

**TENURE REVIEW PRELIMINARY PROPOSAL: SIMONS PASS MACKENZIE BASIN
UNDER PART 2 CROWN PASTORAL LAND ACT 1998**

**STATEMENT BY DR SUSAN WALKER FOR ENVIRONMENTAL DEFENCE SOCIETY INCORPORATED IN
RESPECT OF SUBMISSION ON TENURE REVIEW PRELIMINARY PROPOSAL: SIMONS PASS MACKENZIE
BASIN
(ECOLOGY)**

18 JULY 2017

INTRODUCTION

1. My name is Susan Walker. I am an ecologist, researcher, and research programme leader at the Crown Research Institute Landcare Research, based in Dunedin.
2. I have been engaged by the Environmental Defence Society Inc (**EDS**) to analyse the Preliminary Tenure Review Proposal for Simons Pass Station (**Preliminary Proposal**) to determine whether it:
 - a. enables protection of significant inherent terrestrial ecological values¹ (**SIVs**) present on the property; and
 - b. promotes management of the land in a way that is ecologically sustainable.
3. In summary, I consider that:
 - a. the ecological values assessed as SIVs by experts in 2006² remain highly significant;
 - b. the rarity and importance of those SIVs has greatly increased regionally, nationally and internationally since they were documented in 2006. Recognition of their importance has also increased greatly;
 - c. since the property was surveyed by ecological experts in 2006 there has been a progressive reduction in the areas recommended for protective mechanisms by the responsible agencies. I can see no justification for these reductions on ecological grounds; and
 - d. the proposed designations fail to protect the property's SIVs and fail to promote the management of reviewable land in a way that is ecologically sustainable.

¹ Meaning the inherent value of such importance, nature, quality, or rarity that the land deserves the protection of management under the Reserves Act 1977 or the Conservation Act 1987 (Section 2 Crown Pastoral Land Act 1998) (**CPLA**).

² Simons Pass Botanical Survey, October 2006, Kate Wardle; Simons Pass Pastoral Lease Tenure Review Invertebrate Survey, November 2006, Warren Chinn; Assessment of the fauna values (bird and lizards) of Simons Pass Pastoral Lease (DOCDM-52676), undated, Simon Elkington.

EXPERIENCE

Professional

4. I have an MSc (1994) and PhD (1997) from the University of Otago. I have published more than 60 peer-reviewed scientific journal papers and book chapters in international and national literature, and produced more than 40 internally peer-reviewed contract reports.
5. My primary fields of expertise are:
 - a. the botany, ecology, and conservation management of modified indigenous ecosystems of the dry eastern rainshadow zone of South Island New Zealand (being dry inland South Island);
 - b. biodiversity assessment, including measurement and reporting of the biodiversity and conservation outcomes and achievements of policies (including tenure review under the CPLA), approaches (for example, biodiversity 'offsets') and incentives (including economic or market-based instruments);
 - c. quantitative field sampling and measurement of biodiversity components and assessment of ecological significance³ and/or significant inherent values⁴; and
 - d. national and regional long-term changes in New Zealand's land cover and indigenous bird fauna.
6. I have particular expertise and field experience in the ecology of dryland ecosystems on the floor of the Upper Waitaki basin (hereafter **Mackenzie Basin**) and the basin floors of Central Otago and Queenstown Lakes districts.

Simons Pass

7. I have specific knowledge and experience of the ecology of Simons Pass. I have:

³ Under s6(c) Resource Management Act 1991 (**RMA**).

⁴ Under s24 CPLA.

- a. reviewed a number of analyses of its ecological values for different legal processes; and
 - b. visited the land.
8. For a more comprehensive description see **Attachment A**.

