BEFORE THE INDEPENDENT COMMISSIONERS

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the Proposed Waikato Regional Plan Change 1 - Waikato and Waipa River Catchments, and Variation 1 to proposed Plan Change 1

AND

IN THE MATTER of submissions under clause 6 First Schedule

ON BEHALF OF **BEEF + LAMB NEW ZEALAND**
Submitter

EVIDENCE IN CHIEF OF GERARDUS HENRICUS ANTHONIUS KESSELS
15 FEBRUARY 2019

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QUALIFICATIONS AND EXPERIENCE

1. My full name is Gerardus (Gerry) Henricus Anthonius Kessels.

2. I am an independent contracting consultant, retained as Principal Ecologist for Tonkin and Taylor Ltd.

3. I hold a Bachelor of Science degree majoring in zoology, completed in 1988 and a Master of Resource and Environmental Planning (first class honours, specialising in collaborative management and wetland ecology) completed in 1999, both from Massey University.

4. I am a member of the Freshwater Sciences Society of New Zealand, the New Zealand Ecological Society, the Ornithological Society of New Zealand, the Waikato Botanical Society and an affiliate member of the New Zealand Planning Institute.

5. I have 29 years of experience in the fields of freshwater and terrestrial ecology and resource management planning. This includes five years with the Department of Conservation (DOC), and three years with Opus International Consultants. From 1999 until 2018 I was Principal Ecologist and Managing Director of Kessels & Associates Ltd (trading as Kessels Ecology).

6. Much of my professional career has been involved in undertaking ecological investigations, monitoring and assessments and restoration planning within the Waikato and Waipā catchments. I have been involved in many studies and projects relating to freshwater, land use activities, biodiversity, the restoration of riparian margins of streams and lakes, and wetland/ lake biodiversity and water quality, particularly for the rural sector and local government.

7. My Masters thesis investigated conserving biodiversity through collaborative management, investigating interactions between ecosystems and DOC's management of the Whangamarino Wetland.

8. I have been contracted by the Waikato Regional Council (WRC) on numerous occasions to study and assess the effects of agricultural-related activities on the ecological values of streams, rivers, lakes and wetlands within the Waikato region, and in particular within the Waikato and Waipā catchments. I have been involved in the preparation of several rural and

urban integrated catchment management plans for WRC, Hamilton City Council and Thames Coromandel District Council.

9. I was the Waikato, King Country and Western Coromandel Regional Representative for Queen Elizabeth the Second National Trust for the Waikato Region for five years, during which time I assisted many landowners in protecting and restoring degraded freshwater ecosystems in the Waikato and Waipā catchments.

10. I have undertaken many riparian and wetland assessment and restoration plans for rural landowners, tangata whenua, non-government organisations and government organisations such as DOC and territorial authorities. For example, currently I am assisting Matahuru marae restore a wetland and stream side ecosystems at Lake Waikare, which is receiving funding from the Waikato River Authority.

11. I have been involved in policy development pertaining to biodiversity and natural resource matters, particularly in the Waikato region, acting directly for the councils, or for organisations summiting during the plan consultation and appeal processes. For example, in the Waikato Region, I have been involved in policy and regulatory development concerning biodiversity and land use for district plans for Hamilton City Council, Waikato District Council, Franklin District Council, Hauraki District Council, Thames Coromandel District Council, Waipa District Council and Waitomo District Council.

12. In preparing this evidence I have reviewed reports, and statements of evidence of other experts relevant to my area of expertise, including:

    (a) Te Ture Whaimana o te Awa o Waikato – The Vision and Strategy for the Waikato River (Waikato River Authority, 2009)[1];

    (b) The National Policy Statement for Freshwater Management 2014 (NPS-FM, amended 2017)[2];

[1] Waikato River Authority 2011. Restoring and protecting the health and wellbeing of the Waikato River. Vision and Strategy for the Waikato River.
[2] Ministry for the Environment, 2017. National Policy Statement for Freshwater Management 2014. Updated August 2017 to incorporate amendments from the National Policy Statement for Freshwater Management Amendment Order 2017. http://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/nps-freshwater-ameneded-2017_0.pdf

(c) The Operative Waikato Regional Policy Statement (WRPS, 2016);

(d) The reports and statements of evidence of other experts giving evidence relevant to my area of expertise, including the evidence of Mr Richard Beetham, Dr Chris Dada, Dr Hannah Mueller, Dr Jane Chrystal, Mr Richard Parkes, and Ms Corina Jordan, on behalf of Beef & Lamb NZ;

(e) Plan change 1 and Variation 1;

(f) The officers s42A report; and

(g) The section 32 Report.

13. I have read the Code of Conduct for Expert Witnesses in the Environment Court's 2014 Practice Note and agree to comply with it. I confirm that the opinions I have expressed represent my true and complete professional opinions. The matters addressed by my evidence are within my field of professional expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

14. This brief of evidence provides an assessment of the suitability and efficacy of the proposed methods including rules pertaining to the Proposed Waikato Regional Council Plan Change 1 – Waikato and Waipā river catchments, and Variation 1 to Plan Change 1 (hereafter '**PC1**'), to deliver integrated management of natural resources in achieving PC1 Objectives. This includes:

(a) An assessment of PC1 freshwater objectives and policies in relation to the relevant sections of the NPS-FM, the Waikato Regional Policy Statement and the Vision and Strategy for the Waikato River (Vision and Strategy) as they relate to my areas of expertise, including collaborative management approaches to protect and enhance ecosystem health and biodiversity.

