which is exposed to the prevailing north-westerly winds.
19. The overall wind farm footprint includes a number of separate land holdings. A significant portion of the wind farm footprint is located within the Turitea Reserve, an area encompassing the bulk of the Turitea Water Supply Catchment. Parts of the project are within other runoff catchments, not flowing to the water supply catchment.
20. A preliminary geotechnical investigation was carried out by Beca in 2006 (as further detailed in the evidence of Mr James). The investigation established that the site is underlain by two distinct geotechnical units. These units are broadly Esk Head Belt "greywacke" and the Browns Flat alluvium. The soil type in the majority of the site is a relatively thin layer of soil (frequently in the order of 300 mm thickness). The soils are primarily clays and silt with some areas of sandy gravel. The relatively thin soil layer over the underlying rock in this area will tend to result in lesser quantities of sediment runoff when compared with areas with a greater soil depth.
21. The erosion and sediment control guidelines that are proposed for use on the project are those published by Greater Wellington Regional Council (GWRC), being *Erosion and Sediment Control Guidelines for the Wellington Region* (Denton and Robson, 2002) (the Guidelines). The use

of the Guidelines in relation to this project is consistent with the provisions of the proposed Horizons “One Plan”, and their appropriateness has been confirmed in an email from Clare Barton of Horizons, dated 14 April 2009, which states that “There is no specific written policy stating that this Guideline is used but in practice this guideline has been used on all major earthwork projects in this Region including other wind farm applications.”

22. Given the proposed use of the Guidelines, it is appropriate to compare the project soils with those of the Wellington Region to confirm applicability of the guidelines. Soils within much of the Wellington Region are also derived from greywacke and are considered to be similar in geology to much of the project area. The Wellington Region tends to have soils with a high content of fine sands and silts, and much of the surface soil in the Turitea area will have similar size fractions. Sands and silts are typically more erodible by surface runoff than cohesive clays, though sands and silts are more easily controlled than clays using the sediment control measures commonly adopted by the construction industry, and outlined in the Guidelines.
23. The topography of the Turitea site is predominantly steep with a mix of vegetation types, including native bush and scrub cover, pine plantation and pasture. The wind farm access tracks (existing and proposed) will be located predominantly along the ridges of the Ranges.
24. Rainfall intensity is a key factor in the potential for erosion because it affects both the direct impact energy of the rain on the soil itself, and also the resulting runoff that can mobilise sediment as it flows across the ground.
25. Because the Guidelines have been used to design the sediment and erosion control measures for this project, the rainfall intensity of the project area has therefore been considered relative to the rainfall intensity for the Wellington Region, which is based on Wellington rainfall characteristics.

26. Rainfall events with the Average Recurrence Interval (ARI) in the range 2-10 years generate the majority of sediment from an earthworks site. This is because less severe events, while more frequent, lack the intensity to mobilise and transport the sediment, while more severe events, although having the potential to generate large volumes of sediment, are much less frequent and have a lower probability of occurrence during the period that the earthworks site is open. In light of this, the rainfall depths for these ARIs have been compared with a subset of samples from the Greater Wellington Region in order to assess whether the two regions are comparable.
27. I have compared rainfall intensities for Turitea with those of the Wellington Region using the HIRDS version 2 software developed by NIWA, which provides a tool for estimating rainfall intensity at any point in New Zealand, even where there is not a specific local rainfall record. The reason I have used HIRDS is that the rainfall intensity across the Turitea site is expected to increase with elevation, and will be higher than the rainfall intensity at lower elevation on the Manawatu Plains to the north-west, where there are rainfall records. I did not have available to me any suitable long term rainfall record for the Turitea area, so use of HIRDS was the only option for carrying out the comparison.
28. Based on HIRDS, for longer duration storms the range of intensities expected at site are similar to those that would be expected at urban sites in the Wellington Region. Rainfall at higher altitude sites in the Wellington Region can be more severe than Turitea. At shorter durations (down to 10 minutes) the rainfall intensity at Turitea can be around 20% higher than for urban areas of Wellington, but again sites at higher elevation in the Wellington Region have higher intensities than Turitea. The proposed use of the Guidelines for Turitea will be adequate to take the short duration intensities into account, as the pond design volumes for Turitea will fully contain the shorter duration events.

29. The Guidelines follow a very similar form to those for other areas of the country, and represent industry standard practice. It is important to recognise that incidences of non-compliance on construction sites seldom reflect any flaw in guidelines, and are generally related to the effort that goes into management of the site. Therefore it is appropriate to use the Guidelines for Turitea, while recognising that the performance of the site in regard to sediment discharge will depend on a robust structure of site-specific erosion and sediment control plans, robust project-wide management plans, regular monitoring, and appropriate and timely responses. This structure is expected to result in appropriate control measures being in place and fully operational at all times, including before any rain event occurs.
30. The Turitea Project area is unusual in that a large proportion of the site is within the water supply catchment for the city of Palmerston North. The water supply catchment contains two water reservoirs (the upper and lower dams) located on the Turitea Stream. As stated in the AEE the upper reservoir has a capacity of almost 1.7 million cubic metres with the lower reservoir providing additional storage of approximately 0.3 million cubic metres. These reservoirs supply approximately 60% of the water supply requirements for Palmerston North City.
31. The majority of the land within the water supply catchment is held by Palmerston North City Council (PNCC) and forms part of the Turitea Reserve. The water supply catchment also includes small areas of farmland adjacent to the Reserve.
32. As outlined by Dr Coffey, the footprint of the proposed wind farm includes the headwaters of the Upper Turitea Stream, Kahuterawa Stream, Otangane Stream, Tainui Stream, Matarua Creek, as well as some unnamed tributaries of the Manawatu River (on the northern boundary of the Wind Farm) and the Lower Turitea Stream. The location of these areas is shown in Appendix A. The four turbine zones proposed for Browns Flat, an

area dominated by wetlands, were removed to address ecological concerns and were among the nine zones removed in January 2009.

