

**MACKENZIE DISTRICT PLAN
PROPOSED PLAN CHANGE 18
INDIGENOUS BIODIVERSITY**

**POST-HEARING REPLY TO COMMISSIONERS
ECOLOGY**

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Introduction

This report is a response to questions from the Hearing Commissioners, and to other key ecological issues raised by submitters and experts, at the PC18 Planning Hearing, Fairlie, 8th to 10th March 2021.

Improved Pasture Definition

Recommended definition

1. A revised definition for improved pasture was proposed in the s42a Hearings Report:
Improved Pasture means an area where, as at May 2020, indigenous vegetation had been fully removed and the vegetation converted to exotic pasture or crops.
2. Alongside this definition, and in response to submissions on PC18, draft maps of 'converted land' were prepared¹. 'Converted land' is land that met the recommended definition (above) of improved pasture at May 2020². These are draft maps, subject to field checking and consultation with landowners³. The s42a Hearings Report does not propose to include these maps in PC18. However, such mapping is a method by which improved pasture can be readily identified.

Further submissions and evidence

3. The appropriateness of May 2020 baseline date in the improved pasture definition was raised in evidence⁴ and further submissions⁵; specifically, that it is not possible to determine what vegetation was present at a site in May 2020. Others supported the May 2020 baseline⁶.
4. I accept that, until a site is field checked, it may not be possible to be certain about the vegetation at that site. However, it is possible, from the interpretation of subsequent satellite images, to determine whether vegetation at a site has changed since May 2020. If satellite images show that the vegetation has not changed since May 2020, it can be assumed that a field survey of the vegetation now, or in the near future, will confirm whether the site was 'converted land' at May 2020.
5. A submitter⁷ has questioned the term 'converted land', as used in the draft maps and referred to in my evidence, and its relationship to the term 'improved pasture'. I adopted

¹ Harding, Attachment 3 is an indicative large-scale map of converted land.

² Harding, paras 116-123.

³ Harding, paras 125-126.

⁴ Espie, para 48;

⁵ Valentine, para 26; Johnston, page 2.

⁶ Head, para 9.4; Walker, para 33; Woodhouse, para 38; Ching, para 89; Willis, para 9.17.

⁷ Forward, para 47.

the term 'converted land' as it more accurately describes the condition of the land than the term 'improved pasture'. Areas mapped as converted land are those areas where, subject to field checking, the vegetation meets the recommended definition of improved pasture. In that sense, the terms are synonymous.

6. Ecologically, the use of the term 'converted land' avoids confusion with other definitions of improved pasture, such as those proposed in the NPSFM and draft NPSIB. I note that another submitter⁸ has suggested that the term 'improved pasture' should not be used in PC18. I see no difficulty, ecologically, with the PC18 provisions being amended to replace references to 'improved pasture' with 'converted land', as the terms are synonymous.
7. The 'partially converted' land layer included in the draft maps needs further explanation. This layer is the land that appeared⁹ to have been developed, but for which it was not clear if that development had resulted in fully converted land (as defined by the recommended improved pasture definition). It is intended to be a holding category which (following a field inspection) would be transferred to either the 'converted' land layer or become unconverted land, following field survey.

Other Improved Pasture Definitions

8. I have been asked to comment on the suitability of the definition of improved pasture in the National Policy Statement for Freshwater Management (NPSFM).
9. The definition in the NPSFM¹⁰ is:
Improved pasture means an area of land where exotic pasture species have been deliberately sown or maintained for the purpose of pasture production, and species composition and growth has been modified and is being managed for livestock grazing.
10. This definition is very broad. It would include nearly all land in the Mackenzie District that is presently used for farming. Any area that had, at any point in time, been oversown, and that is still used for livestock grazing, would meet this definition, as follows:

⁸ Jennings, para 21.

⁹ From satellite images, Google Earth images, and roadside views, as described in my evidence, paras 120-123.

¹⁰ NPSFM, Section 3.21 (1) Definitions relating to wetlands and rivers.

