BEFORE THE HEARINGS COMMITTEE

IN THE MATTER **of hearings on submissions concerning the Proposed One Plan notified by the Manawatu-Wanganui Regional Council**

SECTION 42A REPORT OF ALLAN KIRK ON BEHALF OF HORIZONS REGIONAL COUNCIL

INTRODUCTION

BACKGROUND

1. My full name is Allan Norman Kirk. This evidence has been requested as further information with relation to a number of matters that have arisen from the Hearing to this point. The nature of the evidence will be restricted to answering specific questions in response to the Chairperson's Minute No. 3.

SCOPE OF EVIDENCE

2. My evidence is limited to providing an expert opinion on the questions submitted via the planning team.

EXECUTIVE SUMMARY OF EVIDENCE

3. Increasingly, there is a need for specialist knowledge to function in any business in today's dynamic business environment. This is especially true of agriculture, the prime users of our Region's soils and the custodians of our water resources. The Regional Council employs both young and experienced land management officers who are adept at offering practical, pragmatic and profitable solutions to many of the issues relating to our soil and water resources. The increasing sophistication of these solutions requires ongoing training and access to scientists, research papers, and experienced practitioners in a wide field of endeavours.

4. Access to this knowledge is currently easy, ie. call your regional council and a land management officer will make an appointment. For environmental projects this generally means access to knowledge, facilitation and resources to achieve solutions. It can also mean making successful decisions around soil and water resources. This could include retaining important woody vegetation, effective farm tracks, effective soil conservation around cropping or forestry and protection of fragile soils in both hill country and unique coastal areas.

5. However, it is my experience that as we have relaxed the rules with regards vegetation clearance and soil disturbance, more of the work we now undertake is remedial rather than preventive. There are still many landowners who view environmental sustainability as a priority. I believe rules to protect our soils and water resources are vital. These resources are dynamic and need increasingly improved techniques to ensure their future worth.

QUESTIONS RAISED BY PLANNERS

6. The Chairperson's Minute No. 3 included several areas where further expert input was either requested or is considered necessary to clarify particular issues. To assist in focusing this further evidence, I have been asked to provide advice on the following questions posed by Horizons' planning officers:

Question 1 **– Is a five-metre riparian setback for vegetation clearance appropriate? Does it provide for adequate bank stabilisation? Is the definition of waterway appropriate in hill country and would it capture the right streams where erosion is a concern?**

(a) Riparian setbacks are effective for two key functions that are important for soil conservation purposes. Firstly, they trap and utilise nutrients/sediments that have been mobilised or deposited in ephemeral or stream beds; and secondly, they play an important role in reducing the potential for both streambed and streambank destabilisation.

(b) These abilities to trap and stabilise are only effective if the vegetation is mature and protected. A five-metre (hill country) riparian setback of woody vegetation would be effective once it had achieved maturity as it would act as a natural physical barrier and prevent animals from grazing other important plant species that would then be able to develop. Such natural barriers are a pragmatic alternative to fencing, which would be impractical in most hill country scenarios.

(c) The trapping and utilisation of nutrients and sediment is best accomplished by protected and/or retired grasses and or flaxes. Grass/flax, including indigenous species, develops extensive root systems that allow high levels of nutrient up take. Additionally, overland sediment flows accumulate around the base and leaves of plants that are protected from grazing animals. The retention of a natural woody vegetative riparian setback would address a high proportion of nutrient and sediment issues.

(d) At maturity, succession woody plant species such as manuka and kanuka develop extensive lateral root networks that align with the drip-line of the shrub/tree. These lateral root networks are extremely effective in the first metre of soil and regolith (the layer of loose, heterogenous material covering the rock base) at reducing the potential for streambed or streambank erosion. The root systems interlink, forming an underground network of features including polysaccharides (a glue-like substance) that could help bind the soil into a one-metre deep and 12-metre wide integral unit.