SCOPE OF STATEMENT

9. This statement is structured as follows:
- a. Approach to ecological assessment
 - b. Mackenzie Basin
 - c. Preliminary proposal
 - d. Conclusion & recommendations
10. In preparing this statement I have read and viewed:
- a. Summary of Preliminary Proposal, May 2017 (**Proposal Summary 2017**);
 - b. Preliminary Proposal Designations Plans, April 2017 (**Preliminary Plans 2017**);
 - c. Department of Conservation (**DOC**) Conservation Resources Report including maps, October 2007⁵ (**CRR 2007**);
 - d. Scion Ecological Sustainability Advice including maps, July 2009 (**Scion Report**);
 - e. A map prepared by DOC entitled 'Simons Pass Recommendations', dated 1 October 2009 (**DOC Recommendations Map 2009**);
 - f. DOC map 'Simons Pass Recommendations', dated 11 October 2007 (**DOC Recommendations Map 2007**);

⁵ I note that the LINZ title page is dated 'May 08' but this was not when the report was written.

- g. Simons Pass Pastoral Lease Department of Conservation Recommendations Report, dated October 2007 (**DOC Recommendations Report 2007**);
- h. Map 5.1: Recommendations – Simons Pass Pastoral Lease prepared for DOC by K Wardle in December 2006 (**Expert Recommendations Map 2006**), which is reproduced and attached in **Attachment B**;
- i. Simons Pass Botanical Survey Report by K Wardle, including maps, October 2006 (**Wardle Botanical Report 2006**);
- j. Legal aspects of high country pastoral leases and the tenure review process: a background paper prepared for the Parliamentary Commissioner for the Environment, July 2006 (**Barton Report**); and
- k. Draft guidelines for understanding the promotion of ecological sustainability in tenure review, Landcare Research Contract Report: LC0304/145 prepared by A Hewitt and G Hunter for Land Information New Zealand, June 2004 (**Landcare Research ES report**).

APPROACH TO ECOLOGICAL ASSESSMENT

- 11. In my opinion, ecological analysis for the purpose of tenure review should include two different assessments:
 - a. of the property's SIVs⁶; and
 - b. of the property's ecosystems and effects of current and potential land use and management on them, to determine what management approach(es) are required on the site to achieve ecological sustainability both on the site and off-site (that is, across the wider ecological district and region)⁷.

⁶ Pursuant to s24(b) CPLA 'to enable the protection of the significant inherent values of reviewable land ', and as defined in footnote 1.

⁷ Pursuant to s24(a)(i) CPLA 'promote the management of reviewable land in a way that is ecologically sustainable'.

Significant inherent values

12. Detailed methods and criteria exist for and are used in the assessment of SIVs, including specific guidance developed by the Department of Conservation for tenure review. I am familiar with these methods and criteria, their evolution over time, and their application.
13. Expertise and experience is critical in applying significance criteria. Assessors must be very familiar with the particular ecosystems and species that exist on a property, and be capable of assessing contextual matters such as their rarity and representativeness within New Zealand and internationally. They must have a sound understanding of the relevant ecological processes and of principles of conservation and reserve design in order to determine the spatial and management requirements of enabling protection. To make an adequate assessment, they must also be given sufficient time to inspect a property thoroughly; this varies with the nature and areal extent of the ecological values on a property and the terrain.

Ecological sustainability

14. I am not aware that any formal methods or criteria are used in tenure review for assessment of ecological sustainability.
15. The CPLA does not define 'ecological sustainability' or 'sustainability'.
16. An ecosystem is defined as a 'system of interacting living organisms and their environment' (s2 CPLA).
17. The common meaning of sustainability (from the Oxford Online Dictionary) is 'the ability to be maintained at a certain rate or level'.... and 'avoidance of the depletion of natural resources in order to maintain an ecological balance.'
18. I understand that the definition of ecological sustainability being applied in tenure review is 'making decisions that safeguard the life supporting capacity of the land's ecosystems,

including the ability of those ecosystems to support life outside the reviewable land'⁸. I also understand that in applying that definition⁹:

- a. the land's ecosystem is considered to include indigenous and exotic components and life forms; and
 - b. ecosystem sustainability is to be considered in context of previous land development and use.
19. I consider that ecological sustainability cannot be reduced to safeguarding the life-supporting capacity of the land's ecosystems as in the definition above (at paragraph 18). The flaw is that the term 'life supporting capacity' does not reveal what life is to be supported. If it is any life that is to be supported, then almost most ecological change, short of sterilisation, would achieve ecological sustainability.
20. The root 'sustain' in sustainability entails avoidance of depletion. Ecological means of a 'system of interacting living organisms and their environment'. I consider therefore that management of reviewable land in a way that is ecologically sustainable means management that avoids depletion of the system of interacting living organisms and their environment on that land.
21. All high country ecosystems are composed of mixtures of indigenous and exotic plant and animal species. However, many different land uses and land management practices and systems can have effects such that, over time, the indigenous components, processes, and/or interactions of the ecosystem are depleted and/or their environment is altered. This process is called ecological degradation¹⁰, and not ecological sustainability.

⁸ Summary Preliminary Proposal at [3.1].

⁹ Summary Preliminary Proposal at [3.1].

¹⁰ For example, this was set out by M A C Harding, ecologist for the Mackenzie District Council, before the Environment Court (in the matter of appeals under clause 14(1) of the First Schedule to the Act in relation to decisions on Plan Change 13 to the Mackenzie District Plan).

He stated that '*Activities that may cause degradation are grazing, burning, browsing/predation by introduced animals, invasion by exotic plant species, over-sowing and top-dressing...*

22. Some land uses and practices transform and/or completely remove the native ecosystems and species habitats of a site because they take ecological conditions outside the capacity of the ecosystem's plants and animals to survive at all¹¹. In ecological terms, this process is ecological transformation, not ecological sustainability.

*...Grazing animals selectively remove palatable plant species, reduce the stature of taller vegetation, expose shade-adapted low-growing plants to direct sunlight, trample ground-cover species, remove nutrients from the plant community and redeposit nutrients elsewhere at the site (e.g. at stock camps). Heavier animals, such as cattle, break woody vegetation and damage the ground. The effect of grazing, especially when accompanied by burning, is the conversion of shrubland and tall tussockland plant communities to short tussockland, herbfield and bare ground. This degraded vegetation provides favourable habitat for rabbits and invasive naturalised plants such as mouse-ear hawkweed (*Pilosella officinarum*), sheep's sorrel (*Rumex acetosella*) and exotic grasses. The extent and rate of degradation at any site will depend on a range of factors.'* (M A C Harding, evidence-in-chief 15 July 2016 paragraphs 44 and 45). I concur with this description.

In my evidence before that hearing (S Walker, evidence-in-chief 9 September 2016) I noted that grazing, especially by rabbits, has caused widespread depletion of indigenous cover and ecological processes and interactions in the Mackenzie Basin. When stock and rabbits were removed in 1992, the amount of bare soil approximately halved in the subsequent 18 years (Walker et al. 2015). About a quarter of the bare soil reduction was accounted for by increases in litter and dead plant material on the soil surface, suggesting that formerly most litter was consumed by herbivores or blown away. Furthermore, striking increases in lichen cover on arid surfaces suggest that biological soil crusts had been suppressed by pastoral management, with potentially profound implications for soil moisture retention and temperature, and ecological processes such as succession, nutrient storage and cycling, and erosion. Land management practices can have other major effects. For example, rabbits are the primary mainstay of populations of important predators (especially cats and ferrets) on indigenous fauna (including lizards, birds and invertebrates). Predation on native fauna can increase markedly when rabbit abundance suddenly declines, because their predators remain abundant but switch to feeding primarily on native prey. Repeated cycles of rabbit control and recovery can therefore have detrimental effects on populations of native fauna.

As noted by Mr Harding (cited above in this footnote), oversowing and topdressing (OSTD) also causes ecological degradation by depleting and modifying habitats and biota, and the extent and rate of degradation at any site will depend on a range of factors. For example, infrequent (e.g. once per decade) broadcast OSTD on drier landforms can allow a subset of existing indigenous species to persist, although some modification occurs. Taller native species (e.g. tussocks, shrubs, 'spaniards') can persist with broadcast OSTD on moraines if stocking rates remain low, but the native inter-tussock flora and fauna (which account for most of the ecosystem's biological diversity) is depleted or lost. If stocking rates are increased, degradation and loss of tussocks will occur too.