## **PROJECT ACTIVITIES THAT MAY AFFECT WATER QUALITY**

33. The Turitea Wind Farm involves the construction of a maximum of 122 wind turbines (subject to final turbine selection) and two internal substations. The project also requires the construction or upgrade of 57 km of internal access track, and the construction of transmission lines and lay-down areas.
34. The nature of the construction works is described in detail in the evidence of Mr James. My evidence relates to, and provides a summary of, those aspects of the proposal that may affect the water quality in downstream water bodies, with particular emphasis on the Turitea Water Supply Catchment.

### *Substation construction and operation*

35. Two substations will be constructed as part of the Turitea Wind Farm development, and both are within the Turitea Reserve. The substations are required to allow for the electricity generated by the wind turbines to be converted to 220kV for transporting over distance. These substations will be located at Browns Flat in the south-west of the site, and within the Pine Plantation area in the north-east of the site. The Pine Plantation substation is located outside of the water supply catchment. While the Browns Flat substation is located on the edge of the water supply catchment, it is intended that any drainage from this substation be directed to drain outside of the water supply catchment. This is feasible given its location at the top of the ridge close to the catchment boundary.
36. During the construction phase of the project there will be portable toilet facilities on site for workers, with holding tanks for sanitary wastewater to

be collected and disposed off site. For the operational phase of the project, septic tanks will be constructed to service the facilities based at the substation sites. The treated wastewater will be disposed to a soakage field, which in both cases will be located on land just outside the water supply catchment.

37. Each of the electrical substations will incorporate power transformers, which use oil for insulation and cooling. The transformers based at the Browns Flat and Pine Plantation substations will have an oil capacity of 2 x 60,000 litres and 2 x 100,000 litres respectively. The transformers will be constructed within bunded areas at the substation sites (detailed below).

#### *Hydrocarbon storage*

38. Both of the substation sites will be designed to exceed industry standard practice for storage of hazardous substances and will use bunds and oil catch tanks to prevent leakage of oil in the event of a fire or spill. Stormwater from the bunded areas will be treated in accordance with industry standard practice (Transpower Standard) with a holding tank and a plate separator to maintain compliance with the required standards for the discharge. The stormwater for both sites will be discharged outside the water supply catchment following treatment.
39. Petrol and/or diesel will be stored outside the water supply catchment area, within a bunded area capable of containing 110% of the tank size plus a 1% AEP 24 hour rainfall depth over the bunded area. Fuel can then be transferred in smaller quantities to a bowser for refuelling of plant remotely. Plant may at times be refuelled from the bowser on work sites within the water supply catchment.

### *Concrete production and transportation*

40. There will be two concrete batching sites used at different times during the construction phase of the project, located at the proposed substation sites. It is expected that only one concrete batching plant will be operational at any one time.
41. The batching plants will require a water supply, processes to manage and treat waste water, stormwater discharge facilities, material storage facilities, dust control and wash down facilities. Process and wash water will be allowed to settle out naturally in an interceptor system, and the resulting water will be recycled for use in truck washing and concrete production. Sludge from the ponds will also be removed regularly and stored on the site to dry. Excess concrete will be poured into forms and made into blocks.

### *Roading construction and upgrade*

42. As outlined by Mr Galloway, the public roading network requires some improvement in order to accommodate the traffic associated with the wind farm construction. These improvements involve minor adjustment to certain corners in order to accommodate the long turbine blades and new accesses off Pahiatua Aoukautere Road to ensure safe access on to the site. These will be managed in a similar way, and have similar effects, to the on-site roading works I describe below.
43. The majority of the internal access roads lie along ridges, and I have confirmed with Mr James that because of this, 70% of the road runoff can be discharged outside the water supply catchment. The remaining 30% of access road runoff will discharge to the water supply catchment, and will result in similar quantities of runoff and sediment to land as occur at present. My observation is that the effects of the current discharge are less

than minor. Some routes also cut through valleys and cross streams requiring the use of culverts as described below.

44. Five culverts are required for the construction of roads within the site. The majority of these will be over ephemeral (intermittent) streams at the extreme headwaters of catchments and located in relatively small catchments, though two of the catchments are larger. The sizes of the catchments range from 2 hectares to approximately 65 hectares. The locations of these culverts are shown in Appendix A. One of these culverts (a double culvert located in an un-named tributary of the Kahuterawa Stream) is over a more substantial permanent watercourse.

#### *Earthworks*

45. The turbine platforms are generally flat platforms, with the majority to be built on ridges. The size of the platform will be primarily driven by the working requirements of the crane. The crane pads will be approximately 33 metres long by 20 metres wide (depending on final turbine selection), with an additional 5 metres width required for transport access. This will be in addition to the 17 metres by 30 metres required for the turbine foundations.
46. With respect to earthworks including topsoil removal, cut and fill volumes, it is estimated that 228,000 cubic metres of topsoil will have to be removed over the duration of this project. 1,400,000 cubic metres of earthworks in cut, and 660,000 cubic metres required for proposed filling.
47. The remaining cut material, estimated at 740,000 cubic metres of material will be disposed of to “spoil disposal sites”. Spoil disposal sites have been selected outside the water supply catchment wherever possible, in low points or depressions, in such a way that the finished surface would remain productive to the landowner. The final location, design and management of these spoil disposal sites will be an important matter to address in the

Site Environmental Management Plans (SEMP), which I will describe later in my evidence.