11. It would be virtually impossible, ecologically, to prove that pasture species had not been *deliberately sown* at some point in the farm history. Pasture species are sown *for the purpose of pasture production*; there is no other logical reason to do so. *Species composition and growth has been modified* at most parts of the District, and at all parts of the Mackenzie Basin. Therefore, if an area is presently *being managed for livestock grazing* (i.e. presently grazed, or intended to be grazed), it would meet the NPSFM definition of improved pasture.
12. The improved pasture definition in the proposed National Policy Statement for Indigenous Biodiversity (NPSIB) is the same as that in the NPSFM, except for the inclusion of a comma between the words *being managed* and *for livestock grazing*¹¹.
13. Use of the NPSFM definition (or NPSIB definition) would mean that substantial areas of significant indigenous vegetation and significant habitats of indigenous fauna in Mackenzie District would be regarded as improved pasture.

Conclusion

14. A distinguishing feature of the Mackenzie Basin is that the main ecosystems, and especially those with high indigenous biodiversity values, are non-woody ecosystems (tussockland, herffield, mossfield, stonefield etc.). Vegetation of these ecosystems includes exotic species, some of which were sown as pasture species, and others that have colonised naturally (many of which could be regarded as “pasture species”). And, most unprotected land in the Mackenzie Basin is grazed or has been grazed. To adequately maintain indigenous biodiversity in the Mackenzie Basin, a definition for improved pasture must exclude undeveloped grazing land.
15. I have had considerable experience applying definitions of improved pasture in Mackenzie District and other districts. And, I have been closely involved in the assessment of vegetation in response to alleged breaches of district plan rules for which a definition of improved pasture is crucial (in Mackenzie and Waitaki districts).
16. To effectively maintain indigenous biodiversity, a definition of improved pasture must be clear, simple and unambiguous. The proposed definition meets those criteria better than

¹¹ NPSIB, Section 3.12 (5), Existing Activities in SNAs.

any alternative definition of which I am aware. The ideal way to identify improved pasture with greater certainty is to map it (as I have recommended).

17. If this definition has the consequence of including areas of developed land with low indigenous biodiversity values, such as OSTD pasture with scattered induced tussocks, this is best resolved through an on-site assessment.

Vegetation Clearance Definition

18. Evidence and submissions presented at the Hearing raised concerns about the use of intensive grazing, or 'mob stocking', to remove indigenous vegetation¹². This type of vegetation clearance occurs when livestock are confined to an area in which there is insufficient feed. The purpose of mob stocking is to clear vegetation, or to spell pasture elsewhere on the farm. In the latter situation, livestock are confined to a paddock and provided with supplementary feed, such as balage.
19. The effects of intensive grazing were considered in PC13, resulting in the retention of 'subdivision fencing' in the definition of pastoral intensification¹³. Subdivision fencing is not defined in the MDP. It is likely that subdivision fencing would be interpreted as the construction of permanent fences. Permanent fences are not essential for mob stocking; livestock can be contained by temporary fences such as electric wires.
20. For consistency, I recommend that mob stocking¹⁴ (or intensive grazing) be included in the definition of vegetation clearance. The effects of mob stocking on indigenous vegetation are similar to the effects of other activities in the definition, such as 'cutting' or 'crushing'.

¹² Head, para 10.3; Walker, para 50; Woodhouse, para 31; Ching, para 74; Jennings, para 28;

¹³ Decision No. [2017] NZEnvC 53, paras 254-256.

¹⁴ A definition of mob stocking could be: "Confining livestock in an area in which there is insufficient feed and in a way that results in the removal of all or most available vegetation".

Indigenous Vegetation Definition

21. Evidence and submissions presented at the Hearing raised a number of issues about the definition of indigenous vegetation proposed in the s42a Hearings Report, including:
- difficulty of assessing whether mosses and lichens are native to the ecological district
 - dominance of indigenous species/extent of exotic species
 - thresholds for species cover and composition
 - simplicity and clarity

These are discussed in turn, below.

Mosses and lichens

22. It has been suggested in evidence¹⁵ that it is difficult to determine whether mosses and lichens are native to an ecological district. Mosses and lichens in Mackenzie District plant communities will almost certainly be native to the ecological district in which they occur, for the following reasons.
23. Bryophytes (mosses) produce spores, which are readily dispersed by wind and air currents, and occasionally by dung or insects. Lichens are formed from a combination of a fungal partner and an algal partner. Lichen dispersal is also by fungal spores but, for a lichen to reproduce, the fungus and alga must disperse together.
24. Therefore, the presence of mosses and lichens in vegetation in Mackenzie District will be determined primarily by habitat conditions. Fungal spore dispersal is unlikely to be a limitation. And, mosses and lichens are unlikely to be deliberately introduced by human activities (they are not planted for cultivation, restoration or amenity purposes).
25. Mosses and lichens are an important component of indigenous plant communities in the Mackenzie Basin, especially communities on outwash terraces and river terraces. A diverse range of moss and lichen taxa is present. Some of those taxa are difficult to identify, although mossfield and lichenfield communities are typically dominated by one or more well-known taxa.