¹¹ Two examples of ecologically transforming land management practices relevant to this submission are exotic conifer invasion (or plantings), and modern pastoral intensification practices.

23. In my opinion, considering only the capacity of the land's ecosystems to support 'life' leads to it being logically possible to consider ecological degradation and ecological transformation to be consistent with ecological sustainability. This appears to be the approach taken in the Scion Report. That report suggests conifer planting into inland outwash gravels (which they refer to only as "Mackenzie and Fork soils") would promote ecological sustainability, apparently without considering the living ecosystem that would be transformed by this (which is a critically threatened rare ecosystem and a national priority for protection, as noted in paragraph 44 below), nor that the ecological attributes, interactions, and processes inherent to that ecosystem (including of the soils) would be wholly and irreversibly replaced.

24. I suggest that a more accurate definition of ecological sustainability, consistent with its plain meaning (set out at paragraph 20 above) would be:

'Management that is ecologically sustainable is management that sustains, and avoids depletion of, the attributes and processes of the system of interacting living organisms and their environment, and of connected ecological systems and processes beyond land under consideration.'

25. This suggested definition is consistent with the legal opinion provided in the Barton Report that *'the idea is plainly one of environmental protection; the adverb 'ecologically' emphasizes that'*, and that *'[w]hat is to be sustained is the relations of organisms to one*

Exotic conifers are northern hemisphere fireweeds that have evolved to succeed in ecosystems with frequent fire. The low frequency of fire through New Zealand's evolutionary history is unparalleled internationally. The exotic-conifer life form and ecological strategy has never been present in New Zealand's evolutionary past. When they are planted, or invade, into New Zealand ecosystems, exotic conifers not only directly exclude indigenous species, but also create fire-driven ecosystems unparalleled in New Zealand's evolutionary past, and have profound effects on groundwater.

Many modern pastoral intensification practices create conditions (involving for example, nutrient and disturbance regimes, and competition) that are outside the capacity of indigenous plants and animals to survive at all. These practices include (independently or in various combinations) earthworks, irrigation, herbicide-spraying, soil cultivation (including direct drilling), associated application of fertiliser and sowing of exotic seed, cattle or deer grazing, subdivision fencing and/or elevation of stocking rates.

another and their physical surroundings, and the environment generally' ¹². That is, ecological sustainability entails maintenance of ecological systems ('ecosystems'), and not just some selected soil attributes or pasture.

26. I also agree with the Barton Report about what would be expected in an assessment of ecological sustainability¹³. I add that such an assessment would need to be made by expert ecologists with thorough and specific¹⁴ understanding of the ecology of the site, and of how different potential land uses and land management practices would affect the ecosystem attributes and/or properties, and the associated ecological processes and functioning, both on-site and off-site in the short, medium and long term.

MACKENZIE BASIN

Ecology

27. The abiotic environment of the Mackenzie Basin floor is one of New Zealand's most distinctive. It is almost wholly derived from glacial landforms, and its relatively high-elevation and inland position, confers a seasonally dry, continental climate characterised by short warm summers and some of New Zealand's coldest winters. The climatic extremes of drought, frost, cold, heat, and wind, often combined with shallow, stony and infertile soils, create a highly stressful environment that has given rise to a stress-tolerant terrestrial indigenous plant and animal biota.
28. This environment, and the Basin's history of relative isolation through the Pleistocene glaciations, led to the evolution of many indigenous species and subspecies that are

¹² Barton Report p. 29.

¹³ The Barton Report states (on p. 29): "[t]hus, in tenure review, in relation to the promotion of ecologically sustainable management, one would expect that there would be an assessment of the ecological sustainability of different land uses (extensive pastoral, intensive pastoral including dairying, horticulture, viticulture, tourism, conservation, protection, etc). Equally there would be consideration and analysis of the likelihood of one or another of those land uses after freeholding and the effects of freeholding on ecologically sustainable management. The consideration would need to address the requirement of ecological sustainability, and not, for example, general land use potential. It would need to be specific to the particular lands under review."