(e) Erosion events can be reduced more effectively with root networks in lower order streams and ephemeral waterways. This is due to the morphology of streambeds, which are predominantly characterised by shallow channels less than one metre in depth and less than 2 m in width. As previously described these can be successfully stabilised by the lateral root systems of manuka and kanuka, from a five-metre riparian setback.

(f) A high proportion of hill country sediment is reactivated by weakly consolidated streambeds with steep gradients. They vary in width and are often considerably narrower than the two-metre threshold. In addition, they are generally unprotected by any form of retained grasses/flax species and or woody vegetation. This makes these narrow beds and banks increasingly vulnerable to erosion. The retention of a five metre riparian setback on all permanent or ephemeral beds would add greatly to the stability of our hill country and reduce sediment levels in our waterways.

Question 2 **– Do you think that 100 metres of tracking as a permitted activity on EMA is appropriate? If no, please explan of why not, eg. examples of where 100 m of tracking have caused a problem and what you consider an appropriate permitted allowance would be before resource consent is required.**

(a) Hill country EMA is inherently unstable by its very definition. Hill-slope stability is reliant on a number of inter-related characteristics. These characteristics include ephemeral drainage patterns, drainage beds, colluvial slopes and upper slopes.

Any damage (soil disturbance or vegetation removal) to any one or part of these characteristics will affect general slope stability.

(b) Other factors, such as rock type, soil type, slope, aspect, actual erosion, prevailing weather, vegetation cover, and land use, also effect stability on EMA. These factors impinge on a characteristic, individually or collectively changing the rate and quantity of accelerated erosion, rather than being a trigger.

(c) Figure 1 (EMA) shows severe earthflow and soil slip on LUC Class VIIe4 (moderately consolidated tertiary aged siltstone lithologies). This track will require annual maintenance at a cost to the farm. In addition, the waste material removed will be placed in the easiest position. This will increase the amount of unprotected sediment that can be affected by rain and storm events. Figure 2 (EMA) shows severe soils and moderate sheet erosion on LUC Class VIIe5 (moderately consolidated tertiary aged sandstone). This track has compromised the entire slope and there will be a cost to either protect or provide annual ongoing maintenance.

(d) Tracking on non EMA should be permitted without any consent requirements. However, the development of a code or best management practices should be incorporated into farm planning and this should include sediment control, drainage, water management, and establishment criteria.

(e) EMA generally require significant or complete land use change. Allowing tracking on these soils would be totally contrary to any goal of reducing accelerated erosion or sediment/nutrients moving in hydrology systems.

(f) It is my opinion that no disturbance should be accepted on EMA without a discretionary resource consent process.

Question 3 **– Provide some explanation and justification for why the seven-year old threshold is appropriate**

(a) The seven-year threshold is appropriate for allowing uncontrolled clearance of woody vegetation is related to the maturity and size of plants and, in particular, their ability to develop effective root mass. It aligns with standard soil conservation advice relating to the age of conservation species. Poplars, forest plantations and replanted commercial forest are recognised as having less effective stabilising ability until they reach the seven-year threshold. This also true for manuka and kanuka regrowth. The size, maturity and canopy development becomes significant after the seven-year threshold.

(b) Root size and mass, grass shading effects, soil binding features, canopy cover and plant size all impact on woody vegetation's ability to reduce erosion potential. These attributes all develop with age and reach a critically effective point around the seven-year mark.

Question 4 **– Is harvesting of forestry an appropriate activity in coastal erodible land and on the foredune? What sorts of controls are needed to manage adverse effects in these areas?**

(a) Foredunes are extremely fragile when in both a disturbed state, and even when in a natural state. Retention of appropriate healthy vegetation in these areas is imperative. Their (coastal soils) stability will be extremely compromised by any vegetation disturbance, including forestry operations.

(b) Forestry harvesting on foredunes is an 'easier' operation than on steep hill country. Slope angles and lengths allow the ability for the possibility of less environmentally skilled operators to log in these areas. This could lead to extreme soil erosion events impacting on ecological areas, infrastructure, waterways, or productive farm land.