¹⁵ Thorsen, para 21.

Dominance of Indigenous Species/Extent of Exotic Species

26. The recommended definition for indigenous vegetation does not specify the number of indigenous species, or the extent of indigenous species' cover. This has prompted concern that vegetation dominated by exotic species, or vegetation containing only one indigenous species, will be inappropriately defined as 'indigenous vegetation'¹⁶.
27. Many plant communities in the Mackenzie District, and especially non-woody communities in the Mackenzie Basin, are degraded but have not been completely converted to exotic vegetation. They are depleted indigenous plant communities in which indigenous plant species are frequently sparse or uncommon, and in which exotic species are frequently common or dominant.
28. It has been recently acknowledged that, to maintain indigenous biodiversity, the effects of activities that reduce the extent and quality of most ecosystems and habitats of indigenous species, including many highly modified ecosystems and habitats, must be avoided¹⁷.
29. In the Mackenzie Basin, vegetation on unconverted land commonly contains Threatened or At Risk species¹⁸, often sparsely distributed or in low numbers. A definition for indigenous vegetation that specifies a percentage cover or percentage of the total number of species present, may exclude some plant communities that support Threatened or At Risk plant species.
30. The consequence of such a definition would be that an area of vegetation that is significant (when assessed against the CRPS criteria) for the presence of Threatened or At Risk plant species may not be protected under the MDP because it is not 'indigenous vegetation'.
31. Concern has been expressed that the definition will inadvertently include plant communities that are heavily modified by exotic plants such as dense wilding pine, broom or gorse infestations¹⁹. I agree that the definition may include such communities.

¹⁶ Thorsen, para 22.

¹⁷ Advice from Manaaki Whenua Landcare Research to the Biodiversity Collaborative Group (NPSIB), Wellington, 2018; Walker et al, in press.

¹⁸ Harding Attachment 1

¹⁹ Thorsen, para 16.

One way to address this is to provide for the clearance of exotic woody pest plants so long as the activity does not result in clearance of associated indigenous plant species.

Thresholds for Species' Cover and Composition

32. Evidence presented at the Hearing stated that a definition for indigenous vegetation should include thresholds for indigenous species' cover and composition²⁰. Inclusion of percentage cover or species' composition in a definition introduces uncertainty. Estimates of percentage cover and species' composition are influenced by the survey method and by the ability of a surveyor to accurately identify all plant species.
33. In assessing percentage cover and species' composition, results are strongly influenced by survey-plot size. Comparison of survey methods at Tekapo Scientific Reserve showed that survey of small plots (0.5m x 0.5m) recorded less than half the number of indigenous species present than survey of standard (20m x 20m) plots.²¹.
34. Very small (0.5m x 0.5m) survey-plots have been used for research in the Mackenzie Basin²². And, small (1m x 1m) survey-plots have been used in ecological assessments submitted to MDC as part of resource consent applications. To provide certainty, a definition containing thresholds for indigenous species' cover or composition would need to specify the survey method.
35. Assessments of species' composition require positive identification of all species present. Such assessments are difficult in non-woody plant communities, as grasses are frequently difficult to identify when seed heads are absent, and a relatively large number of species in these plant communities are seasonal²³. Assessment results are strongly influenced by the skill of the observer and the timing of the survey.

Clarity and Simplicity

36. Ideally, a definition for indigenous vegetation should be clear and easy to apply. If application of a definition is difficult for ecologists, it will likely be even more difficult for

²⁰ Espie, para 36; Thorsen, para 39.

²¹ Walker et al, 2016.