¹⁴ By 'specific', I mean of the particular ecosystems and species that occur a property and of the relevant ecological processes that have shaped and sustain the present ecosystem attributes there.

endemic to it, especially in the least mobile groups (particularly invertebrates and freshwater fishes). Consequently, the indigenous biological diversity ('biodiversity') of the Basin floor is also highly distinctive in a national and international context.

29. The Basin floor retains New Zealand's most continuous, most extensive, and least-fragmented sequences of indigenous vegetation across originally rare ecosystems¹⁵. There is no other place in New Zealand where historically rare ecosystems occur to such an extent and in natural connected sequences in a relatively low lying landscape. As a consequence of recent development, sequences of these particular rare ecosystems are now unreplicated nationally. Simons Pass itself is the only property in the Basin to encompass the Basin's complete geomorphological and corresponding ecological sequence.
30. This interconnected complex or mosaic of naturally rare ecosystems and vegetation, and associated wetlands and freshwater habitats, together support populations of regionally endemic and threatened invertebrates and freshwater fish, and internationally important populations of migratory wading birds, gulls and terns, in addition to many endemic, threatened, and at risk plant species. The Mackenzie Basin's ecosystem is made up of these different elements.
31. It is well recognised that connected biological sequences and gradients such as these, and sizeable areas, are needed for many species to persist in the face of climatic variability. For example, when a plant species inhabits a connected sequence, wetter parts provide refuge in protracted dry periods, and drier parts provide refuges in extreme wet periods (e.g. when drought-adapted species are overtopped by faster-growing species in the wetter portion of their range). The refuge facility is lost when sequences and gradients are geographically and functionally truncated and fragmented by habitat loss, and thus fragments in fluctuating environments result in species loss over time.

¹⁵ Principally glacially derived moraines (within which are ephemeral wetlands and tarns formed in kettleholes) and inland outwash gravel surfaces (outwash plains and terraces, meltwater channels and fans) which are cut by braided rivers. Seepages and flushes issue from moraine and outwash slopes and scarps, and there are some inland sand dunes.

32. The ecosystems and species habitats still represented on the Basin floor have undergone extreme loss nationally, with especially high loss-rates in the last two decades. A number of endemic plants, invertebrates, lizards, freshwater fishes, and birds now depend for their persistence largely on the remaining areas of connected and relatively undeveloped habitats still found here.

Pressures on ecosystems

33. I recognise three categories of pressures on the ecosystems of the Mackenzie Basin floor that affect ecological sustainability: chronic, transformational, and exacerbating.
34. Management of land in a way that is ecologically sustainable is management that relieves or prevents these pressures.
35. Chronic pressures have relatively slow and persistent adverse effects from which there can be some recovery. The main ones on the ecosystems of the Mackenzie Basin are
- a. predation, which continues to deplete populations of native invertebrates, lizards and birds; and
 - b. removal of plant biomass through burning of vegetation and grazing by stock and feral animals such as rabbits and hares, which led to progressive depletion of native cover, especially shrubland and tussock, and to the dominance of hawkweed.
36. I do not regard erosion as a pressure on the Mackenzie Basin's ecosystems¹⁶.
37. I do not regard hawkweed¹⁷ as a pressure on the ecosystems of the Mackenzie Basin floor. Research indicates that grazing (by stock and rabbits), and not hawkweed, results in bare soil and associated ecosystem changes. For example:

¹⁶ Soils erode from lightly vegetated surfaces and deposit on better-vegetated surfaces, often nearby, respectively favouring native species that are more and less tolerant of moisture stress and nutrient depletion. This process occurred naturally throughout the Holocene, increased with the advent of pastoral grazing and rabbits, and has probably slowed since the early 1990s with generally lower rabbit numbers, and with hawkweed invasion.