(b) A review of the suitability and efficacy of the proposed methods and rules in PC1 to reduce diffuse containment loading from agricultural land in relation to the mitigation options defined within the economic

model for Healthy Rivers Wai Ora (Doole 2015[3] and Doole et al 2016[4]).

15. I am aware of the directions of the Hearing Panel to allocate blocks of time for particular topics. My evidence addresses matters relating to the overall direction of the Plan, particularly in relation to sub catchment management approaches which in PC1 largely sit outside of the methods of the plan including rules, along with the tools that are available to farmers in the region to manage their impacts on aquatic ecosystem health. I also consider the science and modelling in relation to the mitigation methods tested by Doole (2015) and Doole et al (2016), which pertain specifically to Hearing Stream 1.

16. For the purpose of Hearing Stream 1 I have outlined the methods I consider are the most appropriate for the management of farming activities in relation to achieving freshwater ecosystem health and biodiversity objectives. These methods have the following matters in common:

    (a) They enable flexibility, adaptation and innovation;

    (b) They seek to engage farmers and provide a sense of ownership of the solutions / practices;

    (c) They are spatially appropriate and scalable to allow for local solutions (on-farm and sub-catchment) to regional problems; and

    (d) They enable an effective management and mitigation focus on achievement of desired ecosystem health and biodiversity enhancement outcomes, especially where multiple stressors and diffuse effects are involved.

EXECUTIVE SUMMARY

17. The PC1, in order to achieve a 10 percent improvement in water quality within the life of PC1, largely focusses on managing the activities of farming,

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[3] Doole, G. 2015. Description of mitigation options defined within the economic model for Healthy Rivers Wai Ora Project. Description of options and sensitivity analysis. Prepared for the Technical Leaders Group of the Healthy Rivers/Wai Ora Project. Report No. HR/TLG/2015-2016/4.6

[4] Doole, G.; Quinn, J.M. Wilcock, B.J. Hudson, N. 2016. Simulation of the proposed policy mix for the Healthy Rivers Wai Ora process. Prepared for the Technical Leaders Group of the Healthy Rivers/Wai Ora Project. Report No. HR/TLG/2016-2017/4.5

includes the establishment of a property scale nitrogen reference point to be established by modelling current nutrient losses from each property, and implementation of fencing off of water ways in relation to slope, farm environment plans (FEPs), along with a suite of practice standards. In relation to the property scale nitrogen reference point, landowners must ensure that their discharges must not exceed their reference point in the future. The rationale for achieving the desired outcomes of PC-1 has primarily been based on modelling commissioned by the Healthy Rivers Wai Ora Project Technical Leaders Group, with input from a Collaborative Stakeholder Group.

18. The policy framework of PC1 encourages the adoption and implementation of a tailored, risk-based approach to define mitigation options (Policy 2a); a sub-catchment approach to prioritisation of implementation of mitigation and management measures (Policy 8a, Policy 9a,b, c, and d); and application of best practicable options and mitigation or offsets for point source discharges (Policy 11 and Schedule 1). However, despite the aspirations of this policy, the regulatory framework of PC1 is such that it is unlikely to fully achieve its desired policy direction in this regard.

19. The implementation methods and rule set of PC1 does not utilise or incentivise best practice in terms of enabling widespread collaborative management through instigation of water management groups at sub catchment levels. This is systematic of 'command and control' type regulatory approaches, which will be unlikely to deliver on integrated and holistic sustainable management of natural resources as effectively as a mix of implementation and regulatory methods that allow for more community and sub catchment focused initiatives. I have found through my research studies and experience that sub catchment scale, community based approaches to restoration, mitigation and monitoring lends itself to more effective, collaborative solutions, than top down, 'command and control' approaches.

20. Council has not undertaken sufficient analysis to take into account the full range of mitigations and benefits that could be achieved through sub catchment approach, critical source areas, tailored FEPs, and collective action through tailored, sub catchment approaches.

21. PC1 does not provide for an integrated, holistic and coordinated approach to the management of the Waikato and Waipā river catchment as required by the Vision and Strategy or the WRPS, particularly for drystock farmers on steeper land.

22. By focussing on a limited suite of water quality parameters, PC1 may not provide sufficient direction to ensure overall ecosystem health is safeguarded and biodiversity is enhanced, as the plan is required to do by the NPS-FM, WRPS and the Vision and Strategy.

23. To achieve the desired water quality outcomes and ecological health set out in the NPS-FM, the WRPS and the Vision & Strategy, a more collaborative, ecosystem management based approach, is needed in the implementation methods and rule set of PC1.

24. Creating implementation methods and rules which allow for greater input into the mitigation and monitoring requirements by landowners in sub catchments is like to result in the implementation of a wider, more flexible sub catchment focused and more site-appropriate range of riparian and edge of field mitigation tools. This approach will also create greater opportunities to measure the effectiveness of these local measures. A better platform for increased and more measurable positive outcomes, particularly for hill country lands, as well as a more rapid and enduring uptake that the current proposed plan currently provides, will be the result of this approach.