²² e.g. Espie, 1997; Meurk et al, 2002

²³ Spring annual or summer-green species, which have visible above-ground parts for only a short period of time, such as orchids.

landowners or Council officers. An inclusive definition (as recommended) makes it clear to landowners (and Council officers) that it cannot be assumed that vegetation is not indigenous, or not significant, just because it appears degraded, or because it is dominated by exotic species.

Alternative Definitions

37. The definition for indigenous vegetation proposed in the evidence of Dr Thorsen²⁴, and supported by some submitters, is an edited form of the Waitaki District Plan definition. I have considerable experience (over more than 10 years) applying the WDP definition and the earlier (similar) MDP definition. The definition is not simple and does not address the uncertainties described above.
38. The WDP definition was developed more than 25 years ago. It has not helped prevent widespread clearance of indigenous vegetation in Waitaki District. And, it does not address the issues raised by submitters to PC18.
39. The recommended definition for indigenous vegetation is consistent with that in the proposed NPSIB²⁵. The NPSIB definition does not include thresholds for species' cover or species' composition.

Oversowing and Topdressing (existing/continued use)

40. Oversowing and topdressing (OSTD) are activities that are used to improve vegetation for livestock grazing. The effect (and purpose) of these activities is to introduce and establish palatable exotic pasture species. OSTD may benefit some indigenous species, such as tussock grasses, but will displace most low-growing indigenous inter-tussock plant species²⁶.
41. The extent of the effects of OSTD on indigenous vegetation depends on a number of factors, including frequency (how often), duration (the length of time over which the activity has been undertaken), characteristics of the site (e.g. vegetation, soils and

²⁴ Thorsen, para 42.

²⁵ The NPSIB definition is "Indigenous vegetation means vascular and non-vascular plants that, in relation to a particular area, are native to the ecological district in which that area is located", s.1.8(1).

²⁶ Decision No. [2017] NZEnvC 53, para 134.

rainfall), and subsequent management (e.g. intensity and frequency of grazing). The Environment Court concluded (at PC13) that the long term effects of OSTD on indigenous vegetation will depend on ongoing management and fertiliser input.²⁷

42. While the initial effects of OSTD on indigenous vegetation may be greater than the subsequent effects of OSTD²⁸, ongoing effects will depend on a range of factors, such as those listed in the preceding paragraph.
43. Protection of areas of significant indigenous vegetation, or maintenance of indigenous biodiversity, cannot be assured by a description of the activity alone (such as by specifying the frequency of OSTD). That assurance can only be provided by an assessment of the indigenous biodiversity values at the site.
44. I am familiar with areas in the Mackenzie Basin at which the vegetation comprises scattered tussocks and/or matagouri but is otherwise dominated by exotic pasture species. These areas do not appear to have been cultivated, though the vegetation has clearly been modified by ongoing pastoral use; most likely by regular OSTD and grazing. At such sites, a continuation of that use may have only minor adverse effects on indigenous biodiversity, and may favour the continued growth of some indigenous species, such as tussocks or matagouri.
45. The only way to be certain that continued OSTD will not have adverse effects on indigenous biodiversity is to survey indigenous biodiversity at the site and assess the extent to which continued OSTD will affect those biodiversity values.

Farm Biodiversity Plans (Rule 1.2.1)

46. Evidence and submissions presented at the Hearing raise concerns about Farm Biodiversity Plans²⁹.
47. The purpose of Farm Biodiversity Plans is *“to facilitate integration of land use and development with the identification and protection of significant indigenous vegetation and significant habitats of indigenous fauna to ensure no net loss of indigenous*

²⁷ Decision No. [2017] NZEnvC 53, para 144.

²⁸ Murray, para 8.

²⁹ Head, paras 11.1-11.4; Walker, paras 53-57; Jennings, paras 25-27; Weir and Snoyink, page 7;

*biodiversity, and the maintenance of other indigenous biodiversity, on a comprehensive whole of property basis*³⁰.

48. Ecologically, there are three key issues: the difficulty providing for further use and development while protecting significant indigenous biodiversity (and maintaining indigenous biodiversity generally); the ecological complexity of adequately identifying indigenous biodiversity values; and the difficulty of monitoring outcomes.

