BEFORE THE ENVIRONMENT COURT
AT CHRISTCHURCH

ENV-2010-CHC-115, 123, 124 AND 135

IN THE MATTER	**of Appeals pursuant to Section 120 of the Resource Management Act 1991**
BETWEEN	**WEST COAST ENT INC** **Appellant**
AND	**ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INC** **Appellant**
AND	**WHITE WATER NEW ZEALAND INC** **Appellant**
AND	**DIRECTOR GENERAL OF CONSERVATION** **Appellant**
AND	**WEST COAST REGIONAL COUNCIL AND BULLER DISTRICT COUNCIL** **Respondents**

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STATEMENT OF EVIDENCE OF
ASTRID CORA VAN MEEUWEN-DIJKGRAAF
FOR DIRECTOR-GENERAL OF CONSERVATION
Dated: 14 May 2012

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AND	**MERIDIAN ENERGY LIMITED** **Applicant**
AND	**FRIDA INTA** **Section 274 Party**
AND	**WHANAU PIHAWAI WEST – RICHARD WAYNE BARBER AND IRI MAY BARBER MILNER** **Section 274 Party**
AND	**J MacTAGGART** **Section 274 Party**
AND	**ORION ENERGY NZ LTD, ALPINE ENERGY LTD, MAIN POWER NZ LTD AND ELECTRICITY ASHBURTON LTD** **Section 274 Party**
AND	**NZ RAFTING INC** **Section 274 Party**
AND	**ANN SHERIDAN** **Section 274 Party**
AND	**BULLER ELECTRICITY** **Section 274 Party**

TABLE OF CONTENTS

1. QUALIFICATIONS AND EXPERIENCE

1.1. My full name is Astrid Cora van Meeuwen-Dijkgraaf.

1.2. I am a Senior Ecologist with Wildland Consultants Ltd, a position I have held since 2007, based in Wellington. Prior to that I was employed as National Services Manager with the Queen Elizabeth II National Trust, with previous experience as a Conservancy Advisory Scientist and Ecologist with the Department of Conservation in Wanganui. I have been employed in the ecological field since 1998.

1.3. I hold the degrees of Bachelor of Science, Master of Science with Honours (Environmental Science and Botany), and a Doctor of Philosophy (Ecology, plant animal interaction) from the University of Auckland.

1.4. I have considerable experience in New Zealand forest ecology which I studied during both my Masters degree and Doctoral research. I have undertaken extensive field work throughout the North Island and parts of the South Island. I have produced numerous reports on ecological aspects whilst working for the Department of Conservation and Wildland Consultants Ltd. Clients have included private individuals and organisations and various government agencies in both the North and South Islands. I have also presented aspects of my research at national and international scientific conferences and other forums.

1.5. Memberships include the New Zealand Ornithological Society, the New Zealand Ecological Society, and the New Zealand Plant Conservation Network.

1.6. Through Wildland Consultants Ltd, I am seconded to the Department of Conservation for the equivalent of two days per week as their technical advisor on the Biodiversity Offset Programme. This programme is led by the Department in conjunction with other government organisations. In this capacity I am developing a best practice guideline (known as the Technical Support Tool) for biodiversity offsetting (more detail provided in Paragraphs 4.1 to 4.3) that includes a desktop estimator tool. In this role I also peer-review reports produced for the programme.

1.7. I have also worked on, or collaborated with, a number of projects that deal with assessing the appropriateness of biodiversity offsetting, or with developing a suitable biodiversity offset package. This includes Castle Hill Wind Farm, a privately owned Northland wetland system, and the Kapiti Coast water supply project.

1.8. I have read the Environment Court's Code of Conduct for Expert Witnesses, and agree to comply with it. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

1.9. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed. I have specified where my opinion is based on limited or partial information and identified any assumptions I have made in forming my opinions.

1.10. I have not visited the site.

1.11. In writing this evidence I have considered the evidence in chief of Mr William Shaw (dated 2012), Dr Kelvin Lloyd

(dated 2012), Dr Bill Langford (dated 2012), Dr John Leathwick (dated 2012), Dr Colin O'Donnell (dated 2012), Dr Russell Death (dated 2011), Mr Farrell (dated 2012) and Ms Kath Walker (dated 2012) for the Department of Conservation. I have also considered the following evidence in chief for the Applicant:

- Dr David Norton, dated 30 September 2011.
- Dr Graham Ussher, dated 30 September 2011.
- Mr Charlie Watts, dated 29 September 2011.
- Dr Nick Eldred, dated 22 September 2011.
- Mr Ned Norton, dated 27 September 2011.
- Dr Suren, dated 28 September 2011.
- Dr Lee, dated 16 September 2011.
- Terrestrial Ecology Management Plan (TEMP) attached to Mr Overmars' evidence.
- Biodiverity Enhancement Strategy (BES) attached to Dr Parkes' evidence.
- Aquatic Ecology Management Plan (AEMP) attached to Dr James' evidence.

2. SCOPE OF EVIDENCE

2.1. My evidence addresses the following:

- An explanation of what constitutes biodiversity offsetting, including New Zealand interpretations and working definitions of the key principles promoted internationally;

- A broad examination of the offset approach used by Mokihinui Hydro Project (MHP) and whether this approach adheres to best practice biodiversity offsetting, as outlined by the ten principles of the Business Biodiversity Offset Program (BBOP), or the best practice guidance being developed in the Biodiversity Offset Project, funded by the Cross Departmental Research Programme led by the Department of Conservation (hereafter referred to as CDRP BOP).

- The offsetting approach applied to MHP, including whether the biodiversity offset accounting model used was appropriate and transparent;

- Whether the potential loss of biodiversity values from the proposed MHP project can be adequately offset at the offset sites to result in no net loss of biodiversity values.

3. KEY FACTS AND OPINIONS

3.1. The methodology and the model used to develop the MHP biodiversity offset was assessed against the ten Business Biodiversity Offset Program (BBOP) principles (interpreted in a New Zealand context) and in my opinion the MHP proposed offset **does not achieve any** of the principles. Therefore this cannot be considered to be a no net loss, like-for-like biodiversity offset. At best, the proposed offset is **partial compensation** for some values lost.

3.2. Under the developing New Zealand biodiversity offset best practice guidance, this location should have been avoided altogether, given the number of exceptionally high value,

very high value, and high value components that occur within the MHP impact area **and** that will be adversely affected. As well as high value biodiversity components, the Mokihinui River and its associated catchment is one of the few relatively unmodified large catchments in New Zealand and has been identified as being required to protect a representative suite of ecosystems within New Zealand (evidence of Dr Leathwick).

3.3. The MHP biodiversity offset model does not adequately capture key biodiversity components that are severely impacted by the MHP; that is, those biodiversity features that we care about and wish to retain, such as coal measures vegetation, aquatic ecosystems, riparian vegetation, and the connections between and diversity of ecosystem types (evidence of Mr Shaw, Dr Leathwick, and Dr K. Lloyd). Moreover, the forest classification used to design the offset does not adequately address ecological comparison between the impact site and the offset site; and the impact site has components of high value that do not occur, and will not occur, at the offset site (evidence of Dr K. Lloyd, Dr O'Donnell, Dr Ussher). The Waimangaroa Bush element of the proposed offset is also a different ecosystem type, and the applicant has not demonstrated additionality for this component.

3.4. Given the significant differences in biodiversity features and values between the two sites, a like-for-like biodiversity offset accounting model, as used by the applicant, is not appropriate. A like-for-like approach requires each adverse effect to be explicitly identified and then addressed with a specific mitigation activity, which has not been done.

3.5. Some biodiversity features, considered to be ecologically valuable, are shown to decline or be lost without replacement and this is considered acceptable by Dr Ussher and Dr Norton because they will not become extinct on a national or global basis. The BBOP handbook (2009) states "*biodiversity offsets may be an inappropriate approach for a species or ecological community that is currently or has already undergone a significant decline, as the risk that the offset will fail could be too high*". Moreover loss or decline of these features indicates that the proposed biodiversity offset **cannot achieve no net loss** in a like-for-like offset.

3.6. The mathematical calculations used in the MHP offset model are unrealistic and do not reflect ecological processes. No evidence or justification for the various growth models are provided and the model lacks computational transparency (also shown in Dr Langford's evidence).

3.7. Just because the offset area is sizable (35,000 ha) does not mean that it adequately captures or replaces the values that will be impacted by the MHP. The sizable area is referred to as 'trading up' by the applicant, whereas in BBOP literature 'trading up' generally refers to biodiversity of **higher** conservation value, and warns against exchanging a large area of lower condition for impacts on a smaller area of excellent ecological condition. My view is that 'trading up' has not been demonstrated for MHP.