POLICY FRAMEWORK

25. It is my professional opinion that PC1 has placed too much focus on achieving a limited suite of water quality parameters namely nitrogen (N), phosphorus (P), *E. coli*, Clarity, and Ammonia, and as such is not sufficient to ensure that the overall ecosystem health of freshwater is safeguarded, and freshwater biodiversity diversity and resilience protected and enhanced, as required by the NPS-FM, WRPS and Vision and Strategy. Moreover, PC1 does not fully provide for an integrated, holistic and coordinated approach to the management of the Waikato and Waipā river catchment as required by the Vision and Strategy or the WRPS, by not sufficiently incentivising landowners at a sub catchment level to work collaboratively together to achieve the proposed plans desired outcomes.

26. PC-1 freshwater objectives and targets which specify the desired water quality outcomes are set out in Table 3.11-1. The methods including rules which are intended to achieve a 10 percent improvement in water quality within the life of the plan. They are largely based on managing the activities of farming and include the establishment of a property scale nitrogen reference point (NRP) by modelling current nutrient losses from each property, and FEPs, along with a suite of practice standards. In relation to the NRP, landowners must ensure that their discharges do not exceed their reference point in the future, and higher dischargers (those at or above the 75th percentile for their Freshwater Management Units (FMU)), must reduce their nutrient losses. This is set out in further detail in the planning evidence of Ms Jordan. The efficacy of the proposed policy and implementation methods of PC-1 has been prepared by modelling (Doole 2015) with input from a Collaborative Stakeholder Group (CSG).

27. The NPS-FM states that one of the compulsory national values and uses for freshwater is ecosystem health. In Appendix 1 of the NPS-FM ecosystem health is defined as:

"The freshwater management unit supports a healthy ecosystem appropriate to that freshwater body type (river, lake, wetland, or aquifer). In a healthy freshwater ecosystem ecological processes are maintained, there is a range and diversity of indigenous flora and fauna, and there is resilience to change.

Matters to take into account for a healthy freshwater ecosystem include the management of adverse effects on flora and fauna of contaminants, changes in freshwater chemistry, excessive nutrients, algal blooms, high sediment levels, high temperatures, low oxygen, invasive species, and changes in flow regime. Other matters to take into account include the essential habitat needs of flora and fauna and the connections between water bodies." (Underlining is my emphasis)

28. The Vision and Strategy outlines a number of key objectives for fulling the strategies vision of *"…a healthy Waikato River sustains abundant life and prosperous communities who, in turn, are all responsible for restoring and protecting the health and wellbeing of the Waikato River*…". These include, amongst other matters; *"(d) The restoration and protection of the relationship of the Waikato region's communities with the Waikato River*

including their economic, social, cultural and spiritual relationships."; *(g) The integrated, holistic and coordinated approach to management of the natural, physical, cultural and historic resources of the Waikato River.*" Strategies to achieve the objectives include (amongst others): *"(9) Encourage and foster a 'whole of river' approach to the restoration and protection of the Waikato River, including the development, recognition and promotion of best practice methods for restoring and protecting the health and wellbeing of the Waikato River.*"

29. The WRPS requires for the integrated management of natural and physical resources which is holistic, collaborative and catchment based (for example s3.1, Policy 4.1, Policy 4.4, Policy 8, Policy 11.3) and in line across national and regional legislation and strategies (s3.3). It requires the restoration and protection of the ecosystem health and biodiversity values of the Waikato River through a range of policy requirements, including the requirement to implement the Vision and Strategy (s3.4.) and maintaining or enhancing indigenous biodiversity (Policy 11.1).

30. The policy framework of PC1 encourages the adoption and implementation of a tailored, risk-based approach to define mitigation options (Policy 2a); a sub-catchment approach to prioritisation of implementation of mitigation and management measures (Policy 8a, Policy 9a,b, c, and d); and application of best practicable options and mitigation or offsets for point source discharges (Policy 11 and Schedule 1). However, the regulatory framework of PC1 is such that it is unlikely to fully achieve its desired policy direction in this regard.

31. The focus of PC1 is on a limited suite of catchment-wide water quality parameters, combined with implementation methods that are largely inflexible and non-incentivising, focused around input control with the inclusion of output regulation for N through NRP. This is systematic of 'command and control' type regulatory approaches, which will be unlikely to deliver on integrated and holistic sustainable management of natural resources as effectively as a mix of implementation and regulatory methods that allow for more community and sub catchment focused initiatives. I have

found through my research studies (Kessels (2000)[5] and Kessels (2004)[6]) and experience that sub catchment scale, community based approaches to restoration, mitigation and monitoring lends itself to more effective, collaborative solutions than top down, 'command and control' approaches.

32. Implementation Method 3.11.4.5 of the proposed plan requires sub catchment scale planning to address such matters as identification of the causes of current water quality decline (3.11.4.5a), assessment of the effectiveness and efficient placement of constructed wetlands (3.11.4.5c), and integration with the regulatory requirements to fence waterways (3.11.4.5e), amongst others. The monitoring and accounting requirements of PC1 are required at a FMU scale using existing monitoring networks, sub catchment that are currently under-represented, and freshwater management units (implementation method 3.11.4.10). I am uncertain if the monitoring requirements of Implementation Method 3.11.4.10 are sufficiently prescriptive to measure the desired outcomes of PC1 at a farm and sub-catchment scale.

