

**BEFORE THE ENVIRONMENT COURT  
I MUA I TE KOOTI TAIAO O AOTEAROA**

**IN THE MATTER** of the Resource Management Act 1991 ('the Act')

**AND**

**IN THE MATTER** of an appeal under Clause 14(1) of First Schedule to the Act

**BETWEEN**

**RAYONIER NEW ZEALAND LIMITED**

Appellants in ENV-2018-CHC-49, and section 274 party to appeals: ENV-2018-CHC-40 Federated Farmers of New Zealand, ENV-2018-CHC-46 Southwood Export Limited & Others, ENV-2018-CHC-50 Royal Forest and Bird Protection Society of New Zealand Incorporated

**AND**

**SOUTHLAND REGIONAL COUNCIL**

Respondent

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**WILL SAY STATEMENT OF CHRISTOPHER JOHN PHILLIPS**

Date: 29 October 2021

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Judicial Officer: Judge Borthwick

## **MAY IT PLEASE THE COURT**

### **INTRODUCTION**

- 1        Manaaki Whenua Landcare Research was commissioned by Rayonier New Zealand Ltd (Rayonier) in October 2021 to provide written evidence pursuant to submissions/appeals under the RMA relating to the Proposed Southland Regional Council Water and Land Plan.
- 2        My evidence is given on behalf of Rayonier in relation to Decisions Version (4 April 2018): Cultivation Definition and Rule 25 Cultivation on sloping ground.

### **QUALIFICATIONS AND EXPERIENCE**

- 3        I am a Senior Researcher – Erosion Processes at Manaaki Whenua – Landcare Research.
- 4        My qualifications include a Bachelor of Science in Geology and Physical Geography from Otago University, a Master of Science with Honours in Earth Sciences from the University of Waikato and a PhD in Agricultural Engineering from the University of Canterbury.
- 5        My specialist areas are the assessment of erosion processes and slope stability, forest harvesting effects on erosion and sediment delivery to streams, the role of vegetation in mitigating erosion and integrated catchment management.
- 6        My qualifications and experience as an expert are set out above and I confirm that the issues addressed in my evidence are within the scope of my expertise.

### **SCOPE OF EVIDENCE**

- 7        My statement of evidence will cover the following:
    - (a)     What erosion is, what causes it, how it is mitigated.
    - (b)     The susceptibility of Southland landscapes to erosion generally and regional sediment yields.
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- (c) How forestry activities/operations affect erosion processes and sediment yield.
- (d) The specific forestry activity of windrowing and its influence on erosion and sediment yield.
- (e) The specific forestry activity of herbicide spraying and its influence on erosion and sediment yield
- (f) The suitability of Rule 25 (Cultivation on sloping ground) to act as a “control” to reduce the impacts of erosion and deliver the water quality outcomes it seeks.

## **SUMMARY OF FINDINGS**

### **Context**

- 8 Compared to other parts of New Zealand, Southland is regarded as not being highly erosion prone. It ranks at the bottom of regions in terms of inherent susceptibility of land to erosion (erosion risk) under the National Environmental Standard for Plantation Forestry (NES-PF) erosion susceptibility classification system.
  - 9 Excluding Fiordland National Park, only 11% of land in Southland is zoned either high or very high erosion risk under the NES-PF. Most land (75.9%) is zoned low erosion risk.
  - 10 Modelled suspended sediment for Southland indicates 8% is derived from bank erosion, with 92% from surficial erosion. Surficial erosion is thus the key erosion process in much of Southland.
  - 11 In the context of plantation forestry, harvesting (including mechanical land preparation for the next rotation) is often associated with a period where erosion and sediment yields will increase. In part this is because the physical removal of the tree canopy exposes the soil’s surface to the direct impacts of rainfall.
  - 12 Research indicates that if areas of deep disturbance can be minimised this will have a positive effect on post-harvest sediment generation from rain splash and surface erosion (slope wash). Deep disturbance occurs in areas where
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mineral soil is exposed by soil scraping (i.e. logs being dragged to landings, or by earthworks).

- 13 To put this into perspective, research indicates that slope wash is the least important sediment generating process and slope wash from deep disturbance sites contributes only a very small proportion (2%) of total sediment to waterways. By comparison, soil scraping and land sliding contribute 26% and 72% respectively.
- 14 Research also indicates that most generated (eroded) sediment from bare areas, including landslide debris (not a common process in Southland), does not travel far from its source, getting trapped by micro-topographic features on the slope or by harvesting residue. Where sources are close and connected to the stream network, sediment may enter the stream.
- 15 Sediment generation and any potential increases in sediment yield that might occur during and following site preparation will be affected by geology, soil type, slope steepness, initial vegetation cover, litter and residue cover, climate (rainfall), amount of bare area immediately following harvesting and the amount and degree of soil disturbance following any mechanical site preparation.