4. BACKGROUND INFORMATION

Cross-Departmental Research Programme (CDRP) on Biodiversity Offsetting

4.1. A Policy Guidance and Technical Support Tool are currently being developed by the Department of Conservation based on findings from a three-year Cross Departmental Research Programme (CDRP) on Biodiversity Offsetting (hereafter referred to as the CDRP BOP). This programme is led by the Department of Conservation, in collaboration with the Ministry for the Environment, other government departments, ecologists, technical experts, extractive industries, developers and environmental stakeholders. My role is to develop the Technical Support Tool.

4.2. The CDRP BOP aligns with the work of the international Business and Biodiversity Offsets Programme (BBOP), a global collaboration of scientists, policy makers, industry and non-governmental organisations (including representatives from the Department of Conservation, extractive industries, and environmental consultancies). The BBOP provides principles, guidelines, and working documents on which to draw when considering, designing and implementing biodiversity offsets.

4.3. Much of the focus of the CDRP BOP programme has been on developing a New Zealand-specific framework that is appropriate to our needs but is also consistent with emerging global best practice such as BBOP. The Technical Support Tool (and the Policy guidance) will not be a statutory document under New Zealand legislation. However, it is hoped that it will become widely adopted as

a reference document for developing and assessing biodiversity offsets against current best practice and be used by decision-makers and developers.

Definitions of Terms

4.4. As part of the CDRP BOP we are proposing the use of standardised terms to describe biodiversity elements that are compared and possibly traded in any biodiversity offset exchange. The following terms will be used throughout this evidence and these terms are broadly consistent with the terms used by Dr Ussher.

4.5. **Biodiversity types** are the key biodiversity features found at a site. These are the 'must have' items that every biodiversity offsetting approach should include (if present at the site). Biodiversity types generally include vegetation communities (e.g. forest types), Threatened and At Risk species[1], and other valued ecological features.

4.6. **Biodiversity components** are the structural and functional components that describe the vegetation or habitat community, or in the case of an iconic species, model the important aspects of the life-cycle or population model. Key components are the dominant or high value species that occur at the site, ensuring that the entire range of ecosystems and habitats is represented, and being able to demonstrate the species composition within those ecosystems. Components can include vegetation tiers (e.g. ground, understorey, canopy, epiphyte, climber), groups of indigenous species (e.g. vertebrate, invertebrate, bird, bat, lizard), or functional roles (e.g. insectivore, nectivore, frugivore). Threatened species are generally

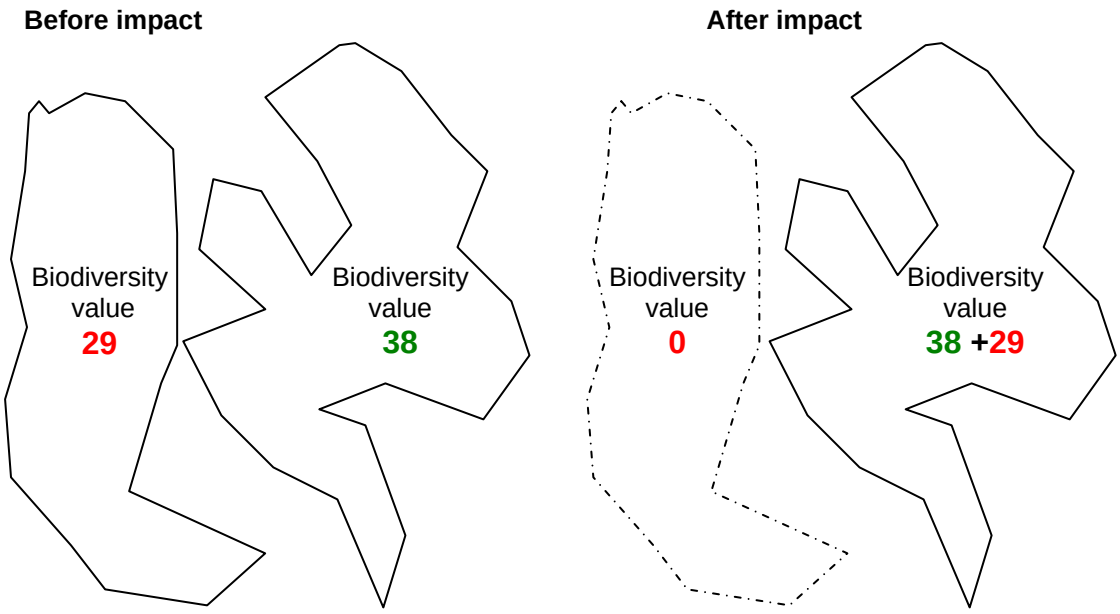
[1] As a category rather than listing of individual species.

listed as separate components within the offsetting approach.

4.7. **Biodiversity attributes** are the elements of biodiversity that have their condition measured or estimated, and are represented as individual lines in an accounting model. There is no limit to the number of attributes that can be used to gauge the condition of a component, but the attributes chosen should be sufficient to 'capture what you care about'. They must also be at the same level of biological organisation; that is, you can't have individual species and ecosystems listed as separate attributes (line items) in the same accounting model.

What is Biodiversity Offsetting?

4.8. Biodiversity offsets have been defined internationally as "... measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development **after** appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve **no net loss** and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function and people's use and cultural values associated with biodiversity". (BBOP glossary http://www.forest-trends.org/documents/files/doc_3117.pdf) [**my emphasis in bold**]. Put simply, to achieve no net loss, loss of biodiversity at a site has to be replaced somewhere else.



4.9. In order to demonstrate that a biodiversity offset is possible, and that it can achieve no net loss (or better), it is necessary to;

- Identify the values within the site, and the surrounding areas[2], that will (or could) be affected by the proposed development.
- Quantify (or estimate) the residual adverse effects[3] on these values.
- Identify within-site[4] or off-site areas that have similar biodiversity types **and** where the values of

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[2] Surrounding areas need to be included to address potential cumulative effects. For instance removal of an important overwintering location for seasonally migratory species will have effects well beyond the development site boundaries.

[3] After demonstrating suitable avoidance, minimisation and remediation of these values.

[4] Site is used as development site. Often not all areas within a development site are impacted by the actual development, thus there may be scope for biodiversity management and enhancement within the site.

these types are threatened[5] by something other than the proposed development **and** where the values can be improved by management[6].

- Quantify (or estimate) the gain of biodiversity achieved through management at the offset site **and** determine whether this will be similar (no net loss) or greater than what will be lost at the impact (development) site.

- Implement ongoing management **and** monitoring of biodiversity outcomes to ensure that no net loss of biodiversity is achieved within and over the timeframes specified.

4.10. Biodiversity offsets also need to address the length of time over which biodiversity is lost or gained. A biodiversity loss in the short term may require a greater management input, or higher offset threshold, to ensure the loss won't become permanent. The time factor may be the length of time for which a resource consent is granted, but it could potentially be in perpetuity depending, to a large extent, on whether the impacts are permanent or temporary.

4.11. Biodiversity is complex to measure and quantify, and subject to considerable variability (e.g. seasonal, climatic changes, environmental impacts such as storms, droughts, and fire). This makes it difficult to accurately estimate and

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[5] If the values are not threatened or degraded then there is no (or limited) opportunity to improve the values.

[6] If there are no known techniques to manage the identified values then it will not be possible to improve these biodiversity values. If management techniques are untried, or experimental, then the amount of biodiversity improvement gained needs to be conservatively assessed (i.e. underestimated) to take account of delivery risks and the uncertainty of outcomes.

compare biodiversity values, and to predict how these values might change over time, with or without management. As Dr Langford notes in his evidence, each variable that is measured will be associated with some degree of error, and these errors are often multiplied when combined in a model. Thus there is a great deal of uncertainty in any biodiversity model, including biodiversity offset models. The only ways we currently have to deal with this are to attempt to quantify the degree of error (uncertainty) for a particular model, to be very conservative in our assessments and projections, and to gain agreement from stakeholders that the parameters and the model(s) used are sensible.

4.12. Currently there is a preference, by BBOP and CDRP BOP, for "like-for-like" (in-kind) offsetting rather than a “like-for-unlike” (out-of-kind). For example, clearance of indigenous forest should, preferably, be mitigated by the re-creation or enhancement of indigenous forest (with a similar suite of ecosystem types and species, both plant and animal), rather than creation, or enhancement, of a wetland or a dune. This is partly because it is not possible to compare values of unlike systems in a meaningful manner and, fundamentally, it is an attempt to achieve no net loss of the feature(s) being damaged or lost. Restoration of a wetland will not compensate for loss of a lowland forest or a dune system (all ecosystem types are nationally much reduced). Increased numbers of kiwi will not compensate for the loss of indigenous fish such as kōkopu.

4.13. If the offsetting proposed is like-for-unlike then the values within the offset site need to be demonstrably greater[7] than those lost at the impact site **and** they need to be able to be managed so that the values can be further improved to an extent that exceeds the losses of values caused by the impacts of development. This type of exchange is referred to as 'trading up', but there currently are no accounting models, or exchange rules, or logical basis, to enable this to be quantified in New Zealand.