33. I support the officers' preliminary view that *"…focusing on sub catchments could have real benefits in terms of implementing local solutions and community commitment*…"[7] I also agree with Ms Jordan where in her evidence she states that policy interventions based on a 'one size fits all' approach, as proposed in some aspects of PC1, do not support holistic and integrated environmental outcomes, nor will they likely deliver on the water quality improvements sought by PC1.

34. Like Ms Jordan, I do not agree with the Officers' that a sub catchment approach "…*risks not having an 'eye on the prize', which is the health and restoration of the whole river system*."[8]

35. I note that the Officers' contend that "…*it is difficult to reach agreement within farming sectors (and between different sectors) as to what these*

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[5] Kessels, G.H.A. 2000. Conserving Biodiversity through collaborative management. An investigation of interactions between ecosystems and societal systems and the Whangamarino Wetland. Masters thesis. Massey University, Palmerston North, NZ.
[6] Kessels, G. 2004. In Search Off The Right Mix: An investigation of tools for biodiversity management. Report for Local Government New Zealand, Kessels & Associates.
[7] Section 42A, para 143, page 28
[8] Section 42A, para 143, page 28

kinds of enhanced mitigation frameworks entail and what reductions and contaminant losses can realistically be achieved."[9] The Officers' state that: *"While some of the alternative approaches put forward by submitters may have some merit and may result in a redistribution of contaminant losses across different land uses, there is very limited information provided to demonstrate whether or not the alternative approaches would result in freshwater objectives and water quality outcomes being met for the Waikato and Waipā catchments*." I do not agree with the Officers' dismissal of alternative approaches. There is a wide range of international and New Zealand based evidence to indicate that these approaches are effective. My reasoning is as follows.

36. Holling et al (1998)[10] suggest there is a crisis in resource management and advocate rethinking resource management science because of its non-linear, multi-sectoral, multi-scale and dynamic complexities. They advocate systems approaches and adaptive management. The 1980 World Conservation Strategy states that long-term management of natural resources depends on the support and co-operation of local people (WCEC 1987)[11].

37. Ecosystem management approaches to natural resource management, use and degradation is a viable alternative to command and control. An ecosystem management approach rests on the central principles of complexity, and uncertainty, and necessitates flexibility, anticipation and adaptation, rather than reaction and control (Lister 1998)[12]. It is based on a collaboratively developed vision of desired future ecosystem conditions at a local level (Lucy 1994)[13]. The spatial extent of the management unit is defined by ecological and not political boundaries. It integrates ecological, economic and social factors in a particular management unit, which in turn

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[9] Section 42A, para 145, page 28

[10] Holling, CS, Berkes, F and Folke, C. 1998. Science, sustainability, and resource management". In Linking social and ecological systems: management practices and social mechanisms for building resilience, Edited by: Berkes, F and Folke, C. 342–362. Cambridge: Cambridge University Press

[11] World Commission on Environment and Development (WCED). 1987. Our Common Future. UNEP, New York (Australian edition).

[12] Lister, N.E. 1998. A Systems Approach to Biodiversity Conservation Planning. Environmental Monitoring and Assessment Vol. 49: pp 123- 155.

[13] Lucy, W.H. 1994. If Planning Includes Too Much, Maybe It Should Include More. API Journal Vol. 60 No. 3. pp305-318.

is a pathway to provide ownership and empowerment of the local people to share in the management and monitoring of the natural resources in their area (Sunde et al, 1999)[14].

38. There is also New Zealand specific literature to indicate that collaborative, ecosystem management approaches are effective in achieving desired freshwater ecosystem health objectives. For example, Fenmemor et al (2011)[15] state, on the basis of a review of the Motueka integrated catchment management (ICM) research programme, that: "*achieving ecosystem resilience at a catchment scale requires active measures to develop community resilience.*" They conclude that: "*A primary observation from this research is that catchment management is more likely to achieve agreed objectives when it empowers stakeholders, taking into account their aspirations and values, and adapting as those aspirations and values change. Unless an effective social context and decision-making framework is provided, complex or wicked problems like land and water management are unlikely to be addressed or resolved. This not only risks environmental damage, but also a lost opportunity for social cohesion. It may also reduce the potential for social cohesion in the future."*

39. Sinner & Newton (2018)[16] provide further New Zealand based evidence and examples of effective management of diffuse contaminant leaching and run off at a community based, sub catchment scale, concluding that: "*because outcomes at a sub catchment and catchment scales are the result of multiple stressors originating from multiple properties, RMA[17] policies and rules aimed at individual properties may not achieve the objectives specified in regional plans. WMGs[18] offer a way through this problem, and many groups have emerged around New Zealand over the past 15 to 20 years to address local issues. To use this approach more widely under the National*

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[14] Sunde, C; Taiepa, T; & Horsley, P. 1999. Nature Conservation Management Initiatives for Whanganui Iwi and the Department of Conservation. School of Resource and Environmental Planning, Massey University.