¹⁷ The plant mouse-ear hawkweed, *Pilosella officinarum*, formerly *Hieracium pilosella*.

- a. reductions (not increases) in bare soil occurred simultaneously with the invasion of hawkweed into Basin-floor short tussock grasslands between 1990 and 2000¹⁸; and
 - b. at Lake Tekapo Scientific Reserve, the amount of bare soil approximately halved across moraine and outwash landforms in 18 years following stock and rabbit removal. These landforms had both high (>40%) and moderate (11 to 23%) initial levels of hawkweed cover¹⁹.
38. Transformational pressures act more rapidly and are less reversible (or irreversible) because they take ecological conditions outside the capacity of the indigenous plants and animals to survive at all. Those most relevant for ecological sustainability in the Mackenzie Basin are exotic conifers and modern pastoral intensification practices (see footnote 11).
39. Exacerbating pressures worsen effects of chronic and transformational pressures. Climate change is the most prominent of these for Mackenzie Basin ecosystems²⁰.

¹⁸ Based on data collected in the Mackenzie Basin Grazing Trial, described by Meurk et al. (2002). I participated in the field work, undertook the data analyses, co-authored the journal paper, and hold the dataset.

Meurk CD, Walker S, Gibson RS, Espie P 2002. Changes in vegetation states in grazed and ungrazed Mackenzie Basin grasslands, New Zealand, 1990–2000. New Zealand Journal of Ecology 26: 95–106.

¹⁹ Based on data published by Walker et al. (2016). About a quarter of the bare soil reduction was accounted for by increases in litter and dead plant material on the soil surface, suggesting that formerly most litter was consumed by herbivores or blown away. Furthermore, striking increases in lichen cover on arid surfaces (especially river terrace plots) suggest that biological soil crusts were suppressed by pastoral management.

Walker S, Comrie J, Head N, Ladley KJ, Clarke D, Monks A 2016. Hawkweed invasion does not prevent indigenous non-forest vegetation recovery following grazing removal. NZ Journal of Ecology 40: 137–149.

²⁰ Climate change is predicted to strengthen prevailing westerly winds across New Zealand, delivering more water into the lake headwaters but intensifying rain-shadow effects such as desiccating winds and evaporative demand. Inter-annual climate variability is expected to increase (e.g. more extreme rainfall and wind events, more extreme variation in river flows, more frequent droughts, and more extremely hot days). I would expect these changes to exacerbate adverse effects of most chronic and transformational pressures on the basin's biota.

What has changed since 2006

40. Since 1990, active changes in land use have been responsible for widespread and rapid loss and modification of indigenous vegetation and habitats of indigenous fauna in the Mackenzie Basin, and elsewhere in the South Island where comparable vegetation and ecosystems occur (or previously occurred).
41. I estimate that across the Mackenzie Basin floor the area of indigenous vegetation and ecosystems directly lost between 1990 and the present exceeds 68,000 hectares. That is 22.5% of the total Mackenzie Basin floor area of some 301,000 hectares²¹. However, 22.5% greatly understates the percentage of the Basin that has experienced adverse ecological effects from that change. These effects are many²² and extend far beyond the sites where the ecosystems were directly lost.
42. About half of the direct ecosystem loss occurred recently: between 2009 and the present. By far the most important cause of that ecosystem loss (>90%) has been pastoral intensification. A secondary cause of loss has been the spread of wilding conifers, and infrastructure and urban development is a third.

²¹ This is the area of the LENZ (Leathwick et al. 2003) Level I Environments E, N, J and K that occur within or immediately adjacent to the Mackenzie Ecological Region (McEwen 1987), as shown in the table below.

Environment (LENZ Level I)	Land area in Mackenzie Basin (ha)	Median elevation (m)
E (Central Dry Foothills)	134,900	700
J (Central Well Drained Recent Soils)	4,600	600
K (Central Upland Recent Soils)	18,600	600
N (Eastern South Island Plains)	142,800	500

Leathwick JR, Wilson G, Rutledge D, Wardle P, Morgan F, Johnston K, McLeod M, Kirkpatrick R 2003. Land environments of New Zealand. Auckland, David Bateman. 184 p.