4.14. The main difference between biodiversity offset accounting models and other types of mitigation is that biodiversity offsetting tries to **better quantify** gains and losses in biodiversity **and** that adverse effects on biodiversity will be effectively cancelled out by beneficial effects on biodiversity elsewhere, to ensure that there **is no overall net loss in biodiversity**.

4.15. Several relevant features of biodiversity offsets were recently summarised in the explanatory commentary for Policy 4.2.33A of the Regional Freshwater Plan for the Wellington Region. This new policy was included after a Board of Inquiry review. This policy was proposed to enable consideration of the Transmission Gully proposal on its merits, rather than immediately failing to pass through policy gateway tests; the revised policy includes explanatory information that may be helpful to understanding biodiversity offsetting.

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[7] In the BBOP literature there is generally a consistent theme that like-for-unlike exchanges requires 'trading up' to higher biodiversity features or values.

Greater Wellington Regional Council Fresh Water Plan

[4.2.33A To manage adverse effects of the development of the Transmission Gully Project, in accordance with the following management regime:

(1) Adverse effects are avoided to the extent practicable;

(2) Adverse effects which cannot be avoided are remedied or mitigated.

> ***Explanation**: This policy recognises that the Transmission Gully Project is identified in various statutory and policy documents as having both national and regional significance. In achieving the sustainable management objectives of the Act, resource managers and decision makers have the option of applying avoidance, remediation and mitigation in managing adverse effects. Accordingly, the adverse effects of aspects of the Project may be acceptable, even though they cannot be completely avoided, remedied, or mitigated.*
>
> *Remedying or mitigating can include the concept of offsetting. "Offsetting" means the provision of a positive effect in one location to offset adverse effects of the same or similar type caused by the Transmission Gully Project at another location with the result that the overall adverse effects on the values of the waterbodies are remedied or mitigated.*
>
> *Where offsetting is to be applied, there should be a clear connection with the effect and the offsetting measure. The offsetting measure should preferably be applied as close as possible to the site incurring the effects. Hence, there should be a focus on offsetting occurring within the affected catchments along the Transmission Gully route and to specifically address the effects at issue.*

Offsetting should, as far as can be achieved maintain and enhance the particular natural values affected by the Project when assessed overall.

The adequacy of a proposed offsetting measure should be transparent in that it is assessed against a recognised methodology.

Biodiversity Offset Principles

4.16. Ten principles of biodiversity offsetting have been developed collaboratively by BBOP, and are supported by the CDRP BOP. A set of criteria and indicators that relate to each of these principles have been produced by the BBOP as guidance for best practice biodiversity offset development (provided in full in Appendix 1). The principles, criteria and indicators, together, establish a framework for designing and implementing biodiversity offsets, and verification of their success.

4.17. Proposals that do not adhere to all of the principles should not be considered to be a biodiversity offset.

4.18. As well as these ten principles, biodiversity offsets should be designed to comply with all relevant national and international law, and planned and implemented in accordance with the Convention on Biological Diversity, and its ecosystem-based approach, as articulated in national biodiversity strategies and action plans (BBOP 2009a).

4.19. The ten principles, in order that they are likely to be encountered in a biodiversity offset procedure[8], are:

[8] This order does not relate to the relative importance of the various principles.

4.20. **Principle 1:** *Adherence to the mitigation hierarchy*: A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.

4.21. **Principle 2:** *Limits to what can be offset*: There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.

4.22. **Principle 3:** *Landscape context*: A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.

4.23. **Principle 4:** *No net loss*: A biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.

4.24. **Principle 5:** *Additional conservation outcomes*: A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.

4.25. **Principle 6:** *Stakeholder participation*: In areas affected by the development project and by the biodiversity offset,

the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation, and monitoring.

4.26. **Principle 7:** *Equity*: A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a development project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.

4.27. **Principle 8:** *Long-term outcomes*: The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the development project's impacts and preferably in perpetuity.

4.28. **Principle 9:** *Transparency*: The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.

4.29. **Principle 10:** *Science and traditional knowledge*: The design and implementation of a biodiversity offset shall be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.

5. MOKIHINUI HYDROPOWER PROPOSAL

5.1. My evidence will now assess whether the Mohikinui River Hydropower (MHP) scheme has adhered to the BBOP principles, as interpreted within a New Zealand context.

Adherence to the Mitigation Strategy

5.2. In A New Zealand context, offsets are considered to be part of remediation or mitigation, in a hierarchy where avoidance and minimisation (considered to be partial avoidance) of effects should come first. I have read the statements of evidence prepared for Meridian Energy that I list in Paragraph 1.11, but found no evidence to indicate that, in terms of site selection, the intrinsic biodiversity or conservation values of the site to be affected were avoided, despite these being identified (e.g. evidence of Drs Lee, D Norton, and Suren).

5.3. The important considerations taken into account by Meridian appear to be output capacity (Mr Eldred Paragraph 3.4), the costs of constructing a transmission line (Mr Eldred Paragraph 3.5), and engineering feasibility, construction costs and legal and regulatory issues (Mr Eldred Paragraph 3.7). The Mokihinui River is said to be one of the few rivers in the region **not** subject to a water conservation order or a high conservation protection status (Mr Eldred Paragraph 3.6, and Meridian brochure 2011[9]) and Meridian appears to have used a threshold of high conservation protection status as a surrogate for conservation value and then attempted, but didn't succeed,

[9] Meridian brochure 2011 "While most rivers are protected - as they are located within a national park, ecological reserve or scenic reserve, or have Water Conservation Orders such as the Buller and Grey Rivers - the Mokihinui River is not."

in avoiding areas with high conservation protection status[10] (Mr Eldred Paragraph 3.6). This approach does not acknowledge that:

- Significant biodiversity can (and does) occur on land of any status, including private land;
- The conservation protection status of an area is not necessarily directly related to the biodiversity values actually present in a particular location;
- Most of the area to be affected is managed for conservation purposes pursuant to conservation legislation.

5.4. Using the RL105m to define the upper extent of the inundation the effects of the MHP include inundation of 375ha, with 111.5ha of river bed and 263.5ha of native vegetation; 215ha of which is part of the Lyell Range and Radiant Range Conservation Area administered by Department of Conservation, and 48.5 ha by the Buller District Council (Mr Watts Paragraph 7.11). The transmission line crosses through the Radcliffe and Ngakawau Ecological Areas (areas with high conservation protection status and which, based on the Meridian evidence, should have been **avoided**) with an additional clearance footprint of 2.8 ha (poles sites and new tracks) (Mr Watts Paragraph 7.12). A substation will be constructed at Cedar Creek but the extent of vegetation clearance required for this is not specified in Mr Watt's evidence or addressed in Dr D. Norton's or Dr Ussher's

[10] High protection status, according to Meridian, refers to land administered by the Department of Conservation (Department of Conservation) and classified as: National Park; Wilderness Area; Ecological Area; Scenic Reserve; Scientific Reserve; Recreation Reserve; Historic Reserve; and Conservation Park or Wildlife Management Areas (Mr Eldred Paragraph 6.11).

evidence (Dr K. Lloyd). In addition, the MHP will result in changes to the flow regime of the Mokihinui River downstream of the dam site, and disruption of freshwater connectivity up and down the Mokihinui River by the dam (Dr D. Norton Paragraph 5.1c).

5.5. Dr D. Norton states that impacts from the *c*.27 transmission poles in the best remaining example of sandstone erosion pavement in the Waimangaroa Recommended Area for Protection (RAP) will be 'microsited' and use appropriate technology to minimise ecological impact (Dr D. Norton Paragraph 6.20, 6.22), but he himself would prefer that this area was **avoided** completely (Dr D. Norton, Paragraph 6.21).

5.6. In terms of minimisation of effects Mr Watts (Paragraph 3.4) describes the following measures:

> "(a) Restricting the height of the dam such that the inundation area does not extend into the Mokihinui Forks Ecological Area;
>
> (b) Installation of the transmission line using helicopters to avoid the need to clear vegetation and construct assess roads; and
>
> (c) The use of tall poles through the Radcliffe and Ngakawau Ecological Areas to prevent the need to cut tall vegetation below the conductors."

5.7. Other than as described in the previous paragraph, there is little evidence that the design of the MHP scheme has attempted to minimise impacts on biodiversity values, despite Meridian's own experts attesting to the high

biodiversity values within the area potentially affected (e.g. Dr D. Norton Paragraphs 4.2-4.10; Dr Suren Paragraph 6.27).