[15] Fenemor, C Phillips, W Allen, RG Young, G Harmsworth, B Bowden, L Basher, PA Gillespie, M Kilvington, R Davies-Colley, J Dymond, A Cole, G Lauder, T Davie, R Smith, S Markham, N Deans, B Stuart, M Atkinson & A Collins (2011) Integrated catchment management—interweaving social process and science knowledge, New Zealand Journal of Marine and Freshwater Research, 45:3, 313-331,

[16] Sinner, J; Newton M. 2018. Water Management Groups: Preliminary Guidance. Prepared for Ministry for the Environment. Cawthron Report No. 3199. 15 p.

[17] Resource Management Act 1991

[18] Water management groups

Policy Statement for Freshwater Management, however, will require a more deliberate and structured approach, so that the combined actions of all the groups in a given catchment will achieve the community's desired outcomes for that catchment."

40. There are existing examples of effective, community based, ecosystem management approaches to addressing water quality and freshwater ecosystem and biodiversity health, which appear to be achieving national and regional policy directives in New Zealand. New Zealand Landcare Trust, for example, works with more than 150 land care groups in New Zealand, and many of these are effective at improving freshwater ecosystem health and enhancing biodiversity (NZ Landcare Trust, 2019)[19]. For example, the Pomahaka Water Care Group, Pomahaka Catchment, Otago, where farmers, supported by Landcare Trust and others, are taking control of the issue of addressing ecosystems health of their freshwater resources in order to achieve the water quality targets of Plan Change 6A of the Otago Regional Plan (Gregory 2014)[20].

41. Whilst acting as a regional representative for QEII National Trust I was made aware of the efforts tangata whenua, landowners, the regional council, the district council, the Department of Conservation and the tourism industry made collaboratively to address sediment runoff issues, which were affecting the glow-worm population of the caves. This was largely achieved by these stakeholders working collectively to implement mitigation and monitoring measures relating to runoff and leaching from above-ground land use practices on upstream farms (Pavlovich 2001)[21].

42. Sinner & Newton (2018) provide preliminary guidance advice for regional councils how community based, water management groups can be structured, and what regional council plans should contain to improve the likelihood that groups will achieve the freshwater outcomes sought by their communities.

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[19] http://www.landcare.org.nz/Landcare-Community (accessed February 2019)
[20] Gregory, J. 2014. Pomahaka Catchment Issues and Options to Improve Water Quality. NZ Landcare Trust report for Sustainable Farming Fund Project 13-053.
[21] Pavlovich 2001. The Twin Landscapes of Waitomo: Tourism Network and Sustainability through the Landcare Group. Journal of Sustainable Tourism 9(6):491-504

43. Based on my experience and the findings of Singer and Netwon (2018), I consider that the key elements which regional plans should consider to support and empower a water management group at a sub catchment scale, can be summarised as:

- Ensuring the water management group structure is at a sub catchment scale and representative of all stakeholders within that sub catchment, and that ideally the group has legal status;
- Specification of more than one outcome, e.g. a range of water quality and habitat standards, for every water management group confluence point;
- Policies and methods which provide clear criteria or conditions for a group to be recognised and what its environment plan must contain;
- A regional plan should specify that a water management group's environment plan must be approved by the regional council prior to implementation;
- The environment plans need to contain several key elements including – goals, mapping of land use and effects of each land use practice, mitigation actions, monitoring and reporting strategies, review and auditing processes, an adaptive management approach to account for the complex and non-static ecosystem management dynamics at play, and consequences for non-achievement.

44. I acknowledge that a myriad of small sporadic diffuse pollution inputs cannot all be monitored and managed reliably by government authorities, and thus a water management group approach may be difficult to provide certainty for Council in monitoring the efficacy of the plan. There are, however, examples in New Zealand and elsewhere where this potential issue has been addressed. As Sinner & Newton (2018) note: "*One approach to managing these diffuse effects is to allocate limits for individual pollutants to individual properties. This is usually based on models that may not accurately reflect physical processes and cumulative effects, leaving environmental outcomes in doubt and land users questioning the models (Duncan 2014). Another approach is to require land users to adopt specific 'good management practices'. This provides some certainty of actions and costs but delivers uncertain environmental outcomes and, without other*

controls, may allow further intensification. Hence, both approaches have limitations and may not deliver what the community expects. Collective management offers a way to focus more on achievement of desired outcomes, especially where multiple stressors are involved. By assigning environmental responsibilities to a water management group rather than an individual land owner, land users have more flexibility to identify place-specific mitigations. Members are accountable to each other as well as to the wider community, creating peer pressure to improve performance."

45. PC1 both allocates N discharges at the property scale as modelled by OVERSEER, and while a suite of practice standards, such as stock exclusion from waterbodies through fencing, is required, the approach of the proposed plan has the limitations of command and control approaches to natural resource management, as set out above. As an alternative, the findings from my review of the literature and case studies outlined in paragraphs 32- 45 above indicate that PC1 should be amended to allow for incentivising water management groups, as long as they have sound administrative and management structures, and can demonstrate measurable improvements they may make to ecosystem health and biodiversity improvement at sub catchment levels.