Integrating development and protection

49. In the Mackenzie District, and especially in the Mackenzie Basin, most undeveloped (unconverted) land supports indigenous biodiversity, much of which is ecologically significant. Based on my knowledge of the District, any further development of land would almost certainly have adverse effects on indigenous biodiversity. Therefore, it seems unlikely that “integration” of protection and development will not lead to further loss of indigenous biodiversity.
50. Farm Biodiversity Plans (as proposed in PC18) are further complicated by providing for ‘no net loss’ of indigenous biodiversity in “areas identified as significant”³¹. Determining ‘no net loss’ of indigenous biodiversity is complex and difficult³². And, ‘no net loss’ is not the equivalent of the ‘protection’ that is required for areas of significant indigenous vegetation and habitat³³.

Ecological Complexity

51. The ecological assessments required for a robust Farm Biodiversity Plan would be complex. Individual farmers’ submissions (and farmers’ legal counsel) to the Hearing stated concerns at the cost, uncertainty and or complexity of Farm Biodiversity Plans³⁴.
52. I undertook ecological assessments for a Farm Biodiversity Plan for Waitaki District Council in 2018. Before commencing that work, I searched unsuccessfully for an existing Farm Biodiversity Plan to provide an example or template for that work. I am unaware

³⁰ PC18, Appendix Y.

³¹ PC18, Appendix Y, Part D 1.

³² Harding, paras 66-70.

³³ Walker, para 44.

³⁴ Murray, para 12; Valentine, para 19; Burtscher, para 19; Forward, paras 14 and 32.

of any existing Farm Biodiversity Plans for properties similar to those present in the Mackenzie District.

53. Survey and assessment of indigenous vegetation for the above plan was time consuming. Survey and assessment of indigenous fauna was only partially completed. The projected cost of that fauna advice halted further work on preparation of the Farm Biodiversity Plan. Adequate fauna survey requires assessments by specialists, favourable survey conditions, specialised survey methods and equipment, and appropriate timing.

Monitoring and reporting

54. If a Farm Biodiversity Plan was submitted, Council would need to review the assessment of ecological values³⁵ and the proposed monitoring and reporting³⁶. In my experience, there is considerable risk that ecological assessments and monitoring data will be inadequate. Farm Biodiversity Plans will need to be carefully reviewed (by an ecologist) to ensure that they do protect significant indigenous biodiversity and maintain indigenous biodiversity generally.

Clearance Area (Rule 1.2.2)

55. I have been asked to comment on the ecological effects of providing (as a Restricted Discretionary Activity/RDA) for 5000m², or an alternative extent, of vegetation clearance³⁷.
56. Evidence presented at the Hearing suggests that the clearance area be reduced to 100m², and that the rule needs to provide greater protection for areas that meet the CRPS significance criteria³⁸.
57. Threatened plant species in Mackenzie District, and especially in the Mackenzie Basin, are often confined to very specific localised habitats, such as limestone bluffs, outwash

³⁵ PC18, Appendix Y, Part B.

³⁶ PC18, Appendix Y, Part E.

³⁷ Rule 1.2.2. provides for clearance of *“up to 5000m² of indigenous vegetation within any site in any continuous 5-year period”*.

³⁸ Head, para 10.1. (also, Walker suggests (para 52) that the clearance area be reduced to 100m² for clearance permitted by Rule 1.1.1.1).

terrace edges, boulderfields, stony ground, low dunes or tarn margins. Many of these habitats extend for only a few square metres, and could be completely destroyed by the clearance of 5000m² (e.g. 50m x 100m) of indigenous vegetation.

58. It is difficult, ecologically, to predict the extent of a clearance area that would ensure indigenous biodiversity is protected and maintained. The appropriate clearance area would likely depend on a number of factors, including location, ecosystem, and adjacent land use. At many locations, on-site assessment of ecological values would be required to determine the extent to which the proposed clearance was consistent with the protection and maintenance of indigenous biodiversity.
59. With respect to protection for areas that meet the CRPS significance criteria, clearance is not permitted within a Site of Natural Significance (SONS)³⁹. To ensure protection of significant indigenous vegetation and habitat that lie outside existing SONS, the clearance of areas that meet the CRPS significance criteria⁴⁰ should be protected in the same way that identified SONS are protected.