5.8. Additionally, no mitigation has been proposed to offset changes to a range of significant biodiversity features. This includes the significant changes in river flow regime and the effects on the river biota (as described in Dr Leathwick evidence). No mitigation could be proposed to offset the loss of unusually high bryophyte cover in a small stream in Andersons Flat (Dr Suren Paragraph 6.29). Dr D Norton and Dr Ussher indicate that it will not be possible to mitigate for loss of grey duck, coal measures vegetation and, riparian zonation vegetation.

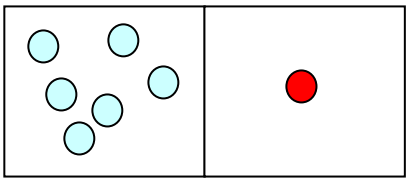
5.9. Thus, in my opinion, the MHP project has failed to adhere to BBOP Principle 1: *Adherence to the mitigation hierarchy.*

Limits to What Can be Offset

5.10. New Zealand flora and fauna has a high degree of endemism, meaning that many species are only found in New Zealand and nowhere else in the world. Also, there are some habitat and/or ecosystem types that are, or have become, uncommon or rare and cannot be recreated if lost. This means that decisions on the appropriateness of offsetting should place significant emphasis on the **irreplaceability** (unique, or needed to protect full range of conservation features) or **vulnerability** (not many/much left or already in decline, and the likelihood or imminence of destruction or alteration) of the biodiversity at that place. As the irreplaceability and vulnerability of impacted

biodiversity **increases**, effort should be increasingly focussed on avoidance, minimisation, and remediation.

5.11. **Irreplaceability** (or uniqueness) reflects the number of additional spatial options available for conservation if the biodiversity affected by the project were to be irreversibly lost. Irreplaceability of a biodiversity feature[11] can be defined in two ways: (1) the likelihood that it will be required as part of a conservation system needed to achieve a set of targets; and (2) the extent to which the options for achieving the set of targets are reduced if the feature is unavailable for conservation. Where a biodiversity feature occurs at many sites (low irreplaceability), many options exist for its conservation, whereas where if the feature is restricted to one or few sites (high irreplaceability), few options exist for its conservation elsewhere. Measures of irreplaceability must be clearly referenced to geographic scale. A feature is considered irreplaceable if conservation goals for that component cannot be achieved without it (BBOP 2009b).



[11] A feature can be a species, habitat, ecosystem, ecosystem process, or provide a resource (e.g. food, species habitat, fuel).

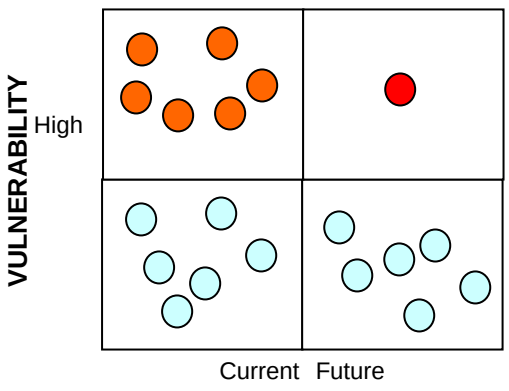
5.12. Information on **irreplaceability** should be a major factor in determining whether a biodiversity offset is inappropriate simply because high irreplaceability indicates:

(a) No other similar sites exist where an offset could occur.

(b) Failure to execute appropriate on-site avoidance action will result in a higher likelihood of extinction.

5.13. Where a project will significantly increase the **vulnerability** of particular biodiversity components (i.e. makes it more likely to become extinct or disappear should another threat appear), offsetting will not be appropriate. The more common and/or widespread a species or habitat is, the more likely it is that it can cope with some development pressures, and the more likely that biodiversity offsetting could be appropriate.

5.14. **Vulnerability** indicates risk of imminent loss and severity of loss, and so reflects irreplaceability over time. Measures of vulnerability are based on aspects that indicate risk and magnitude of impending loss. As a general rule, biodiversity features which are isolated and rare and have long generation times and low mobility are more vulnerable. The conservation significance of a component of biodiversity (be it a species, community, habitat, ecosystem or ecological process) is influenced by its vulnerability to threats (BBOP 2009b).



5.15. Vulnerability applies to a specified feature of biodiversity at any level of biological organisation (species, community, habitat, ecosystem, ecosystem process). It has a spatial frame (site, district, country, to global), a magnitude (vulnerable to extinction, prone to rapid decline leading to population collapse, already in decline, degradation) over a specified time frame (year, decade, century, etc.). Ways to quantify vulnerability that capture these dimensions across all scales are not well developed.

5.16. Species threat status is perhaps the most familiar measure of vulnerability used in New Zealand, but it can also be used for community types, habitats, or ecosystems. The threat status of New Zealand species is decided by panels of experts and they consider information about the current size of the population, the number of sub-populations (spreads risk of loss), the total area that a species occupies, past loss (of numbers and/or habitat), the number and intensity of threats, and current prospects as indicated by recent population growth or decline. Any one of these metrics could be used to measure and evaluate some aspects of vulnerability. There will be a point, however, below which a population is no longer viable, or where individuals in a population are too widely separated to be viable. At this point vulnerability is at its maximum.

5.17. One of the research papers (TBC 2011) produced by the CDRP BOP reviews international approaches to limits to offsetting, and suggests a biodiversity value threshold matrix for assessing the risk of undertaking and achieving a like-for-like no net loss biodiversity offset. This matrix is summarised in Table 1 below.

Table 1: A system for establishing biodiversity value thresholds for assessing the risk of development and associated biodiversity offsetting (modified from TBC 2011).

Vulnerability of Biodiversity Feature / Irreplaceability of Management Unit	Critically Endangered	Endangered	Vulnerable	Near Threatened/ Least Concern	Data Deficient/ Not Evaluated
Sustaining ≥ 95% of global range/population	**Extremely High Risk**	**Extremely High Risk**	**Very High Risk**	High Risk	Assign to a threat level or apply precautionary principle
Sustaining ≥ 10% of global range/population	**Extremely High Risk**	**Very High Risk**	High Risk	Medium Risk	
Sustaining ≥ 1% of global range/population	**Very High Risk**	High Risk	Medium Risk	Low Risk	
Sustaining ≥ 0.1% of global range/population	High Risk	Medium Risk	Low Risk	Low Risk	
Sustaining < 0.1% of global range/population	Medium Risk	Low Risk	Low Risk	Low Risk	

5.18. Within a New Zealand context the Risk categories above can also be equated to whether a particular component is considered to be of International, National, Regional, or Local importance. Any components considered to be of International value would be considered to have an extremely high risk of being unable to achieve a no-net-loss biodiversity offset. National value equates with very high risk, regional value with high risk, and local value with either medium risk or low risk depending on the combination and sum of values at the development site.

5.19. The issue that needs to be considered is not necessarily whether these high value components occur[12] at the site,

[12] Includes species that can usually be found at that location (i.e. they live there), and also species that use that location as part of their migration route (e.g. a particular species of wading bird may only use that site in autumn when they are migrating north) or a regular feeding route.

although a site with many high risk components should ideally be avoided altogether, but whether the proposed development will have an adverse impact that might not be fully avoided, minimised, remedied or mitigated.

5.20. As illustrated by experts such as Mr W Shaw, Dr K. Lloyd, Dr Leathwick, Dr O'Donnell, Ms Walker, Dr Suren, Dr Death, and Dr D. Norton there are many values within the MHP footprint that exceed medium risk and will be impacted by development. Many of the impacted values are not able to be fully mitigated. This indicates that this site should have been avoided altogether. These features include species (grey duck, *Powelliphanta* snails, long-tailed bat,) communities (seeps including those with high bryophyte richness, high diversity of aquatic invertebrate species), ecosystems (pristine river, coal measure, lowland rimu-podocarp forest, riparian zonation), ecological processes (migration) and physical processes (sediment and nutrient transport).

5.21. Dr Norton indicated that the MHP could potentially result in: (1) impacts on the best remaining example of coal measures ecosystem (Dr D. Norton Paragraph 5.17a), (2) further 'loss' of the Nationally Critical grey duck through hybridisation with mallards (Dr D. Norton Paragraph 5.17b), (3) reduce the limited extent of river riparian vegetation (Dr D. Norton Paragraph 5.17c), (4) affect the rapidly declining population of *P.I. unicolorata* (Dr D. Norton Paragraph 5.17d). Dr D. Norton considers these impacts to be significant. I consider all of these to be either vulnerable or irreplaceable biodiversity features.

5.22. In Dr D. Norton's opinion, none of the biodiversity components in the areas impacted by the MHP, with the

exception of coal measures vegetation, are considered to be irreplaceable or vulnerable (Dr D. Norton Paragraph 6.13). In addition, he asserts that the MHP will not increase the imminent loss of any species or ecosystems, or ecological processes (Dr D. Norton Paragraph 6.14).