48. Based on the estimated quantity of spoil for disposal, it has been calculated that these sites will cover approximately 33 hectares in total. The proposed location of spoil sites has been indicated in the figure shown in Appendix A.
49. This summary is based upon the earthworks required to establish access roads and turbine platforms for the site. No construction within watercourses is required for the establishment of turbine platforms, or for spoil disposal. Some spoil disposal sites at the heads of gullies, while not in permanent watercourses, may require subsoil drainage to address intermittent seepage flows that would currently occur from time to time.
50. Cable connections will mostly be laid along roads, and some will cross streams within the road at culvert locations. Transmission line routes result in most pylons being reasonably accessible to proposed access roads, with only a few sites requiring construction remote from access roads. At these sites it is proposed that access will be by helicopter, avoiding the effects of construction of access roads on steep slopes. Equipment lay-down areas will also be provided in a number of locations, and will have similar form and construction to turbine platforms, but with a footprint typically 150 metres by 75 metres.
51. My evidence will predominantly address the site erosion, sediment control and environmental management associated with the construction process. In addition I will address how the construction and operation of the Turitea Wind Farm may affect the Water Supply Catchment.

## ENVIRONMENTAL MANAGEMENT PLANS

52. A hierarchy of environmental management plans has been proposed for the site, with specific management techniques to address each type of activity.
53. There will be two environmental management plans, one to cover the construction phase, and another to cover the operational phase of the project.

### *Construction Environmental Management Plan*

54. A draft CEMP is currently being prepared to provide an overall framework for the environmental management of all construction works. I am actively involved in the preparation of this document, which will provide a robust basis for management of the construction phase of the project. The document is in development and will involve consultation with relevant stakeholders during this development. I understand that a draft of this document will be available prior to the hearing.
55. The CEMP will work as an umbrella document, providing the framework under which the SEMP's are to be prepared. The final CEMP will be prepared following the granting of consents and in accordance with the conditions of consent imposed. It will also be provided to each relevant Council to demonstrate how the consent holder will achieve compliance with the necessary standards and conditions.
56. The CEMP will include details of processes covering each major aspect of the construction process including, but not limited to:
  - a. Objectives of the environmental management process, statutory and contractual requirements;
  - b. Proposed construction methodology and timetable;

- c. Revision of the plan including the approval process for revisions;
- d. Roles and responsibilities;
- e. Training;
- f. Complaints response;
- g. Permits;
- h. Methodology for preparing a SEMP;
- i. Potential environmental effects;
- j. Environmental emergency response;
- k. Inspections, monitoring and reporting;
- l. Environmental Procedures; and
- m. Contingency Procedures.

*Site Environmental Management Plans*

57. The SEMP's are a site specific application of the CEMP, providing sufficient detail about the specific design (e.g. platform location and dimensions, spoil disposal locations, lay-down areas, volumes and dimensions, proposed construction methodology and avoidance and mitigation techniques) for that part of the works so there is certainty of environmental outcomes. These documents will be used on site by construction managers, providing clear guidelines as to construction methods, staging, control methods, monitoring and reporting. The methodology for the preparation of a SEMP will be detailed in the CEMP.

58. In order to provide a consistent approach and effectively maintain the quality of the SEMP's, the CEMP will outline the process to be followed for approving the SEMP's by the Mighty River Power representative (indicated in the plan as "Engineer to the Contract", or delegate). In addition to the approval process, all SEMP's will be submitted to the relevant Council prior to them becoming operational. There will be the opportunity for the council officer to perform a site walk-over with the main contractor and Mighty River Power representative and review the proposed SEMP and address any concerns raised. Issues raised would then be considered, and any changes would be incorporated into the final SEMP for the site.
59. Once a SEMP has been produced the contractor will be required to work in compliance with this, and to take this information into consideration when preparing the Erosion and Sediment Control Plan (ESCP) for any earthworks that they undertake through their contract in the area corresponding to the SEMP.

*Erosion and Sediment Control Plans (ESCPs)*

60. ESCPs will be the responsibility of the contractor. They are a "live" document that sets out precisely how erosion and sediment control will be managed on any particular site, including the staging of the protection works, the position of cut-off bunds and diversion channels and the location and details of treatment ponds.
61. Representative ESCPs have been prepared and are included as Appendix E to the Construction Effects Report contained within the AEE. The ESCPs will be submitted to the Engineer's Representative on site, and through the Engineer to the relevant Councils.

### *Water Quality Monitoring Plan*

62. The CEMP will incorporate a summary of the WQMP. This plan covers the Turitea Water Supply Catchment. The WQMP outlines the water quality monitoring programme in the Turitea Water Supply Catchment. This programme aims to provide triggers to assist in the protection of water quality and aquatic ecology from any adverse effects resulting from the project, both during construction and operation.

### *Operational Environmental Management Plan*

63. Towards the end of the construction phase of the project, an Operational Environmental Management Plan will be written and submitted to the relevant Councils to demonstrate the controls and procedures which will be put in place to maintain compliance with the relevant standards and consent conditions.

## **EROSION AND SEDIMENT CONTROL**

### *Overview*

64. As stated previously, all earthworks associated with the construction of the Turitea Wind Farm will be performed in accordance with the Guidelines.
65. Below this, there will be a project specific CEMP and site-specific SEMP. The CEMP will outline the principles of erosion and sediment control and how these are to be put into practice during the construction of the Turitea Wind Farm.
66. The principles of sediment and erosion control used within the New Zealand construction industry are well established and based upon many years of experience both in New Zealand and overseas.

67. Horizons Regional Council (Horizons) under the current statutory framework requires “effective sediment and erosion control”, and does not have a guideline document on erosion and sediment control. Horizons has verbally confirmed that it considers the use of the Greater Wellington Region Guidelines as in line with this requirement.
68. I consider that when rainfall intensity and soil types are taken into consideration that the Guidelines are appropriate for use at the Turitea Wind Farm and will provide an acceptable level of protection to the receiving environment.
69. The Guidelines are known in the area, and have been mostly well utilised by other wind farm projects in the area including West Wind (located in Makara, Wellington). They were also proposed for use on Project Hayes (located in the Lammermoor Range, about 70 km north-west of Dunedin) and Central Wind (between Waiouru and Taihape).