46. In my opinion PC1 does not give sufficient recognition to the ecosystem health and biodiversity policy directives of the NPS_FM, and the WRPS. Dr Mueller, in her evidence in chief, notes that the NPS-FM requires that PC1 must give effect to the life supporting capacity of freshwater systems that must be safeguarded (her paragraph 14). As Dr Mueller states in her evidence, alternative parameters and freshwater objectives must be included in PC1 to provide for ecosystem health and processes, and that these parameters should encompass attributes of overall ecological health, such as oxygen levels or biota that can indicate that an ecosystem can sustain diverse life (her paragraph 18).

47. PC1 requires individual FEPs to be implemented (Rules 3.11.5.2, 3.11.5.3 and 3.11.5.4) as prescribed in Schedule 1. I support the use of FEPs as a tool to achieve the policy directives of PC1. However, the effectiveness of FEPs will be curtailed by these same rules, which also require mandatory stock exclusion provisions by fencing in relation to slope for certain lands regardless alternative methods developed through the FEP process. In

effect, the fencing regulations could override a mix of potentially more effective or efficient on-farm management or edge-of-field mitigation alternatives identified during the development of individual FEPs, especially for those farming systems on more diverse geologies and slopes above 15 degrees. The reason being is that farmers will have to prioritise resources towards erecting and maintaining fences for stock exclusion of waterways on slopes greater that 15 degrees (and less than 25 degrees), thereby reducing opportunities and resources to use other management and mitigation options available to achieve similar or more effective outcomes.

48. In this regard I support the evidence of Dr Beetham where he states in paragraph (14): "*Sheep and beef farm systems are complex and diverse. There is huge variation in topography, soil type, climate, stocking rates and livestock policies. No two sub-catchments are the same and often no two farms are the same.*" In addition, from an ecological perspective these farms also have variations in their bio-physical and biodiversity values, as do the sub-catchments they reside in.

49. I therefore agree with the Land and Water Forum (LAWF) fourth report, which suggests that while exclusion from some waterbodies should be required by the national [and regional] stock exclusion regulation, additional stock exclusion requirements should still be able to be set by local communities, councils and collaborative processes. The report contends that this: "..*recognises that identification of particular waterbodies has to happen at a local level and allows local communities to decide on whether or not stock should be excluded from them on the basis of a risk assessment. The key consideration is weighing the environmental benefits of exclusion from these waterbodies against the costs, impracticality and disruption of grazing practices that landowners would suffer. Local discretion also allows communities to move to exclude stock faster than the dates outlined in a national regulation if they identify critical source areas for contaminants or areas that have particular ecological, cultural or social value.*" (Sections 211-212, LAWF 2015)[22].

[22] Land and Water Forum. 215. Fourth report of the Land and Water Forum. Land and Water Trust

BEST PRACTICE MITIGATION AT FARM AND SUBCATCHMENT SCALE

50. As discussed above, management of contaminant losses from farms needs to occur at the individual farm scale using tailored FEPs. The gains accrued from FEPS can be increased if a collaborative, water management group, sub-catchment scale approach is taking to identifying and implementation the most efficient and effective mix of possible measures to reduce contaminant losses and restoring ecosystem health. Doole (2015), in support of his assumptions for the mitigation parameters for his economic model, concludes that "*farm plans were appropriate to define as the primary mitigation instrument for hillslope erosion...*" (page 14) and that "*Farm plans are assumed to achieve a 70% reduction in sediment loss, once all actions have been adopted*." (page 14).

51. Fencing stock from waterways has a number of direct and positive effects on reducing pollution runoff and enhancing biodiversity values (for example, Belsky et al. (1999)[23] and McDowell et al. (2017)[24]). However, McDowell et al (2013)[25] concludes, the effectiveness of fencing off stock as a strategy to mitigate contaminant loads is highly site and contaminant specific, ranging from highly effective in flat areas and where contaminants are particulate associated, to very ineffective in steeper areas and where contaminants are mobile. In addition, while some research has indicated the efficacy of riparian zones for nitrate removal, there is a well-established concern that these areas could act as a *source of nitrogen*, if vegetation is not regularly cut and removed, as both Doole (2015) and Doole et al (2016) acknowledge. In hill country areas logistics related to blanket fencing may contribute to further decline in the water quality through vegetation clearance required for access track building and maintenance for fences as well as being potentially difficult to implement. Mr Beetham discuss the practical consequences and costs associated with blanket fencing in

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[23] Belsky, A.J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. J. Soil Water Conserv. 54:419 -431

[24] McDowell, R.M.; Cox, N.; Snelder, T.H. 2017. Assessing the Yield and Load of Contaminants with Stream Order: Would Policy Requiring Livestock to Be Fenced Out of High-Order Streams Decrease Catchment Contaminant Loads? Journal of Environmental Quality. 46:1038–1047.

[25] McDowell, R.W.; Wilcock, R.J.; Hamilton, D. 2013b. Assessment of Strategies to Mitigate the Impact or Loss of Contaminants from Agricultural Land to Fresh Waters. Ministry for the Environment, Wellington, New Zealand.

relation to slope in his evidence (for example, his paragraphs 34 and 86-92).

52. Doole (2015) provides evidence to show that while a 5 m wide stock exclusion, planted buffer strips can reduce total nitrogen range from 16% to 25% for dairy farms, for drystock farms the reduction in total nitrogen to receiving waterways is less, ranging from 7 to 15%. Generally, the primary benefit of fencing streams from stock in terms of reducing nitrogen and phosphorus inputs into waterways are by abating urinary deposition by restricting direct access of cattle to the streams, noting that sheep show less propensity to enter waterways than cattle (Doole 2015).