5.23. A number of taxa (including vascular plants, fish, and birds) present within the MHP impact area are ranked as 'At Risk' and are shown to decline with the MHP, without replacement as part of the proposed 'offset'. This is considered acceptable by Dr D Norton because they will not become extinct on a national basis. Dr Ussher (Paragraphs 7.5 to 7.12), in his discussion of what he considers to be non-offsetable aspects (grey duck, coal measures vegetation) notes that while they are unlikely to become extinct, even locally, they cannot be offset, but states that they could be "traded up[13]" or compensated for in some other manner. However, the BBOP handbook (BBOP 2009a) states: "*biodiversity offsets may be an inappropriate approach for a species or ecological community that is currently or has already undergone a significant decline, as the risk that the offset will fail could be too high*". Moreover loss or decline of these features indicates that the proposed biodiversity offset also cannot achieve no net loss.

5.24. Thus, in my opinion, the MHP fails to meet Principle 2: *Limits to what can be offset.*

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[13] Dr Ussher does acknowledge that both grey duck and coal measures vegetation are already in the highest threat categories for species and community types respectively. Therefore trading up will not be feasible.

Landscape Context

5.25. The relative importance of an area is typically evaluated within the context of a spatial framework; using that to evaluate how important a site is relative to other sites nearby, in the region, or nationally. Assessment of potential adverse effects and benefits within a relevant landscape[14] context is now commonly undertaken as part of the RMA process, especially with regards to cumulative effects with other development projects.

5.26. Also, evaluation of the key concepts underpinning biodiversity offsetting (irreplaceability, vulnerability, no net loss, the ability to undertake an offset, and identification of the ecological values of a site) all include a spatial component.

5.27. Dr Leathwick's evidence in chief indicates that the Mokihinui River and catchment are important for national and regional representation of the full range of ecosystem types. This increases the irreplaceability of the river ecosystem and associated catchment (refer to Paragraph 5.11 this evidence). The Mohikinui River is one of the best condition large rivers of its type remaining in New Zealand, and the MHP would be the first significant barrier with impacts on fish movement, invertebrate community structure and diversity, water flow and connectivity (evidence of Dr Leathwick). Dr K. Lloyd and Dr D. Norton identify that coal measures vegetation is nationally important, and would be adversely impacted by the MHP. The area affected by the MHP also supports an unusual diversity of ecosystems, habitat types and species,

[14] By landscape, in this context, I am referring to broad scale ecosystem wide assessment.

which, in combination, are not found elsewhere in New Zealand (evidence of Mr W Shaw). All of these biodiversity features will be affected by the proposed MHP. Very few impacts on these features are able to be mitigated, such that no net loss is achieved.

5.28. In my opinion the mitigation of the impacts on the Mohikinui River, and its surroundings, have been insufficiently addressed with regards to Principle 3: *Landscape context.*

No Net Loss

5.29. The concept of no net biodiversity loss (no net loss) lies at the heart of biodiversity offsetting. No net loss, in essence, refers to the point where biodiversity gains from targeted conservation activities match the losses of biodiversity due to the impacts of a specific development project, so that there is no net reduction overall in the type and amount of biodiversity present, over space and time. A net gain means that gains to a set of biodiversity features in one or more locations exceed the losses to the same biodiversity features in another one or more locations (TBC 2011).

5.30. The BBOP definition of no net loss is:

> "A target for a development project in which the impacts on biodiversity caused by the project are balanced or outweighed by measures taken to avoid and minimise the project's impacts, to undertake on-site restoration and finally to offset the residual impacts, so that no loss remains. Where the gain exceeds the loss, the term 'net gain' may be used instead of no net loss. No net loss (or net gain) of biodiversity is a policy goal

> in several countries, and is also the goal of voluntary biodiversity offsets" (BBOP 2009b).

5.31. The CDRP BOP supports and has adopted the BBOP definition of biodiversity offsets as having the goal of achieving no net loss and preferably a net gain of biodiversity, on the ground.

5.32. The biodiversity values to consider in relation to no net loss should include[15]:

> "No overall reduction in:
>
> - the diversity of (or within) species
> - species' population sizes (taking into account natural fluctuation), and long-term viability
> - area occupied and natural range inhabited by species
> - range and ecological health and functioning of assemblages of species, community types and ecosystems."

5.33. Indicator 4-1-1 under Principle 4 *No net loss* states:

> "The commitment to a goal of no net loss or a net gain of **all** biodiversity components affected by the project is stated by the project developer in a publicly available document." [**my emphasis in bold**]

5.34. And this requires a robust and objective risk assessment under Principle 2 *Limits to what can be offset:*

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[15] Proposed National Policy Statement on Biodiversity.

- Criterion 2-1 states: "The risk that the project's residual impacts on biodiversity may not be capable of being offset ('non-offsetable') shall be assessed and measures taken to minimise this risk."

- Indicator 2-1-1 states: "A risk assessment is undertaken to predict the level of risk that the project's residual impacts on biodiversity will not be capable of being offset, with special attention afforded to any highly irreplaceable and vulnerable biodiversity components."

5.35. The evidence of Mr W Shaw and Dr Leathwick (for the Department of Conservation), and Dr Lee (for the applicant) summarise the risk of the MHP impacting on biodiversity features that will not be able to be offset. All authors concluded that there are key features that are either not offset, and/or the management actions required to offset the residual effects appeared to be unattainable.

5.36. Given the high level of endemism in New Zealand, the high level of threat to some species and ecosystems types and habitats, and the significant reductions in population size (for species) and extent (for species, ecosystem types, and habitats) the CDRP BOP considers that the **best practice definition for no net loss** (in a like-for-like exchange) should be:

> "*all high value indigenous components*[16] *and all indigenous types need to be fully offset*".

5.37. If this cannot be achieved with the mitigation and remediation offered then it cannot be considered to be no net loss biodiversity offsetting.

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[16] Definitions of biodiversity types and biodiversity components in Paragraphs 4.5 and 4.6 respectively.

5.38. Currently, like-for-like biodiversity offsets are preferred, because potential accounting models have been developed for this approach, and because it is easier to compare values between sites. Requiring like-for-like biodiversity offsetting can also be helpful for Resource Management Act (RMA) processes because, rather than lumping effects and describing their overall magnitude and producing an overall mitigation package of supposedly corresponding value, the like-for-like approach requires each adverse effect to be explicitly identified and addressed with a specific mitigation activity.

5.39. At present there are no useable offset accounting tools for like-for-unlike offsetting (that is between different ecosystem types), although these may possibly be developed in the future. Dr Ussher concurs with this statement in Paragraph 4.16 of his evidence.

5.40. The biodiversity offset model used for the MHP appears to contain elements of a like-for-unlike model. This is indicated by statements such as, *"for vegetation communities, components such as canopy trees may be traded for improved biodiversity outcomes in other parts of the community, for example bird species or understorey vegetation*" (Dr Ussher Paragraph 5.7). Dr K. Lloyd has illustrated that the vegetation classification, description, and quantification of vegetation types used in the MHP model is seriously inadequate, and Dr Leathwick notes that aquatic ecosystems are not included at all, despite a very significant adverse impact. In a like-for-like exchange, each adverse effect should be explicitly identified and addressed with a specific mitigation response. Nevertheless, the Meridian model is presented as being a like-for-like model, as shown by numerous references in

Drs Ussher's and D Norton's evidence to in-kind or like-for-like.

5.41. In order for like-for-unlike trading to be considered, the biodiversity values to be affected at the impact (development) site should be modest or low[17], and the values protected and managed at the offset site should be substantially greater prior to additional offset-related management taking place. Like-for-unlike offsetting therefore requires 'trading-up' of biodiversity values. However, there is no ecological or other conceptual basis for working out how much of the more valued feature must be added to compensate loss of a given quantum of a lesser valued feature.

5.42. Dr D. Norton (Paragraph 6.44) defines 'trading-up' as "an offset located where there is an ecosystem and/or species that is under greater threat[18] and is not currently being actively managed [and] might well represent a better outcome for biodiversity conservation nationally". He does not appear to acknowledge that the MHP fails to achieve no net loss for like-for-like trading (although Dr D. Norton does note that the BES is like-for-like for **most** biodiversity values, hence not all biodiversity values Paragraph 6.34). He ignores the reality that some of the values in the offset site are lower, or totally lacking, compared to the impact site (such as lack of distinctive riparian ecosystem, no primary lowland rimu-dominant forest, no coal measures

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[17] High biodiversity values should ideally be avoided, and if high biodiversity values are adversely affected then it will prove very difficult to find biodiversity elements of greater value to protect and manage at the offset site.

[18] As a general rule, the greater the threat(s) to a biodiversity value, the more valuable it is. This is because biodiversity elements that are threatened are more vulnerable to ongoing decline and generally occur less abundantly due to the threat(s).

vegetation). Moreover, no attempt has been made to offset the loss of, or changes to, aquatic values. Thus, in my opinion, despite the size of the proposed Biodiversity Enhancement Area, **this is not an example of 'trading-up'**.