#### *Objectives*

70. Mighty River Power aims to exceed industry standard environmental outcomes during construction of the Turitea Wind Farm through the establishment and imposition of an environmental management framework. The key environmental objectives for the project are:
  - a. To avoid the erosion of the stream banks;
  - b. To avoid as far as practicable the discharge of sediment from earthworks sites into streams, as this would have the potential to damage the receiving stream ecology;
  - c. Manage the fill sites as far as practicable to avoid sediment discharge; and

- d. Avoid effects on water quality in the Upper Turitea Catchment (which is the water supply catchment).

*Proposed methods*

71. Various areas have been identified which represent the nature of the conditions which are likely to be encountered on site. These areas were identified in the Construction Effects Report, and are South Range Road, Water Catchment Access Road, Western Ridge, Browns Flat and Cross Valley Transmission and Out of Reserve (farmland). A range of standard erosion and sediment control methods will be employed to achieve the desired environmental objectives in each of these areas. As noted above, representative ESCPs have been prepared for these areas illustrating the different approaches to erosion and sediment control which would be appropriate under these circumstances. In summary, these approaches include the following aspects.
72. Site disturbance will be minimised at all times, including minimising the overall footprint of the works. This will be achieved by a combination of staging and progressive site stabilisation. An example of this approach includes the stabilisation of access roads as soon as their base course is down. Shoulders and batters will be re-vegetated as soon as practicable after completion. Roads with a slope greater than 14° will be stabilised with lime/cement or chip seal and the remaining roads stabilised with metal.
73. Re-vegetation is a key method by which the quantity of earthworks open at any one time will be managed. This will predominantly be achieved by the spreading of topsoil and grassing, with mulch likely to be required in some areas. Hydroseeding will primarily be used on cut slopes, fill batters and on spoil sites to establish cover and stabilise the sites. If site conditions do not allow for immediate revegetation, geotextile may be required to temporarily stabilise the any at-risk areas at the end of each working day or

when rain is forecast. Where appropriate, such as some areas inside the Reserve, targeted replanting and/or the direct transfer of native vegetation from adjacent parts of the site will follow the hydroseeding.

74. Diversion of clean upslope water away from the works area will be accomplished using non-erodible channels or bunds (clean water diversion), to avoid excess flow of water into the works area, reducing the risk of mobilisation of sediment.
75. Diversion of sediment laden flows to treatment devices as described below using non-erodible channels or bunds will provide for removal of sediment from stormwater discharges. Runoff diversion channels or bunds may require stabilisation where flow velocities are likely to be greater than 1 metre per second (m/s). Where channel or bund erosion may be likely, stabilisation methods would be used. Stabilisation measures include geotextile lining, vegetation stabilisation or rock check dams.
76. All disturbed area runoff will be treated to remove sediment using best practicable options before discharging to land. The techniques to be used will include a combination of sediment retention ponds (for larger earthworks areas), grit traps (for smaller roadside discharges), earth bunds and silt or super-silt fences (smaller earthworks sites and at the toe of fill batters).
77. For the access tracks, the objective will be to distribute discharge flow as much as practicable, to avoid the risk of erosion associated with concentrated flow. This will be achieved by using frequent turnouts from the roadside drainage, discharging in a manner that spreads the flow onto a suitable downstream area that is well vegetated or otherwise protected, e.g. a small depression.
78. Grit traps are proposed as a collection point for grit suspended in stormwater at these turnout points. Grit traps are pits that act as a small

retention device. These are to be positioned along the access tracks, where they will be the primary control. Drains on the side of the road will capture flows and 'direct' them to the turnout areas, and associated grit-trap. Grit traps will be positioned according to topography and practical considerations. For instance grit traps will be required more frequently at steeper sections of the road but would generally not be installed when the road is located within a cut, where it is likely that flow would be concentrated and need more substantial treatment at the point of concentrated discharge.

79. Where necessary, lay-flat pipe or stabilised channels will be used to convey the discharge of a grit trap or the larger turnouts to the bottom of the hill slope to avoid erosion below the discharge point.
80. Silt fences or super silt fences are temporary barriers of geotextile which will be used to reduce the velocity and trap sediment contained within the flows. These are suitable where there is a linear area of earthworks such as a roadside fill batter, where it is more appropriate to allow the flow to discharge in a distributed manner as it runs off the batter, rather than to concentrate it at one point for treatment and potentially introduce a risk of localised erosion at the concentrated discharge point. Once the fill has been permanently re-vegetated the silt fences will be removed.
81. Water from the turbine platforms and crane pads will be contained within the working footprint and directed to a treatment device, either a silt fence or grit trap depending on which is more appropriate to the specific site conditions.
82. Sediment retention ponds will be used to treat areas typically from 0.3 to 5 hectares that will remain exposed for a reasonable period of time, e.g. spoil disposal sites. They consist of a low earth dam with a pond excavated behind, to settle sediment from the runoff. They incorporate a decant device to dewater the pond at a rate which will allow sediment to settle out.

Decants are floating pipes with holes that allow surface water to be taken at a slow rate, and passed through the dam to a treated water outlet pipe for discharge to land.

83. The ponds are sized in accordance with the size and topography of the contributing catchment. Earthworked areas with slopes less than  $10^\circ$  and less than 200 metres flow length require a pond with a minimum of 2% of the catchment area. For catchments with a slope greater than  $10^\circ$  and/or greater than 200 metres flow length require a minimum pond volume of 3% of the catchment area.
84. In order to treat the sediment generated during the construction of the sediment retention pond, silt fences will be installed down gradient from the proposed ponds.
85. Where cable reticulation is to be installed underground a trench will be cut into the road (new or existing). Once cables have been laid, where possible, excess material will be returned as backfill. As the amount of sediment generated during this process will be minor in any given location, it will be treated by the existing controls for treatment of the tracks.
86. Where overhead transmission lines are to be installed there are minimal earthworks required. Where vegetation is required to be cleared, most will be able to be cleared above ground level, which will minimise the disturbance of earth, and therefore the potential for sediment generation. The areas to be excavated for the transmission tower posts are small, with an area of 4 square metres required to be cleared for the construction of each monopole, or each of the four footings for each lattice tower. Runoff will be treated using silt fences around the perimeter.
87. Works in a watercourse are to be managed in a manner which results in the least adverse environmental effect. This can be achieved by a

combination of the following sediment and erosion control measures and construction methodology.