Existing Regional Council Consents

60. Some proposed irrigation in the Mackenzie Basin has been consented by the regional council (Environment Canterbury) but still requires consent from MDC. I have been asked to comment on whether these regional council consents adequately address the effects of the proposed activity (irrigation) on indigenous biodiversity.
61. I have provided advice to MDC on a number of land-use activity consent applications, including applications for activities associated with irrigation. In my experience, areas that have been consented for irrigation by the regional council frequently support indigenous biodiversity, including significant indigenous vegetation and significant habitats of indigenous fauna.
62. Therefore, assessments of the effects of activities on indigenous biodiversity undertaken for a regional council consent may assist with, but cannot be assumed to replace, the assessments necessary for MDC's consideration of effects on terrestrial indigenous biodiversity.

³⁹ PC18, Rule 1.2.2, Condition 1.

⁴⁰ Canterbury Regional Policy Statement, Appendix 3.

Adequacy of Existing Protection

63. It has been stated in evidence that the Protected Natural Areas Programme (PNAP) and pastoral lease tenure-review programme have resulted in “extensive protection of all significant indigenous ecosystems in the basin”⁴¹. This mistakenly assumes that protection under the Reserves Act 1977 (PNAP) and Crown Pastoral Land Act 1998 (tenure review) is sufficient to meet Council’s obligations to protect significant indigenous vegetation and habitat, and maintain indigenous biodiversity, under the Resource Management Act 1991.
64. The objective of the PNAP was to identify the best “representative samples of all classes of natural ecosystems”⁴² for the purpose of increasing the representativeness of New Zealand’s network of reserves. The relevant objective of tenure review (CPLA) was to “enable the protection of the significant inherent values of reviewable land”⁴³.
65. The assessment criteria for the PNAP⁴⁴ and for tenure review⁴⁵ differ markedly from the criteria used to assess ecological significance under the CRPS.
66. The PNAP has been widely acknowledged as resulting in inadequate protection for indigenous biodiversity⁴⁶. The Environment Court has ruled that protection under section 6(c) RMA requires more than protection of only the “best” areas⁴⁷. Furthermore, analysis of areas recommended for protection by the PNAP, including those in Mackenzie Basin ecological districts, showed substantial loss of those areas, and therefore indigenous biodiversity, for the period 1989 to 2015⁴⁸.
67. Tenure review has resulted in the protection of only a proportion of the land recommended for protection by the Department of Conservation⁴⁹. A clear example of this outcome in the Mackenzie Basin is documented in the evidence of Mr Head⁵⁰. The

⁴¹ Espie, paras 16-18 and para 119.

⁴² Reserves Act 1977, section 3(1)(b).

⁴³ Crown Pastoral Land Act 1998, section 24(b).

⁴⁴ Kelly and Park, 1986.

⁴⁵ Guidelines for Assessing Significant Inherent Values under the Crown Pastoral Lands Act 1998. *Unpublished document*. Department of Conservation, 2019, 22pp.

⁴⁶ e.g. Maseyk and Gerbeaux, 2014.

⁴⁷ Decision No. [2010] NZEnvC 345.

⁴⁸ Monks et al, 2019.

⁴⁹ Head, paras 11.3-11.4.

⁵⁰ Head, paras 8.7-8.8.

Environment Court concluded, for PC13, that “because some land is protected, does not mean that the natural science components of the ONL are sufficiently protected”⁵¹.

68. The appropriateness of including land that has been freeholded under the Crown Pastoral Land Act 1998 in assessments for the protection of indigenous biodiversity under the RMA has been confirmed by the Environment Court⁵².

Identification of SONS/SNAs

69. The need to identify and map SONS/SNAs was stated in evidence and submissions to the Hearing⁵³. I agree that identification and mapping of SNAs is desirable and urgent.
70. In response to the need to more efficiently identify remaining SONS/SNAs, areas of unconverted land on depositional landforms⁵⁴ in the Mackenzie Basin have been mapped⁵⁵. These maps depict the ‘converted’ and ‘partially converted’ land layers, and include additional layers that are not shown on the large-scale indicative maps presented in Attachment 3 of my evidence.
71. The other data layers are the LCDB-5⁵⁶ land cover classes that do not support indigenous vegetation: exotic forest; deciduous hardwoods (e.g. willow forest); and built-up (urban) areas⁵⁷. The maps also show Farm Base Areas⁵⁸, existing and reviewed SONS, and depositional landforms.
72. The depositional landform layer is based on the 1:1,000,000 GNS Geological Map of New Zealand, which has proved to be of insufficient detail for this purpose. A more appropriate source of depositional landform data would be the 1:100,000-scale Central South Island Glacial Geomorphology map⁵⁹, as suggested by Dr Walker⁶⁰.