5.43. Dr D. Norton identifies only four significant impacts (Dr D. Norton Paragraphs 5.17, 6.34) on biodiversity, effects on the coal measures ecosystem, effects on grey duck, loss of riparian communities, and loss of *P. I. unicolorata* snail habitat. These effects are presumably significant because they are considered to be of **high value and they cannot be offset** elsewhere. Thus Dr D. Norton himself implicitly identifies that the MHP project cannot meet BBOP Principle 4 *no net loss* for all high value biodiversity features.

5.44. Dr Ussher states that the key outcomes of a biodiversity offset programme are to ensure that biodiversity gains are permanent and maintained (Paragraph 3.1). Then, in Paragraph 3.2, he identifies three elements that were not able to be offset (grey duck, coal measures vegetation, riparian vegetation) and in Paragraph 3.3 he notes a loss of general hardwood forest and the upper forest tiers (emergent, canopy and subcanopy[19]) that are to be removed without replacement. Impacts on aquatic features are also not addressed or offset in the Ussher model. This **does not equate to a no net loss biodiversity offset** as these identified high biodiversity values are either lost or reduced without replacement.

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[19] Spreadsheet: model dam & reservoir likely 29 Sept 2011; Tab: Summary; Rows: 5, 6, 7; Columns: C to AB. Values are either negative or zero and result in net loss (Columns Z to AB).

5.45. Even if like-for-unlike trading was to be considered the values at the offset site should be substantially greater (prior to any offset management being undertaken) than those that will be impacted at the development site (refer to Paragraph 5.41 above). Based on the evidence of Dr Lloyd, it is evident that the upper catchment vegetation types within the proposed offset area are less diverse, both in terms of species composition but also ecosystem types, than the impact area, especially within the Mokihinui Gorge itself and the coal measures vegetation. Significantly increasing the size of the offset area to 35,000ha does not necessarily increase its biological value as there is no corresponding increase in diversity of composition and ecosystem types (a point also made by Dr Leathwick).

5.46. Mr Shaw summarises the opinions of the various experts (in Tables 6 to 9) and indicates that the mitigation proposed by the applicant will not offset these adverse effects, resulting in a net and irreversible loss of important biodiversity values in the project area.

5.47. In my opinion the MHP cannot comply with BBOP Principle 4 *No net loss*.

Additional Conservation Outcomes

5.48. The BBOP definition of additionality is:

> "A property of a biodiversity offset, where the conservation outcomes it delivers are demonstrably new and additional and would not have resulted without the offset."

The CDRP BOP supports this definition.

5.49. Where a developer invests in land and/or conservation management actions **for the express purpose of using that site or actions to offset a clearly defined and quantified development impact**, they must be able to show that *but for the intention to use it as an offset*, they would not have invested in it or undertaken the management actions. So biodiversity benefits can only be claimed towards an offset if those actions are directly linked to the development project in question and are additional to biodiversity values and conservation actions already at the offset site.

5.50. Additionality only applies if the management actions are additional to any biodiversity conservation measures, or other actions, that are already being carried out on the land, or are required to be carried out, under relevant legislation.

5.51. Whether an investment or management action can be considered additional will also depend on what is included in District and Regional Plan rules and what previous management was undertaken at the site(s). For instance, some district plans have rules to prevent the clearance of indigenous vegetation, thus legal protection, such as a covenant, may not necessarily confer significant *additional* protection over the vegetation. Or an area may already be subject to active management to control possums (e.g. for TB control), so undertaking pest control would need to be greater in scope (i.e. more intensive, targeting a wider suite of pest species) than just possum control for it to be considered additional.

5.52. Dr D. Norton (Paragraph 6.31) implies that ungulates are impacting on the BEA and therefore control of ungulates will result in additional biodiversity. He acknowledges

(Paragraph 6.30) that biodiversity responses will be greater for some taxa than others. Dr Norton (Paragraph 6.32) also indicates that he considers that the BEA to be degraded.

5.53. However Dr K. Lloyd (Dr K Lloyd evidence in chief) saw little evidence of adverse pest impacts on vegetation during his field surveys, and therefore little opportunity for creating additional biodiversity benefits for vegetation through the pest management proposed. Moreover, most of the offset site has a canopy of beeches and podocarps, which are not significantly affected by possum browse and the full range of size classes of palatable species was present in the terrestrial browse range (evidence of Dr K. Lloyd). The evidence of Mr Farrell and Mr Shaw illustrates that most of the BEA currently receives ungulate and/or possum control. This means that it will be unlikely for the BES to achieve the level of additionality required to ensure no net loss of biodiversity.

5.54. There is also no guarantee that the pest control proposed will provide the benefits outlined for indigenous fauna. Best practice pest control is continually evolving (evidence of Dr O'Donnell). Periodic application of 1080 across the large 'offset' area is less efficient at controlling pest species than a combination of techniques, including aerial and ground-based methods (evidence of Dr Leathwick). Thus it is difficult to see how much, if any, additional conservation benefit the proposed methods can achieve.

5.55. The proposed Waimangaroa block is mostly fenced, with little sign of stock incursion, and receives both browser and predator control (evidence of Dr Leathwick). There is therefore only limited opportunity for additional management to increase biodiversity at this site.

5.56. In my opinion, achievement of additionality in the proposed offset areas will be difficult, if not impossible, to achieve. Thus it seems likely that BBOP Principle 5: *Additional conservation outcomes* cannot be achieved.

Stakeholder Participation

5.57. It would appear, from the fact that the proposal is being opposed by a number of different agencies or organisations, including the key land management agency, that stakeholder participation has not been particularly robust or successful. Dr Ussher considers it appropriate that stakeholder participation is addressed by RMA processes and it is therefore not considered within his evidence (e.g. Dr Ussher, Table G.1.)

5.58. In my experience, projects that have been informed by community and stakeholder consultation prior to seeking consents are achieving a much better consent success rate, with fewer appeals, and the consent is more likely to be issued at a lower regulatory level (this was a key message in several presentations at the New Zealand Wind Energy Association conference 2012). This does not appear to be the case for MHP.

5.59. I suggest that BBOP Principle 6 *Stakeholder participation* has not been achieved.

Equity

5.60. Key aspects of equity include “agreements with relevant stakeholders pertaining to sharing of rights, responsibilities, risk and rewards” (BBOP Indicator 7-1-1), “Documented evidence exists that agreements … were entered into willingly by all parties and comply with existing

regulations, [and] recognise customary arrangements" (BBOP Indicator 7-1-2) and "impacts on peoples' biodiversity uses and values resulting from the development project and offset have been taken into account and appropriately compensated" (BBOP Indicator 7-1-3).

5.61. Fish and Game New Zealand appear to have been consulted with regards to management of trout, and trout angler satisfaction will be surveyed in the **future** (Section 7.2 AEMP). The Department of Conservation **would be** consulted where the activities in this management plan would occur on conservation land and/or they relate to protected wildlife species (Section 1.2 TEMP). However, these **future** discussions do not address current issues in relation to equity, as required under this BBOP principle.

5.62. The Department of Conservation is a stakeholder, as much of the land potentially impacted is protected public land, and is objecting to this proposal on the basis of the loss of significant biodiversity features and the proposed inadequate mitigation to offset this. Other stakeholders that could also be affected are whitebait fishers (the dam is a barrier to maintaining populations of some migratory fish above the dam, and will affect upstream and downstream migration, evidence of Dr Leathwick and Dr Allibone), local hunters (perceived loss of hunting opportunities due to repeated aerial poisoning operation), white water rafting (loss of an important unmodified river) and conservationists such as Forest and Bird. These last two stakeholders are also objecting to the MHP.

5.63. I could see no evidence in the Terrestrial Ecology Management Plan (TEMP) attached to Mr Overmars'

evidence, the Biodiversity Enhancement Strategy (BES) attached to Dr Parkes' evidence, and the Aquatic Ecology Management Plan (AEMP) attached to Dr James' evidence, that these stakeholders had been consulted or offered the opportunity to participate in the management of the offset site, or been appropriately compensated.

5.64. Dr Ussher considers that stakeholder equity is addressed by RMA processes and, on that basis, it is not addressed within his evidence (e.g. Dr Ussher, Table G.1.)

5.65. My assessment is that BBOP Principle 7 Equity has not been addressed.

Long-Term Outcomes

5.66. Given that the loss or modification of a number of significant biodiversity values has not been accounted for, the significant uncertainty about the proposed offsets ability to achieve no net loss, the use of like-for-unlike trading, and the lack of additionality, the mitigation proposed will be unable to achieve no net loss of biodiversity values, either over the short or long term.