- a. Clean water diversion will be utilised to limit the flow into the works area, and works will be timed in ephemeral watercourses so they are performed in the dry. Where possible works should be performed during the summer months when base stream flows are at the lowest. Further, works in a watercourse should only be performed when no rainfall is forecast. Usually a dry period of 3-5 days is considered appropriate. Should rain be forecast the works area will be stabilised, for example by pinning geotextile over the works area and placement of riprap at the upstream end of the geotextile to stop it lifting.
- b. Where the stream is permanent, or it is not possible to time the works for a period of no flow, diversion of the flow is considered the appropriate action. This will be either through pipes, or diversion of the stream around one side of stream bed to allow works to be performed on a dry portion of the bed.
- c. Suitable runoff controls will be installed including diverting runoff from disturbed area to minimise discharge of sediment and construction material into the stream.
- d. The choice of construction materials such as precast headwall and culverts will allow for the time works in the stream to be minimised.
- e. Construction materials will be stored at least 10m from the bed of the stream bed and no construction equipment or materials will be left in the watercourses overnight.

#### *Site management*

88. Construction activities will adhere to site specific constraints as outlined in the CEMP and SEMP. This will include the separation of re-fuelling areas

to ensure that materials such as hydrocarbons do not enter waterways at any time.

89. Regular inspections will be undertaken by Mighty River Power's representative to ensure that the CEMP and SEMP are being followed. This will include checks of construction material handling and erosion and sediment control measures.
90. Coordination with council officers will be appropriate when developing construction methodologies to ensure that the environmental effects are suitably avoided, remedied or mitigated, in accordance with the conditions of consent.
91. It is my opinion that the approach proposed by Mighty River Power for the Turitea Wind Farm is in accordance with industry standard practice, and with the general principles previously outlined, and will meet the objectives as set out in paragraph 70.

## **WATER QUALITY MANAGEMENT**

92. The Turitea Water Supply Catchment is a critical component of the Palmerston North City water supply. Contaminants from this project are considered to present a potential (though very low) risk of adverse effects on water quality. These include:
  - a. Hydrocarbon contamination;
  - b. Sediment discharge;
  - c. Contamination from toilets and washrooms;
  - d. Cement and cement washings;
  - e. Detergents; and

- f. Rubbish and debris.

#### *Hydrocarbon Contamination*

- 93. There are various sources of contamination that may result in the discharge of some hydrocarbons to land or streams within the catchment of the storage reservoirs which form a large part of the raw water source for the Palmerston North Water Supply.
- 94. These sources include lubricant leakage from construction vehicles, and spillage of fuel during refuelling (from the mobile bowser), as a result of equipment failure or an oil leak from a transformer at the substation (which will drain outside the water supply catchment). During the operational phase additional sources might include lubricant leakage from substation equipment or wind turbines, and potentially leakage of oil from vehicles transporting operational staff around the wind farm. These risks can be minimised through regular vehicle inspections and designated parking areas.
- 95. Though there are various sources by which hydrocarbons contamination might occur, the majority of these would only result in a very small amount of hydrocarbons entering the environment.
- 96. Due to the adoption of industry standard measures such as bunding, and the measures being proposed by Mighty River Power to avoid contamination, in the unlikely event that any hydrocarbons would reach the water treatment plant, they are unlikely to be in sufficient quantity to have any effect of the operation of the plant. It would be expected that much of the material would not reach to raw water intake, and over time would naturally evaporate.
- 97. Another benefit of hydrocarbons being largely immiscible in still water, is that in the unlikely event of a significant spill, a large proportion of the

material could be cleaned up using absorbent materials or by skimming the material from the surface of the water of the reservoir.

98. Management, design, standard operating procedures and emergency response training and procedures are the best way to protect streams both inside and outside the water supply catchment from possible spillages. By managing the construction site well (as outlined below) and maintaining equipment effectively the likelihood of spills will be reduced.
99. For the operations phase the substations have been designed to ensure they have the ability to capture a spill. Stormwater from the bunded areas at the substations is to be treated using a plate separator to ensure the water is clean prior to discharge to land. Any contaminated stormwater that did discharge from the substations would not enter the water supply reservoir.
100. Standard operating procedures will outline the correct manner in which potentially contaminating activities should take place. This includes activities such as refuelling, which will take place outside the water supply catchment wherever possible. This should take place a minimum of 50-metres away from any streams or water bodies.
101. Emergency planning and emergency response will also be important. By planning for an emergency and training staff how to act appropriately to protect themselves and the environment in the event of a spill, a spill which would have otherwise found its way into waterways can be effectively contained.
102. Planning should also mean that spill kits are appropriately stocked, and placed at the areas where they are most likely to be required (including at refuelling sites). Adopting such procedures should also mean that downstream effects can be avoided by effective communication.

103. Therefore, the effect of potential hydrocarbon contamination on the water supply catchment or other receiving streams will be minimised through planning and management techniques to be employed that will render any such event very unlikely. In the unlikely event that a spill occurs in sufficient quantities to be observed at the dam, there is little chance of the contaminant entering the raw water stream as it is likely to remain on the surface of the reservoir from where it can be recovered.
104. It is considered that the highest risk to water quality associated with hydrocarbons with this project will be to the immediate aquatic receiving environment of the adjacent streams both inside and outside the water supply catchment due to lower levels of dilution and the sensitivity of the aquatic environment. However, where the proposed planning and management techniques are implemented effectively for handling of hydrocarbons, the risks to the aquatic environment will be no greater than for any similar scale construction project throughout the country.