53. Thus a targeted approach to a range of management and mitigation measures that also involves critical source and high ecological value area identification and management is likely to be more a more effective approach to attenuating a broader range of contaminants on hill country farms in many situations.

54. There are a range of proven on-farm management methods, riparian buffer zone and edge-of-field mitigation methods available which can be applied at an FEP or water management group, sub catchment scale. The evidence of Mr Parkes, Dr Mueller, Mr Beetham and Dr Chrystal discuss the environmental and economic benefits of the range of management and mitigation measures which can be adopted.

55. In terms of methods available to assist farm management Dr Chrystal lists tools such as AgInform®, MitAgator and Land Utilisation Capability Indicator (LUCI) as part of a suite of decision support tools to help aid in the generation of an individual FEP, which can assist in optimising the farming system and farm management to the natural characteristics of the farm, and catchment. In particular, MitAgator and LUCI have the potential to assist farmers and communities understand spatial patterns of risk at the catchment/sub catchment scale and then apply targeted action through FEP to deliver on cumulative catchment/ sub catchment outcomes. Dr Chrystal contends that they would add value by identifying critical source areas on farm, show the optimal farm system and financial outcome, and assist farmers or land owners to understand the implications of individual farm leaching and contaminant loss at a wider catchment scale.

56. Mr Parkes in his evidence, provide evidence that shows overland flow is the primary contaminant transport pathway associated with sheep and beef farming, although the nature and scale of this loss are highly variable throughout the region. He states that N loss to water is proportionally much less of a concern for the drystock sector and that critical source area management is one of the best ways to mitigate environmental risk associated with sheep and beef farming, with up to 80 percent of sediment and P mitigated in this way. Mr Parkes considers that Land Environment Planning provides the most efficient and effective way of identifying the opportunities and limitations of the natural capital assets (climate, soil, topography, biodiversity, and water) of the farm, including the identification of critical source areas, and ensuring that farming systems and practices sustainably manage these natural resources.

57. I consider that the identification and management of critical source areas at the sub catchment and farm level is the most effective approach to mitigate the environment risk associated with sheep and beef farming, because the risks associated with sheep and/or beef farming on rolling hill country is primarily by overland flow paths and through critical source areas of contaminants. Consequently, edge-of-field management approaches should be focussed on identifying these overland flow pathways and critical source areas, with mitigation tailored to reduce or avoid the overland flow of contaminants. The additional benefits of this approach is often these critical source areas are remnant seep wetlands, small low-order streams and springs, surrounded by indigenous vegetation, which will also generally benefit from targeted environmental mitigation.

58. Dodd et al (2016) also agree that for drystock farms the greatest efficiency and long-term gains in reducing contaminant discharges is best achieved when specific mitigations are:

- Chosen on the basis of suitability to the farm;
- Implemented on the basis of cost-effectiveness; and
- Implemented in critical source areas.

59. Edge-of-field mitigation measures, combined with tailored riparian buffer zones, when applied strategically at a farm and sub-catchment scale, i.e. not as a blanket fencing approach, and combined with on farm management

activities, can provide effective alternative approaches to attenuate the runoff of sediment and nutrients, within productive farming landscapes, while enhancing biodiversity values (Parkyn 2004)[26].

60. Doole (2015) does not apply the full range of riparian management and edge-of-field mitigation tools available in the economic modelling commissioned by the technical leaders Group for the Healthy Rivers Wai Ora Project. For example, as an alternative to riparian strip fencing, Parkyn (2004) provides a summary of a range of other riparian management options, including:

- Headwater or riparian wetlands: Fenced wetlands as hotspots for nutrient removal;
- Rotational grazing: Filter strips with varied stock grazing practices, such as occasional light grazing by sheep;
- Forested or planted native or production trees: a buffer of native trees to return ecological function to the stream and provide water quality benefits; and
- Multi-tier system: a combination of buffers where native forest trees may be used beside the stream to enhance ecological function and biodiversity, a buffer of production trees may occur outside of that and at the outer edge beside agricultural land a grass filter strip may be used.

61. There are also a range of edge-of-field mitigation measures which can be adopted by individual farmers, or at a subcatchment level. They include: detention bunds, constructed wetlands, sedimentation ponds and traps, swales, and water distribution networks. Edge-of field measures are most effective when they are combined, for example sedimentation and wetland combinations.

62. Doole (2015), provides a useful description (section 11) and tabulation of the efficacy of a range of different edge-of-field mitigation strategies (Table 14). This shows that for detention bunds, efficacy for N reduction is 10%

[26] Parkyn, S. 2004. Review of Riparian Buffer Zone Effectiveness. MAF Technical Paper No: 2004/05. Ministry of Agriculture and Forestry, Wellington, NZ.

and 30% for P reduction. For small constructed wetlands the efficacy is 20% reduction for N and 35% for P, while for medium constructed wetlands the efficacy is 40% reduction for N and 70% for P.