5.67. By contrast, if consent is granted, the long-term (permanent) impact on biodiversity is certain, including adverse effects on coal measures vegetation, permanent loss of distinctive riparian vegetation, permanent loss of significant aquatic habitat and high bryophyte diversity seeps, permanent loss of lowland rimu-podocarp forest, long-term reduction of large emergent podocarp and northern rata species, further reduction in the population viability of grey duck and *P. I unicolorata*, likely loss for a range of aquatic species, and perhaps most significantly of

all, the permanent loss of a very significant component of one of New Zealand's best remaining unmodified river systems.

5.68. It is clear that BBOP Principle 8: *Long-term outcomes* has not been achieved.

Transparency

5.69. BBOP INDICATOR 9-1-1 "Information on baseline findings, impact assessment as well as offset design and implementation is reported to stakeholders and the public in appropriate media during offset design and implementation".

5.70. As discussed elsewhere in this evidence, and in the evidence of Dr Langford, the type of model used, the biodiversity features used in the offset accounting model, and mathematical calculations within the accounting model are not transparent, and some are ecologically unfounded. The vegetation classifications do not accurately reflect the community composition (evidence of Dr K. Lloyd). A 'net gain' in biodiversity offsets is claimed despite not including loss of any aquatic features into the model, and this 'net gain' includes losses for other valued features such as grey duck, lizards, kiwi, shag species (evidence of Dr O'Donnell), loss of river riparian zonation area, adverse impacts and lack of rehabilitation for coal measures vegetation (evidence of Drs K. Lloyd, and Leathwick), and loss of general hardwood forest and the upper forest tiers (emergent, canopy and subcanopy in Dr Ussher's evidence).

5.71. So, although this information has been made available (through the hearing process), significant omissions and inaccuracies, and other issues, have reduced the transparency of the scientific process.

5.72. BBOP INDICATOR 9-1-2 “An independent mechanism (such as a steering committee, review panel, or system for peer review) is established to oversee the offset design and implementation process and report regularly to the public on their assessment of progress”.

5.73. I can find no evidence that such an independent mechanism has been proposed in the Terrestrial Ecology Management Plan (TEMP) attached to Mr Overmars’ evidence, or the Biodiversity Enhancement Strategy (BES) attached to Dr Parkes’ evidence. In the Aquatic Ecology Management Plan (AEMP), attached to Dr James’ evidence, an expert panel will be convened to assess the effects on trout, but no indigenous biodiversity features appear to be included.

5.74. The Department of Conservation will be consulted with regards to management on public conservation land or protected wildlife species (Section 1.2 TEMP). The consent holder will report annually (for the first 8 years), then every three years thereafter, to the West Coast Regional Council and Buller District Council with respect to a range of topics (Section 4 TEMP). The consent holder will report on various water quality parameters to the territorial authorities and local iwi. They will also report findings in relation to trout to Fish and Game New Zealand, and monitoring results for whitebait to the Mokihinui Ratepayers Association and the West Coast Whitebait Association (AEMP).

5.75. Thus the only panel of experts proposed is for trout, a non-indigenous species.

5.76. Dr Ussher indicates (e.g. Table G.1.) that the transparency criteria has been achieved because “The BES is a public document and the management of the BEA requires monitoring and reporting which are independently reviewed”.

5.77. In my opinion, BBOP Principle 9 Transparency has only been partially met, and only for a single non-indigenous species, but not for any indigenous biodiversity features.

Science and Traditional Knowledge

5.78. I undertook a limited investigation of some of the biodiversity offset accounting model parameters, focussing on those that I am most familiar with. The mathematical calculations used in the MHP offset model, such as ‘unlimited’ exponential growth for some fauna, ‘unlimited’ linear increase for understorey vegetation, and the same rates of increase across different vegetation types for some components, are unrealistic and do not reflect our knowledge of ecological processes. No evidence or justification for the various growth models are provided and the model lacks computational transparency, for reasons outlined in Dr Langford’s evidence.

5.79. In my opinion, Dr Ussher has used inappropriate surrogate measures of the state of biodiversity. He has assigned values to the measures comprising those surrogates that are not founded on measurement or indeed any auditable basis. I do not consider the values he has assigned to be ecologically credible.

5.80. BBOP Principle 10 *Science and traditional knowledge* requires that best available scientific knowledge and methods have been used in offset design and implementation. In my opinion, the biodiversity offset model has not been used in a manner that is consistent with best practice scientific procedure or ecological science standards. This opinion is independently reflected in the evidence of Drs Langford and K. Lloyd.

5.81. I am unaware of any traditional knowledge being applied by the applicant to the MHP biodiversity offset model.

5.82. I therefore conclude that BBOP Principle 10 *Science and traditional knowledge* has not been met.

6. CONCLUSIONS

6.1. I have reviewed the applicant's proposed biodiversity offset against the ten Business and Biodiversity Offset Program Principles that have been arrived at through international collaboration between companies, financial institutions, government agencies, and civil society organisations.

6.2. In my opinion the proposed biodiversity offset fails to meet any of these ten principles.

6.3. The most significant failures are:

- The range and combination of significant biodiversity features that occur within the impact area, and will be adversely affected, indicate that this area should be avoided under Principle 2: Limits to what can be offset.

- Ignoring the significant adverse impacts on significant biodiversity features in the biodiversity offset model, yet nevertheless claiming a net gain in biodiversity.

- Insufficient demonstration that additionality can be achieved.

- Lack of transparency and scientific robustness in designing the biodiversity offset accounting model, in terms of parameter selection, ecological processes modelling, and mathematical clarity.

REFERENCES

BBOP 2009a: Business and Biodiversity Offsets Programme (BBOP) - Biodiversity Offset Design Handbook. Business and Biodiversity Offsets Programme (BBOP), Washington, D.C. 105 pp.

BBOP 2009b: Business and Biodiversity Offsets Programme (BBOP) - Glossary (updated 2012). Business and Biodiversity Offsets Programme (BBOP), Washington, D.C. 40 pp.

BBOP 2012: Standard on Biodiversity Offsets. A tool to assess adherence to the BBOP Principles in Biodiversity Offset Design and Implementation. Business and Biodiversity Offsets Programme (BBOP), Washington, D.C. 22 pp.

Meridian 2011: Mokihinui Hydro Project. Meridian Energy. (http://www.meridianenergy.co.nz/assets/PDF/What-we-do/Our-projects/Mokihinui-project/MokihinuiBrochure18Feb2011.pdf)

TBC 2011: Biodiversity offsets: appropriate limits and thresholds *Unpublished report to the New Zealand Department of Conservation* The Biodiversity Consultancy Ltd, Cambridge, UK. 70 pp.

APPENDIX 1

Principle 1 ***Adherence to the mitigation hierarchy*: A biodiversity offset is a commitment to compensate for significant residual adverse impacts on biodiversity identified after appropriate avoidance, minimisation and on-site rehabilitation measures have been taken according to the mitigation hierarchy.**

Criterion 1-1 The developer shall identify, implement and document appropriate measures to avoid and minimise the direct, indirect and cumulative negative impacts of the development project and to undertake on-site rehabilitation/restoration.

Indicator 1-1-1 An assessment of the development project's impacts on biodiversity (including direct, indirect and cumulative impacts, as appropriate) is conducted with stakeholder participation.

Indicator 1-1-2 Measures to avoid and minimise biodiversity loss and to rehabilitate/restore biodiversity affected by the project are defined and documented, and these measures implemented, monitored and managed for the duration of the project's impacts.

Criterion 1-2 The biodiversity offset shall only address the residual impacts of the development project, namely those impacts left after all the appropriate avoidance, minimisation and rehabilitation/restoration actions have been identified.

Indicator 1-2-1 Any residual losses of biodiversity that may exist following avoidance, minimisation and rehabilitation/restoration are identified and described in the Biodiversity Offset Management Plan.

Principle 2 ***Limits to what can be offset*: There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.**

Criterion 2-1 The risk that the project's residual impacts on biodiversity may not be capable of being offset ('non-offsetable') shall be assessed and measures taken to minimise this risk.

Indicator 2-1-1 A risk assessment is undertaken to predict the level of risk that the project's residual impacts on biodiversity will be not be capable of being offset, with special attention afforded to any highly irreplaceable and vulnerable biodiversity components.

Indicator 2-1-2 The risk assessment demonstrates how the project's residual impacts can and will be offset through specific measures and commitments, taking into account the level of risk and uncertainties regarding the delivery of the offset.

Principle 3 ***Landscape context*: A biodiversity offset should be designed and implemented in a landscape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.**

Criterion 3-1 The biodiversity offset shall be designed and implemented to complement and contribute to biodiversity conservation priorities identified at the landscape, eco-regional and national levels.

Indicator 3-1-1 The identification of potential offset locations is undertaken in the context of a landscape level analysis, and the ecosystem approach is used to plan the offset.

Indicator 3-1-2 Evidence is provided that the offset gains and conservation outcomes contribute to regional and national conservation goals, where these exist.