#### *Sediment Contamination*

105. One potential adverse environmental effect during the construction period is an increase in sediment entering watercourses. This would be caused by runoff from areas cleared of vegetation, disturbed slopes and fill areas. Sediment may also be generated by windblown dust and losses from earthwork areas. During the operational period sediment discharges could be caused by stormwater runoff from landslides or other erosion that has been caused or exacerbated by the project works.
106. The most likely adverse effect from the discharge of sediment to waterways is the potential for sediment to deposit in the waterways and smother aquatic habitat. There is also the possibility that it could deposit in the lake and reduce reservoir capacity, or could carry through to the water supply intake and affect the treatment plant.

107. The risk of sediment generation and deposition is generally limited to the construction period and the effects would be mitigated and managed through the erosion and sediment control measures discussed in the previous section of my evidence. Thus under normal operation, the water leaving the sediment ponds will have been treated to remove sediment, and any sediment incidentally reaching waterways will likely remain in suspension until it reaches the reservoirs.
108. Due to the slow velocity and long retention time in the reservoirs, sediment that did not settle in the treatment ponds, or when discharged to land, might subsequently settle in the reservoir. However, a very large quantity of sediment would be required to be deposited in the reservoirs in order to have any more than a minor effect on the water supply for Palmerston North. Even in the event of a major sediment discharge due to the failure of a control device, it is extremely unlikely that this would have an adverse effect on the storage capacity of the reservoirs.
109. There is a possibility of suspended sediment colouring the reservoir water, and for the finer fractions to carry through to the treatment plant. Given the soil types, the proposed mitigation, and the significant volume of the reservoirs, any sediment entering the reservoirs would be more likely to settle out in the reservoir than to reach the water intake.
110. Provided the risks due to sediment discharge are minimised and effectively managed, it is considered that the risk to the water supply catchment is very low.

*Sanitary wastewater disposal*

111. Where toilet or washroom facilities are placed within the water supply catchment, they could potentially provide another potential source of contamination. Contamination might occur during the construction phase due to leakage of temporary toilets on the site, or spillage from the sewage

tanks when transporting the waste from the site for disposal. Wherever possible, temporary toilets will be placed outside the water supply catchment, but there will be places where this is not practicable.

112. During the operational phase substation sanitary wastewater is the only identified source of potential contamination, and this will not reach the water supply catchment as it will be treated in a septic tank and disposed in a soakage field outside the water supply catchment.
113. In the unlikely event that contamination of this type did occur (due to some unforeseen failure of the measures put in place to avoid it), it is possible this could result in bacterial contamination reaching the Palmerston North water supply reservoirs and potentially (though unlikely) there could be adverse effects on the aquatic environment. Nevertheless, the risk of contamination is very low.
114. Potential contamination from this source will be significantly diluted by the time it reaches the treatment plant. In addition the treatment plant uses chlorine to dose the water supply thereby killing any remaining bacteria. Therefore the potential for an adverse effect on the water supply is extremely low.

*Cement and cement washings discharge*

115. Cement equipment washings and debris forms another potential source of contamination within the water supply catchment, and also for other streams.
116. Cement and cement washing have a very high pH due to the high lime content of cement. The aquatic environment is very sensitive to changes in pH, and as such cement contamination would likely result in adverse effects to the aquatic environment.

117. The management of concrete is very important for the health of the aquatic environment, especially during in-stream works, such as culvert construction. Pre-cast culverts or headwalls will be used where possible. While primarily proposed to minimise the time required for works in the watercourse, this technique also has the added benefit that only minimal amounts of in-situ concrete would be used for the construction of culverts.
118. The batching plants are designed to retain any process waste containing cement and settle out the solids and recycle the water for further use on site. Water drained from working areas around the concrete batching plant will also be captured and stored in sediment catchment ponds. In the event of the capacity of these ponds being exceeded during a rainfall event, then water would discharge from the site. However, this water would have had most solids settled out in the pond before discharge. Further, because the site stormwater discharge will be directed outside the water supply catchment, the risk of discharge of cement-laden water from the sites to the reservoirs is avoided.
119. In order for cement or cement washing contamination to have an adverse effect on the treatment plant, a very large quantity of concrete or cement from a construction site would need to enter the storage reservoirs, and then carry through to the treatment plant. Even then, settlement of particulates and dilution of suspended and dissolved components in the reservoir would mean that the net quality of the water reaching the plant was unlikely to have an adverse effect.
120. The raw water influent to the plant has inline monitoring for pH and in the very unlikely event a large cement contamination event occurred, this would be detected. This would decrease the likelihood of the event passing through the treatment plant unnoticed.
121. This risk of this type of contamination will be managed through the CEMP which will state that all concrete washings must be performed in the

designated washdown area, which is to be situated outside the water supply catchment. The CEMP will provide guidance on the appropriate disposal of any remaining concrete within the works area in a way that does not result in runoff of cement from the site and reaching either the water supply system or other receiving water bodies.

*Detergents from equipment washing*

122. The risk of contamination of watercourses due to detergents used for the washing of equipment, structures or other facilities is a potential risk associated with the construction and operation of Turitea Wind Farm.
123. It is considered that at no stage of the project will there be sufficient quantities of detergents on site to cause any effect on the water supply catchment or on other receiving streams. This is due to the very small quantities of detergents required, the generally long flow paths to the streams and reservoirs, and the dilution provided in the water reservoir. Detergents do have the potential to have adverse effects on the aquatic environment, and the risk of detergents entering other waterways will be minimised as far as practicable. This will predominantly be managed through designated washdown areas as will be shown in the CEMP, all of which will be situated outside the water supply catchment.

*Debris and rubbish*

124. Other potential sources of contamination include debris and rubbish entering the waterways and increased nutrients and biological oxygen demand (BOD) from plant decay and rubbish.
125. Contamination due to debris and rubbish is not considered significant to the water catchment and can be managed with good on site housekeeping and transparent roles and responsibilities. Construction waste will be the responsibility of the contractor.