⁵¹ Decision No. [2017] EnvC 53, para 535.

⁵² Decision No. [2012] NZEnvC 252.

⁵³ Mitchell, para 58; Ruston, para 56; Ching, para 64; Head, para 9.4; Walker, para 33; Weir and Snoyink, page 4.

⁵⁴ Most unconverted land on depositional landforms (moraine, outwash terrace and river terrace) in the Mackenzie Basin has significant ecological values (Head, paras 6.1-6.6; Walker, para 15; Harding, para 44).

⁵⁵ Harding, para 48.

⁵⁶ Land Cover Database-5 (Manaaki Whenua-Landcare Research).

⁵⁷ Harding, para 124.

⁵⁸ Developed land around farm homesteads, identified and mapped as part of PC13.

⁵⁹ Barrell et al, 2011.

⁶⁰ Walker, para 49.

73. The purpose of the maps is to indicate, for the benefit of MDC and landowners/landholders, the likely extent of significant indigenous vegetation in the Mackenzie Basin. They are draft maps, subject to confirmation of the extent of the 'converted' land layer.

Converted Land Maps

74. A number of submitters have identified errors in the 'converted land' layer on the maps in Attachment 3 of my evidence⁶¹. As stated in my evidence, these are draft maps, subject to confirmation through more detailed checking⁶², at a finer scale, and in consultation with landowners/landholders⁶³.

75. Large-scale maps were included in my evidence (as Attachment 3), at the request of Council, to provide an indicative map of the converted land layer. They were not intended to be made generally available until a formal process and capacity for field checking and landowner consultation were established, and only if this method was confirmed.

76. Furthermore, the maps as depicted in my Attachment 3 are not complete. Identification of 'converted land' was a consequence of identifying potential SONS/SNAs (see above); not the primary purpose of the exercise.

Waitaki Power Scheme

77. Evidence was presented at the Hearing of the ecological values of the Operating Easement Areas of the Waitaki Power Scheme (WPS) area. Substantial parts of the Operating Easement Areas of the WPS support significant indigenous vegetation and/or significant habitats of indigenous fauna⁶⁴.

78. PC18 Rule 2.1.1, as proposed in the s42a Hearings Report, permits vegetation clearance where "*the clearance is required for the operation and maintenance of the Waitaki Power Scheme*". The proposed PC18 definitions of 'Waitaki Power Scheme' and 'Maintenance of Waitaki Power Scheme' are broad and inclusive.

⁶¹ Burtsher, paras 25-27; Murray, paras 30-31; Valentine, para 27; Forward, para 22.

⁶² Harding, para 116.

⁶³ Harding, para 126.

⁶⁴ Harding, paras 81-84; Walker, paras 59-60.

79. There is a risk that operation and maintenance of the WPS within the Operating Easement Areas will have adverse effects, which are more than minor, on significant indigenous vegetation and/or habitat, and on indigenous biodiversity generally⁶⁵. That ecological risk would be reduced if 'operation and maintenance' within the Operating Easement Areas were more clearly defined to be activities in the vicinity of existing defined structures, such as buildings and vehicle tracks⁶⁶.

Mike Harding

26th March 2021

List of Abbreviations

CPLA	Crown Pastoral Land Act 1998
CRPS	Canterbury Regional Policy Statement
MDC	Mackenzie District Council
MDP	Mackenzie District Plan
NPSFM	National Policy Statement for Freshwater Management 2020
NPSIB	Proposed National Policy Statement for Indigenous Biodiversity
ONL	Outstanding Natural Landscape (Mackenzie Basin)
OSTD	Over-sowing and Topdressing
PC13	Plan Change 13
PC18	Proposed Plan Change 18
PNAP	Protected Natural Areas Programme
RDA	Restricted Discretionary Activity
RMA	Resource Management Act 1991
SNAs	Significant Natural Areas
SONS	Sites of Natural Significance
WDP	Waitaki District plan

⁶⁵ Harding, para 85; Head, para 10.2.

⁶⁶ This would be consistent with Condition 1 of proposed Rule 1.1.1.

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