Criterion 3-2 The biodiversity offset shall be designed and implemented for the long term, taking into consideration other likely developments (e.g. competing land use pressures) within the landscape.

Indicator 3-2-1 Evidence is provided that any reasonably foreseeable future developments that might affect the offset, including developments by third parties, have been considered in the offset design.

Indicator 3-2-2 Evidence is provided that the offset planner has proposed to the relevant government authorities that the biodiversity offset should be incorporated, where possible, within local, regional and national government land use or other similar plans.

Principle 4 ***No net loss*****: A biodiversity offset should be designed and implemented to achieve in situ, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.**

Criterion 4-1 The no net loss or net gain goal for the development project shall be explicitly stated, and the offset design and conservation outcomes required to achieve this goal clearly described.

Indicator 4-1-1 The commitment to a goal of no net loss or a net gain of all biodiversity components affected by the project is stated by the project developer in a publicly available document.

Indicator 4-1-2 All residual biodiversity losses due to the project are quantified relative to the 'pre-project' condition of affected biodiversity, which is identified, characterised, and documented.

Indicator 4-1-3 The biodiversity gains anticipated from the offset are quantified relative to the 'without-offset' condition of biodiversity in the area of the offset site(s). The 'without offset' biodiversity condition is identified, characterised and documented.

Indicator 4-1-4 The Biodiversity Offset Management Plan (BOMP) describes the offset design and its intended conservation outcomes, and includes

the evidence and assumptions used to predict that these outcomes will result from the offset activities described.

Criterion 4-2 An explicit calculation of loss and gain shall be undertaken as the basis for the offset design, and shall demonstrate the manner in which no net loss or a net gain of biodiversity can be achieved by the offset.

Indicator 4-2-1 A set of key biodiversity components at species, habitats and ecosystem levels, including landscape features and components related to use and cultural values, is identified. The rationale for selecting these key biodiversity components to represent all the biodiversity affected by the project is explained and documented.

Indicator 4-2-2 Methods for (1) determining the equivalence of residual biodiversity losses and gains (assessing like for like or better) in the offset design, and (2) calculating the net balance of biodiversity losses due to the development project and gains due to the offset activities, including identification of suitable metrics, are identified and the rationale for their selection explained and documented

Indicator 4-2-3 The methods used for determining equivalence of biodiversity losses and gains address equity10 in the type and condition, the location, and if possible, the timing of biodiversity losses and gains, and explicitly consider the key biodiversity components.

Indicator 4-2-4 The metrics selected for quantifying the net balance of biodiversity losses and gains capture the type, amount and condition of affected biodiversity, including the key biodiversity components, and are used to calculate losses and gains in the offset design.

Indicator 4-2-5 The methods to determine net balance and equivalence of losses and gains (Indicator 4-2-2) are applied as the basis for the offset design, and demonstrate no net loss or a net gain of biodiversity.

Criterion 4-3 The offset design and implementation shall include provisions for addressing sources of uncertainty and risk of failure in delivering the offset.

Indicator 4-3-1 Sources of risk and uncertainty in the design and implementation of the offset (including in the loss/gain calculations), together with the measures taken to manage them, are documented in the Biodiversity Offset Management Plan.

Indicator 4-3-2 A series of milestones for implementing the offset, tracking progress towards achieving no net loss or net gain and verifying that the offset delivers the intended conservation outcomes, is established and monitored.

Principle 5 ***Additional conservation outcomes*****: A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.**

Criterion 5-1 The conservation outcomes of the biodiversity offset shall be 'additional' in that they are due to the offset activities and would not have occurred without them.

Indicator 5-1-1 Evidence is provided that the conservation gains at the offset site(s), calculated as the difference between the conservation outcomes with and without the proposed offset activities, were caused by the offset activities. The gains are predicted for a specified, long-term period, and monitored and verified during offset implementation.

Criterion 5-2 The offset shall be designed and implemented to avoid 'leakage': the displacement by the offset of activities that harm biodiversity from one location to another.

Indicator 5-2-1 An assessment is undertaken to identify potential leakage resulting from the offset activities.

Indicator 5-2-2 The offset design includes provisions for addressing the risk of leakage and these are put into effect during implementation.

Principle 6 ***Stakeholder participation*: In areas affected by the development project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making about biodiversity offsets, including their evaluation, selection, design, implementation, and monitoring.**

Criterion 6-1 Consultation and participation of relevant stakeholders shall be integrated into the decision-making process for offset design and implementation, and documented in the Biodiversity Offset Management Plan.

Indicator 6-1-1 Relevant stakeholders are identified and informed of the plan to design and implement a biodiversity offset for the project.

Indicator 6-1-2 Records are maintained that document the results of informed consultation and participation of relevant stakeholders related to the design and implementation of the biodiversity offset.

Indicator 6-1-3 The roles of relevant stakeholders in the implementation of the biodiversity offset, including its evaluation and monitoring, are established and clearly defined in the Biodiversity Offset Management Plan.

Indicator 6-1-4 For projects and/or offsets with adverse impacts on indigenous peoples, their free, prior and informed consent (FPIC) will be obtained and documented.

Criterion 6-2 A mutually agreed and documented system for handling grievances exists and is accepted and implemented by all relevant parties.

Indicator 6-2-1 A documented system, open to relevant affected parties, which handles and resolves grievances in an effective, timely and appropriate manner and records outcomes, is in operation.

Principle 7 ***Equity*****: A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities, risks and rewards associated with a development project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.**

Criterion 7-1 Rights, responsibilities, risks and rewards shall be clearly identified and mechanisms to share these fairly amongst relevant stakeholders shall be included in the Biodiversity Offset Management Plan.

Indicator 7-1-1 The Biodiversity Offset Management Plan references all agreements with relevant stakeholders pertaining to sharing of rights, responsibilities, risk and rewards related to the design and implementation of the project and offset.

Indicator 7-1-2 Documented evidence exists that agreements concerning the project and the design and implementation of the biodiversity offset were entered into willingly by all parties and comply with existing regulations, recognise customary arrangements and, as appropriate, respect the internationally and nationally recognised rights of indigenous peoples.

Indicator 7-1-3 Agreements with relevant stakeholders demonstrate that the impacts on peoples' biodiversity uses and values resulting from the development project and offset have been taken into account and appropriately compensated.

Principle 8 ***Long-term outcomes*****: The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the development project's impacts and preferably in perpetuity.**

Criterion 8-1 Mechanisms shall be in place to ensure that the measurable conservation outcomes from the offset will outlive the duration of the development project's impact.

Indicator 8-1-1 Evidence is provided that those responsible for implementing the offset (see indicator 6-1-3) have the requisite management and technical capacity.

Indicator 8-1-2 Legal and financial mechanisms are in place to guarantee the financial and institutional viability of the offset for at least the duration of the project's impacts, including under conditions of a sale, or transfer of project ownership or management.

Criterion 8-2 Adaptive monitoring and evaluation approaches shall be integrated into the Biodiversity Offset Management Plan to ensure regular feedback and allow management to adapt to changing conditions, and achieve conservation outcomes on the ground.

Indicator 8-2-1 Evidence is provided that the measures to manage and mitigate identified risks (see Indicator 4-3-1) are implemented, the results are monitored, and that risk assessment and management are adapted as necessary throughout offset implementation.

Indicator 8-2-2 Offset conservation outcomes and milestones are independently audited and project responds to audit recommendations in a timely manner.

Indicator 8-2-3 A system exists for monitoring and evaluating the success of offset implementation, including the monitoring of risks, and this provides regular feedback which is used to document, correct and learn from problems and achievements.

Principle 9 ***Transparency*****: The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.**

Criterion 9-1 The developer responsible for designing and implementing the biodiversity offset shall ensure that clear, up to date, and easily accessible information is provided to stakeholders and the public on the offset design and implementation, including outcomes to date.

Indicator 9-1-1 Information on baseline findings, impact assessment as well as offset design and implementation is reported to stakeholders and the public in appropriate media during offset design and implementation.

Indicator 9-1-2 An independent mechanism (such as a steering committee, review panel, or system for peer review) is established to oversee the offset design and implementation process and report regularly to the public on their assessment of progress.

Principle 10 ***Science and traditional knowledge*****: The design and implementation of a biodiversity offset shall be a documented process informed by sound science, including an appropriate consideration of traditional knowledge.**

Criterion 10-1 Scientific information, and, where applicable, traditional knowledge, shall be utilised when designing and implementing the offset.

Indicator 10-1-1	The Biodiversity Offset Management Plan describes how the best available scientific knowledge and methods have been used in offset design and implementation, providing evidence of consultation with scientific experts.
Indicator 10-1-2	The Biodiversity Offset Management Plan describes whether and how relevant traditional knowledge has been used in offset design and implementation, with, as appropriate, the involvement and prior approval of local communities and indigenous peoples, and of relevant experts.