Question 5 **– What are your views on restrictions on planting forests in riparian areas? Has this kind of planting caused a problem in our Region? What would be an appropriate setback if one is required?**

(a) The nature of commercial trees in conservation or riparian areas is such that they should be required to be harvested. They are simply not adapted as 'retirement' and/or riparian plantings. Their size, silviculture and characteristics mean they will have detrimental side effects if retained as long-term conservation trees.

(b) Commercial forests have high initial stocking rates to promote growth characteristics that are economically driven rather than environmentally driven. These stocking rates result in individual trees becoming interdependent on their neighbouring trees for stability. Retaining selected riparian or conservation trees after harvesting would create environmentally compromised situations. In addition, most commercial tree species become top heavy at maturity. This creates what is referred to as developing a greater sail area or susceptibility to wind damage. The high stocking rates and mature tree increase their susceptibility to wind throw.

(c) Further, most commercial tree stocks have managed root systems. The seedlings' root systems are wrenched, or reduced, in the nursery to allow for ease of handling and planting. This results in changes to root morphology, affecting both lateral and tap root development. As riparian or conservation trees their singular environmental ability is compromised by this wrenching process.

(d) Restrictions on planting in environmentally sensitive areas, such as riparian, is economically beneficial. Trees in these areas require high levels of consultation, careful planning and intensive labour requirements to safely harvest without impact on key sites. In addition there is often increased risk from storm or flood events and if the tree is damaged or lost, any economic return to the forest owner is obviously affected.

(e) A minimum six-metre riparian setback would be extremely beneficial to both foresters and environmental agencies. (I acknowledge that five metres is the current rule in the Land and Water Plan. I note for your information that the zone of significant influence for commercial tree roots in a number of studies has been determined as six metres).

Question 6 **– Describe the vulnerability of sand country to wind erosion. Describe land use activities that have high potential to cause erosion effects (cultivation, dune re-contouring, etc). Describe the controls that should be put in place to manage this.**

(a) Coastal foredunes and recent dunes systems have the most erosion prone soils in our Region. Their erosion potential is in some cases as extreme or greater than 60%. Any disturbance of the vegetation in these areas would result in wind dislodging any exposed soil and or parent material to the point where remediation would be very difficult. Sand plains (both wet and dry) are less susceptible to wind erosion due to their greater ability to retain vegetative cover.

(b) Figure 3 (EMA) is a Waitarere soil LUC Class Vie24 (rock type windblown sands) where land use options have created very severe wind erosion. Figure 4 (EMA) in Waitarere soil LUC Class VIIe15 (rock type windblown sands) is an example of less effective management of a foredune soil.

(c) Soils in the recent dune phases are the Waitarere sand, Hokio series (generally described as dry sand plains but often appear in association with dune sands), and Foxton series. All these soils require control of all soil disturbance activities such as cultivation, re-contouring, developing house platforms, forestry, grazing, and roading. All soil disturbances, including vegetation removal, have the potential to extremely exacerbate wind erosion on all sand dunes or sand soils.

(d) Control is needed over management, activities, types, timing, re-vegetation, restricted areas, vegetation retention, conservation structures and development options. As with EMA hill country, some activities in EMA sand country should be restricted to discretionary consent requirements.

Question 7 **– Explain the map of coastal highly erodible land currently in the One Plan, ie. what soils does it cover? Explain why it covers these particular soils and comment on whether it covers the appropriate area.**

(a) Soils of the coastal sand can be divided into three distinct groups – dunes, dry sand, plains and wet sand plains. Dune soils have little development in terms of profile and accumulated organic material. This results in dune soils having very few cohesive characteristics and they are therefore highly susceptible to wind erosion. The dry sand plains are more prone to wind erosion if cultivated and/or disturbed in dry periods. Wet sand plains are not an erosion consideration unless the water table is compromised. The map of coastal EMA needs to cover all the dune areas and parts of the dry sand plains so as to include these at-risk soils, including Waitarere sand, Hokio series and Foxton series.