63. Constructed wetlands are an effective mitigation tool for reducing sediment and nutrient inputs to waterways. For example, effective removal of N inflows in the wetlands of the Tutaeuaua sub-catchment of Taupo was attributed to denitrification in that wetland (Collins et al 2005)[27]. However, constructed wetlands must be designed specifically to extract N (by denitrification) or to capture P (and sediment). A single wetland design cannot do both effectively and for any duration. Thus if N and P and sediment are issues on one farm or subcatchment then the most effective approach is to build several wetlands (or wetland bays) in series, each one specifically designed to manage one contaminant (MacGibbon pers com)[28].

64. Doole (2015), presents a summary of the sensitivity analysis of the economic model in Table 16 of his report. While I agree that the model is robust to significant changes in costs and nutrient removal efficacy parameters for the set of mitigations reported in the model, it does not analyse a wide range of potential mitigation and management scenarios, which reduces its robustness. Doole et al (2016) acknowledge that FEPs are a core part of the proposed PC1, but it is challenging to simulate the range of mitigation and management options and assumptions in the simulation modelling.

65. In addition, I consider Doole (2015) has not supplied sufficient information to identify the underlying land use assumptions and implications of how this impacts the scenario output in the sensitivity analysis of the model, particularly for the Upper Waikato FMU. It would thus be useful to have more information available to understand how the model is calibrated for a range of edge-of-field mitigation options at an on-farm and sub catchment/landuse scale and how this relates to each scenario output. Of concern is how the predication error by the aggregation into representative

[27] Collins, R.: Elliott, S; Adams, R. 2005. Overland flow delivery of faecal bacteria to a headwater pastoral stream. Journal of Applied Microbiology 99:126-132
[28] Principal Environmental Consultant, Tonkin and Taylor Ltd

farms effects the model outputs in terms of estimating contaminant losses and flow paths.

66. Aside from having a lack of data of sufficient quality and quantity (as acknowledged by Doole et al 2016), the model does not analyse the full suite and combinations of mitigation and abatement choices/options. For example, 'large' constructed wetlands, have been omitted from the analysis. Despite acknowledging their value, especially when combined with other management and mitigation options, they have been omitted "*because their cost and large scale mean that they are unlikely to be broadly used across the catchment*" (page 14, Doole et al 2016). Doole et al (2016) provide no evidence to support their assumption that cost and large scale will result in non-adoption by landowners. Further, given there is no regulatory requirement in PC1 to fence streams off in very steep country (greater than 25 degrees), large constructed wetlands would also capture and attenuate contaminant runoff from these localities as well as less steep reaches should they occur within the same sub catchment.

CONCLUSIONS

67. Council has not undertaken sufficient analysis to take into account the full range of mitigations and benefits that could be achieved through targeting measures at critical source areas, tailored FEPs, and collective action through tailored, sub catchment approaches.

68. Doole et al (2016) state that overall, the proposed policy mix of PC1 constitutes: "..*an attractive value proposition in terms of economic and water quality outcomes that it achieves. However, <u>these</u>* [model] *<u>results are conditional on achieving rapid and significant levels of adoption of mitigation actions across the catchment</u>*" (page 46 – my emphasis).

69. My evidence demonstrates that the implementation methods and rule set of PC1 does not utilise or incentivise best practice in terms of enabling widespread collaborative management through instigation of water management groups at sub catchment levels.

70. Nor does the plan encourage best practice for hill country farmers, by restricting adoption of a full range of mitigation options through the blanket fencing rule set, with slope being the only determiner.

71. PC1 is unlikely to fully provide for an integrated, holistic and coordinated approach to the management of the Waikato and Waipā river catchment as required by the Vision and Strategy or the WRPS, particularly for drystock farmers on steeper land. By focussing on a limited suite of water quality parameters, PC1 may not provide sufficient direction to ensure overall ecosystem health is safeguarded and biodiversity is enhanced as the plan is required to do by the NPS-FM, WRPS and the Vision and Strategy.

72. Thus, the overriding 'one size fits all' blanket rules, such as those requiring stock exclusion or/and application of the NRP, and a failure to recognise and empower subcatchment management frameworks and collective community approaches, as well as imprecise requirements for monitoring, means the proposed plan is unlikely to achieve rapid realisation of the desired outcomes predicted in the model it has used as its foundation.

73. To achieve the desired water quality outcomes and ecological health set out in the NPS-FM, the WRPS and the Vision & Strategy, a more collaborative, ecosystem management based approach is needed in the implementation methods and rule set of PC1.

74. Creating implementation methods and rules which allow for greater input into the mitigation and monitoring requirements by landowners in sub catchments is like to result in the implementation of a wider, more flexible sub catchment focused and more site-appropriate range of riparian and edge of field mitigation tools. This approach will also create greater opportunities to measure the effectiveness of these local measures. A better platform for increased and more measurable positive outcomes, particularly for hill country lands, as well as a more rapid and enduring uptake that the current proposed plan currently provides, will be the result of this approach.

75. My opinions are based on my current understanding and review of the evidence, literature and data referenced in my evidence brief, including reports supplied by Waikato Regional Council. In particular, I have relied on the information and evidence of others, particularly where it is relevant, but outside of my areas of expertise. I reserve my final opinions subject to review of further evidence provided by other experts and Council staff, and any subsequent caucusing.

DATED this 15th day of February 2019

Mr Gerry Kessels