#### **Rule 25 and cultivation definition**

- 16 The primary purpose of Rule 25 is assumed to be on reducing sediment entering waterways from a range of management practices in the preparation of land for productive use. As worded, it appears to be primarily focused on agricultural practices rather than forestry practices.
- 17 In the context of plantation forestry, it seems odd that spraying has been included in a rule that is focused (titled Cultivation) on practices that physically disturb the soil. Spraying doesn't have a physical impact on the soil – it is what comes next that does.

#### **Windrowing**

- 18 Windrowing is a common site preparation practice in New Zealand forests and can occur on both flat or sloping land.
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- 19 Topsoil can be disturbed, displaced and removed during raking (the process of creating the wind row) and it is often the skill of the machine operator that determines how much soil disturbance occurs.
- 20 In flat areas this rarely matters but if the site is sloped and can connect with a water way there is a risk sediment can be lost from the site and water quality affected. It's difficult to quantify this risk as I'm not aware of any research on this.
- 21 Good management practices and sediment control measures can reduce the risk of sediment loss from the site and potential effects on water quality.
- 22 For example, contoured windrows are preferred as they tend to act as barriers to any downslope movement of soil particles under gravity or as "brush filters" filtering any runoff.
- 23 I don't consider windrowing to be deep disturbance in the sense I have commented on above.

#### **NPS-PF and windrowing**

- 24 The NES-PF Regulation 74 covers aspects of mechanical land preparation which would include the practice of windrowing, though windrowing is not explicitly mentioned in Regulation 74.
- 25 Regulation 74 requires that operations should be carried out where possible parallel to the contour. Where this cannot occur due to safety reasons then sediment control measures must be used to minimise sediment discharges to water bodies.
- 26 Such measures can include locating a parallel windrow at the base of a section of non-parallel windrows and sediment drains across the contour to pick up any sediment washing down the slope between non-parallel windrows.
- 27 These measures are likely to be effective in reducing sediment discharges to water bodies however I am not aware of any research on this.
- 28 Regulation 74 also requires that exposed areas to be stabilised as soon as practicable after completion of the activity.
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- 29 This would normally be done by oversowing, but other sediment control measures might also be required. Unless there is a long delay between windrowing and planting it would seem pointless to oversow then spray with herbicide.
- 30 In my opinion, there are no special circumstances of the Southland region which would justify greater regulation for windrowing activities than those contained in Regulation 74.

### **Herbicide spraying**

- 31 Herbicides are used to kill plants such as weeds, grass and unwanted vegetation. It takes time for plants to die. The dead plant material will form a natural 'mulch' on the soil surface depending on its initial density and 'canopy thickness'. With time, this may be moved by the wind, or it may bind with the soil surface.
- 32 Also, with time, new weeds and plants will emerge from seed within the soil or dispersed by wind or birds. Thus, the amount of bare ground that is exposed to rainfall following successful herbicide spraying may vary considerably. It is the exposure of bare ground that has the potential to contribute to sediment generation, but not all bare ground will do so.
- 33 Herbicide spraying in a forestry context is used to reduce competition from unwanted vegetation such as woody weeds and seedlings from the previous rotation which may be genetically inferior, i.e., to give the new seedlings the best chance to get established and thrive.
- 34 Spraying of herbicide has a low to negligible impact on erosion and sediment yield compared to other practices that disturb the soil. For this reason, I cannot think of any useful or cost-effective mitigation other than not spraying that could be used to minimise its effect.

### **Riparian setbacks based on slope**

- 35 In my opinion, for the specific activities of windrowing and herbicide spraying I see no benefit in having different setbacks based on slope.
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### **Maximum land slope requirements**

- 36 Erosion and especially surface erosion will increase as slope increases. Increasing the maximum slope from 20 to 30 degrees will increase the potential for erosion but how much will be due to many factors.
- 37 While modern forestry and agricultural equipment is now able to be operated on slopes steeper than 20 degrees, the potential for increased erosion and sediment loss to streams will directly relate to how much soil disturbance occurs, how deep that disturbance is, whether the operations were carried out parallel to the contour or not, and the connectivity between bare disturbed soil areas and the stream.

### **Ephemeral waterways**

- 38 Amending Rule 25 to include ephemeral waterways would entail practical difficulties relating to definition of these waterways on the ground. For example, how would these waterways be defined when the cutover is covered with slash and harvesting residue following harvest of the forest?
- 39 Amending Rule 25 to include ephemeral waterways won't make much difference from an erosion perspective with respect to windrowing and aerial spraying.
- 40 Amending Rule 25 to include ephemeral streams might result in a perverse outcome. It would likely require more tracking of machinery across the landscape to undertake windrowing that would result in potentially more soil disturbance.
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