(b) The appropriateness of determining the EMA (dunes) by use of a general map is difficult. The map is restricted by the fact that all three groups of coastal sands can and often do appear in the same paddock. As the soil maps are at a scale of 1:50,000 this results in the soils being lumped into what is the dominant soil type for the area. The interpretation is that a 1:50,000 map which incorporates the at-risk soils is too inclusive. In contrast, attempting to define the at-risk soils at 1:5,000 would be costly and an ongoing process due to the dynamic nature of sand and sand dunes. The map as it exists is effective at encapsulating all the relevant soil types within the Coastal EMA.

(c) The conservation requirements are to identify the at-risk soils. This could be more successfully better achieved by a definition such as, ‘any loose or unconsolidated parent material within 10 centimetres of the surface’. Consent conditions could then be applied to these defined soils.

(d) Figures 3 and 4 both represent Waitarere soils (AEM) that need to be incorporated into any protection areas. Note the Hokio soil in the foreground of Figure 4 adjacent to the Waitarere soil.

Question 8 **– Provide some evidence about erosion on cultivated land. Provide your opinion on whether a setback from waterways would help mitigate the adverse effects of cultivation. Provide your opinion on whether cultivation of hill country is likely to cause the same or more adverse effects than cultivation of**

'flat' land. Are different controls needed on flat land or hill country for cultivation?

(a) The LUC Class I-IV soils of our Region are generally not developed from in situ materials. They are formed by loess, alluvium or andesitic tephra deposits. Figures, 5, 6, and 7 are all examples of a mix of loess and adesitic tephra on uplifted marine terraces. Under cultivation soil structure is severely compromised to allow the development of a good seedbed for the cash or feed crop. This structural destruction allows overland flows of fine materials that are now effectively unconsolidated. The original parent material was transported there by wind or water. The same processes will possibly now remove them. This overland flow is shown in Figures 5, 6, and 7. No riparian setback is in place in and soil loss is maximised in Figure 7.

(b) Figure 7 is LUC Class IIIe4 with slight streambank erosion occurring, needlessly. Simple grassed buffer setbacks would reduce this considerably.

(c) All cultivation places soils at extra risk from wind and rill erosion. In a soil health sense soils should be spelled, depending on soil types, every 3-7 years for a period of 3-5 years. Soil cultivation practices such as minimum tillage moisture levels and timing should all be incorporated into protecting one of our most valuable natural resources, specifically our Class I-IV soils.

(d) Hill country cultivation faces the same issues and requires the same considerations. Due to slope characteristics and downstream effects, the possible resultant problems are magnified. While soils are developed from *in situ* materials (under natural forest), all cohesive factors within the soil are destroyed under cultivation, thus increasing the erosion risk. Soil quality issues are not as relevant on hill country as cultivation costs are more prohibitive, so cultivation cycles are less relevant.

***Question 9* – Provide evidence on whether there needs to be some control of forestry operations over and above that provided by the current Land and Water Plan rules. How well have these worked? Provide examples where more control would have been beneficial.**

(a) The current suite of rules allows activities to be undertaken with no land management input. In many cases this is not an issue as responsible landowners ensure their soils are well protected. However, new entrants to the industry fail at times to recognise the wide range of environmental considerations required at logging time. The damage often has been done by the time land managers are called to clarify the issues or remedy the problem.

(b) I believe the rules have been largely unsuccessful. The failures by a small minority of operators are unfairly viewed as an example of the whole industry's environmental ethic. The image of forestry would be enhanced by greater environmental perspectives brought to bear on EMAs through the consent process. In addition, the restrictions of the consent process would reduce the influence of the small minority and thereby offer greater environmental protection to our fragile soils and our receiving water bodies.

(c) Problems become issues and create effects that could have been reduced mitigated or eliminated if relevant input had been sought at the appropriate point.

***Question 10* – Do the proposed rules need to apply to EMA on Defence Force land or are their current management plans and practices sufficient?**

(a) No the current rules need not apply to Defence Force land. Their current management plan is sufficient and land management officers would, if concerns arose, request them to comply with their own plan regulations.

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Allan Kirk
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