126. All construction waste will be collected and removed from site, and disposed of at an appropriate licensed facility. Recycling and general waste bins will be located around the site, in particular at any lunch areas. Large bins will be provided by individual contractors. The bins will have lids and be emptied on a regular basis. The bins will be the only area on site where waste may be placed.
127. Contractors will be required to avoid litter or debris being blown by wind from vehicles or site portacomms. The dropping of litter on site will not be permitted. All contractors and sub-contractors will be made aware of this requirement.
128. The potential for contamination due to nutrients and increased biological oxygen demand is of note as the site had a blue-green algal bloom in February 2006. However, the activities related to the construction and operation of the Turitea Wind Farm are unlikely to cause a significant increase in nutrients or BOD. Within the catchment as it presently stands, there are large areas of bush, and a smaller area of farmland which contribute to the nutrient input and biological oxygen demand of the waterways within the catchment. It is my opinion that the Turitea Wind Farm construction and operation will not significantly alter these parameters either inside or outside the water supply catchment.
129. In the event that such effects did occur, the WQMP provides a methodology by which any such changes in water quality can be identified, understood and addressed.

*Summary regarding water quality management*

130. Any risks to the water supply catchment need to be avoided, remedied and mitigated where possible. It is my opinion that the systems proposed by Mighty River Power will achieve an acceptable level of protection to the

water supply catchment, such that the water supply to Palmerston North City is not adversely affected.

131. Further, it is my opinion that the risk of contaminants reaching other aquatic receiving environments sufficient to have any more than a minor adverse effect is very low.

## **COMMENT ON SUBMISSIONS**

132. A large number of submissions have been made in relation to the construction of the Turitea Wind Farm. I will be addressing the matters raised in relation to water quality and sediment related issues within these submissions.

133. A number of people made general submissions raising concerns about the Palmerston North Water Supply and the location of the wind farm within the water supply catchment. A number of people also made general submissions regarding sediment and erosion related effects associated with the construction of the wind farm. The information I have outlined above regarding the various management plans aims to address these concerns and provide an acceptable level of protection to the environment.

134. Where specific concerns have been raised I have attempted to address these concerns in turn. Due to the number of submissions, I have attempted to group submissions in to areas of common concern.

### *Water Supply Related Issues*

135. The following issues were raised relating to the effects the project might have on the quality of water supplied to Palmerston North and the potential effects the project may have on the plant treating the water supply:
- a. Capacity of reservoirs affected by sediment accumulation;

- b. Concerned that foot traffic, trucks, builders, concrete workers, diesel spills, and waste will reduce the quality of water in the reserve;
  - c. Storage of diesel in water supply catchment;
  - d. Turbines always require servicing and can leak oils/metals – contamination of water supply;
  - e. Even with good intentions things can go wrong. The risk to the water supply is not worth it; and
  - f. Mighty River Power has agreement to pay PNCC compensation in the event of any adverse effect on water quality. This is not an acceptable management approach.
136. Some of the concerns raised have been addressed previously in my evidence, although I will summarise the conclusions in relation to the submissions raised.
137. The generation of sediment within the water supply catchment will result in some sediment reaching the storage reservoirs. However, it is my opinion that provided the sediment and erosion control methods and management procedures outlined are followed, the quantity of sediment that reaches the reservoir will have a less than minor effect on the storage capacity and will not adversely affect the Palmerston North water supply.
138. It is accepted that the construction of a wind farm within the water supply catchment will result in increased risk of contamination to the water supply catchment. However, it should also be noted that the risks are very low and the likelihood of the water supply reservoirs becoming contaminated is also very low. The risks are well understood and the proposed management techniques and plans are aligned to standard industry practice and are robust. I consider that the implementation of these

management techniques and plans will provide a good level of protection for the Palmerston North Water Supply.

139. In reference to the concern regarding diesel storage inside the water supply catchment, it is reiterated that this will not occur. Diesel is to be stored outside the water supply catchment and will be appropriately bunded. A smaller mobile bowser will be available for the refuelling of equipment on site (when moving equipment outside the catchment for refuelling is not practical). Refuelling will take place at least 50 metres from streams or water bodies. Procedures relating to the refuelling of equipment will be outlined in the CEMP.
140. I agree with the submitter who noted that even with good intentions, things can go wrong. However, with good contingency planning and training procedures, should a contamination event occur, it can be managed effectively to provide adequate protection of the aquatic receiving environment, including for the water supply.
141. PNCC has an agreement with Mighty River Power which allows compensation to be paid to PNCC should the activities associated with the construction or operation of the wind farm result in an adverse water quality effects. Under this agreement, PNCC can recover the costs it incurs. This is not a management approach to water quality, but rather a prudent approach on the part of PNCC. It in no way reflects any less of a requirement on Mighty River Power to carry out the works and the operation in accordance with the consents and standard industry practice, to avoid adverse effects.

*Sediment and erosion effects*

142. A number of submissions were also made in relation to the effects of sediment and erosion resulting from the project, these include:

- a. The pollution of waterways due to sediment discharge;
  - b. Erosion during heavy rainfall events;
  - c. Sediment discharge to water supply and potential human health effects;
  - d. Sediment discharge might affect trout spawning habitat;
  - e. Turbine sites 076, 077, 078 and 083 and associated earthworks are within 1.5 km of the waters reservoirs;
  - f. High rainfall in the region needed to be taken into consideration; and
  - g. Increased rainfall and global climate change effects on sediment and erosion control.
143. The various methods proposed for general environmental management and for erosion and sediment control are in line with standard industry practice. The rainfall and the geology of the region have also been taken into consideration when determining if the Greater Wellington Region Guidelines are appropriate for the project.
144. It is my opinion that the proposed controls are appropriate for protecting the receiving environments, including the water supply reservoir. It is expected that there will be a minimal amount of sediment discharged to the reservoir.
145. In relation to potential health effects due to sediment in the raw water supply, I do not consider this to be an issue. Where there is sediment in the site runoff (as inevitably there will be), most of that sediment will settle in the reservoir, and the treatment plant will still be in operation, effectively treating any residual sediment in the supply. There would be no decrease

in the quality of potable water supply to Palmerston North. This matter is also discussed further in the evidence of Dr Black.

146. Heavy rainfall and the effect of heavy rainfall had been highlighted by a few submitters as a concern. Heavy rainfall does cause elevated erosion due to the increased impact on the soils surface. While the Turitea area does have heavy rainfall, so do many other areas where large scale earthworks are undertaken. The management practices that will be used are designed to address the risk of heavy rainfall. The proposed controls will provide a good level of protection, although sediment discharge will still occur during heavy rainfall events.
147. It is not just earthworked areas that result in higher sediment loads during heavy rainfall events. Runoff associated with non-earthworked areas will also experience a higher sediment load during such events. It is my experience that, after reasonable mixing and assuming control devices are operational, the sediment load in streams during these events should not lead to downstream effects that are more than minor.

#### *Other Effects*

148. One submitter has raised concern about flooding. The project will result in gravelled surfaces during construction of up to 3% of the overall plan area circumscribed by the wind farm, and following revegetation less than 1.5% would remain gravelled during the operational period. There is minimal roof area. Therefore the additional runoff volumes that the site will generate will be minimal, and will not alter flood risk downstream. Any stream crossings will be designed in accordance with Horizons' guidelines, to avoid the risk of localised flooding. The site is predominantly on ridge lines, and of itself will not be susceptible to flooding.
149. One submitter has also raised a concern related to the project degrading nature's ability to absorb heavy rain. Another submitter requests a

geological/ hydrological assessment of soakage areas and origins of streams that feed the Manawatu River. I do not consider such further studies to be necessary.

150. Pervious surfaces have a natural ability to absorb some of the runoff during rainfall events, while impervious surfaces reduce infiltration. Due to the large size of the catchment overall, and the minor impervious surface area associated with the project, it is my opinion that the increase in impervious area will only have a minor affect the ability of the ground to absorb water, and only at a very local level.
151. Other submissions relate to the view that the proposed activity is not compatible with the water supply catchment and concern at public access to the reserve where this was not permitted previously. I disagree. Public access and roads within water supply catchments and upstream of municipal water supply intakes on rivers and streams are quite common, and it is my view, that when in operation, the wind farm will be compatible with the other uses of the Reserve. I also note that public access to this reserve is currently permitted (subject to obtaining an appropriate permit from PNCC).
152. After the change in the status of the Reserve, renewable energy generation, water supply and protection of flora and fauna were outlined as the three functions of the reserve. One submitter is concerned that the effects of one of these functions should not have adverse effects on the other functions of the reserve. The effects of the proposal and proposed mitigation on flora and fauna are discussed in particular in the evidence of Mr Shaw, Professor Craig and Dr Coffey. I have previously outlined the proposed mitigation actions to prevent adverse effects on the water supply. The effects of the construction of the wind farm are mostly short term and I would not expect them to have a significant effect on the other functions of the reserve in the longer term.

153. A submitter has expressed concern that increased risk of fire in the catchment might lead to use of fire fighting foam and chemicals that have "no place in our water supply". In the event of fire Mighty River Power would be guided by the relevant fire authorities as to the best course of action.

## **PROPOSED CONSENT CONDITIONS**

154. I have had input to the preparation by Mighty River Power of a set of proposed consent conditions. The key element in achieving good environmental outcomes is to provide robust mechanisms for installation of appropriate management procedures and devices, with regular monitoring, reporting and remedial measures. These must be applied seamlessly through from the consent holder to the day-to-day actions of the construction contractor. They must be flexible enough to be able to respond to changing circumstances throughout the project construction period.
155. The conditions have been drafted to require a hierarchy of management plans, with the CEMP and SEMP in particular, that allow the details of the environmental management to be developed and reviewed as appropriate, but with the ability of the consent authority to participate in that process.
156. In my opinion this approach is more appropriate than setting very detailed conditions that specify how all facets of the work should be undertaken, and is more likely to result in a good environmental outcome.
157. I consider that the draft conditions provide suitable basis for the project to proceed in relation to effects of the water environment.

## **CONCLUSION**

158. The environmental management and sediment and erosion techniques I have outlined will provide a robust programme to provide good

environmental outcomes. I consider the systems I have outlined are in line with accepted industry practice.

159. The proposed systems include the following:
- a. Earthworks are to be carried out in accordance with the CEMP, supported by the SEMP and ESCPs.
  - b. Earthworks are to be staged, and separated into small defined areas which will be identified as part of the detailed design phase. The details for each stage will be incorporated into the SEMP and associated ESCP.
  - c. The SEMPs will be produced in a process led by Mighty River Power in accordance with the CEMP.
  - d. The CEMP will be finalised and the SEMPs written in the detailed design phase.
  - e. ESCPs will be produced in accordance with the standards outlined in the Guidelines. These guidelines have been agreed by Horizons as being acceptable with respect to the Turitea Wind Farm and I consider them appropriate for the project area.
  - f. The CEMP, and all SEMPs and ESCPs will be submitted to Horizons and PNCC to demonstrate compliance with the relevant standards.
  - g. The CEMP will be updated to incorporate any relevant conditions imposed on the grant of consent, and provide a mechanism for these conditions to be employed in the field.
160. Construction effects of the Turitea Wind Farm will be minimised as much as practicable and managed using a robust system. Sediment generation will be minimised and will be of relatively short duration.

161. Long term effects of the operation of the project on the water environment will be minor.
162. Under both the construction phase and the operational phase, the effects on the Palmerston North Water Supply will be less than minor.

**Graham John Levy, 27 April 2009**

## **APPENDICES**

- A Drawing 0848RK233. Water Catchment Plan.

**APPENDIX A – Drawing 0848RK233**