McEwen WM ed. 1987. Ecological regions and districts of New Zealand. Third revised edition. New Zealand Biological Resources Centre Publication No. 5 (in four parts). Wellington, Department of Conservation.

²² I have not attempted to fully document those knock-on effects, such as on fresh water.

43. One of the cumulative consequences of these changes is that the threat status of many indigenous species and many originally rare terrestrial native ecosystems, including those that occur on Simons Pass, has been greatly exacerbated, especially in the last decade. The significance of those remaining has become much greater as a result.
44. National guidance recognised the originally rare terrestrial native ecosystems of the Mackenzie Basin as national priorities for protection in 2007²³, and they were given IUCN red list categories in 2012²⁴.
45. The reports upon which the CRR 2007 was based (listed in footnote 2) were written before this period of rapid land use change. In my view this means that the reports are based on a fundamentally different starting point in terms of assessing both ecological significance and ecological sustainability than if those assessments were undertaken now.

Significance and ecological sustainability

46. In my opinion, and for reasons stated at paragraphs 27 to 32 above, it is likely now that most of the remaining undeveloped areas on glacially- and alluvially-derived landforms in the Mackenzie Basin will have SIVs^{25, 26}. By ‘undeveloped’ I mean not repeatedly cultivated

²³ *Ministry for the Environment 2007. Protecting our places: introducing the national priorities for protecting rare and threatened native biodiversity on private land. Wellington, Ministry for the Environment.*

²⁴ The three IUCN Red List categories for threatened ecosystems are critically endangered, endangered, and vulnerable (in order of descending threat). Of the ecosystems that occur on Simons Pass, Holdaway et al. (2012) categorised dry moraines, ephemeral wetlands, and outwash gravels as critically endangered, and braided rivers and seepages and flushes endangered, and tarns as not threatened.

Holdaway RJ, Wiser SK, Williams PA 2012. Status assessment of New Zealand’s naturally uncommon ecosystems. Conservation Biology 26: 619–629.

²⁵ And also qualify as significant under s6(c) RMA, noting the tests for significance under the RMA and CPLA have sometimes been approached differently.

²⁶ I share this view with other independent ecologists who are experienced and reputable. For example, similar opinions were stated in evidence by M. A. C. Harding, ecologist for the Mackenzie District Council, before the Environment Court (in the matter of appeals under clause 14(1) of the First Schedule to the Act in relation to decisions on Plan Change 13 to the Mackenzie District Plan).

Mr Harding’s opinion (paragraph 31 of his evidence-in-chief 15 July 2016) was that ‘*most undeveloped (i.e. uncultivated and un-irrigated) areas on glacially-derived landforms (moraines and outwash*

or irrigated. There will be some undeveloped areas in the Basin that are no longer significant because they have been substantially modified by over-sowing, top-dressing, grazing, or wilding conifer or other weed spread, but their total extent will be small (i.e. probably <10% of remaining undeveloped areas).

47. Considering the ecological pressures it faces and the degree of loss to date, management that promotes ecological sustainability at a property and Basin scale will entail:
- a. relieving chronic pressures by controlling predators and grazing and browsing animals;
 - b. preventing transformational pressures (especially conifer planting and invasion, and pastoral intensification of remaining indigenous vegetation and ecosystems); and
 - c. mitigating the exacerbating effects of climate change on ecosystems (especially through ensuring remaining areas of indigenous cover are maintained, along with their connections, and preventing and rolling back conifer invasion).

PRELIMINARY PROPOSAL

Areas recommended for Crown ownership

48. The area proposed for restoration to full Crown ownership and control is 1,265 hectares²⁷.

terraces) in the Mackenzie Basin are likely to meet [criteria for significance] except where vegetation is substantially modified by over-sowing, top-dressing, grazing, or wilding conifer spread. Severely degraded sites will, in many cases, meet [criteria for significance] as these sites provide habitat for threatened plant and animal species'.

Mr Harding also stated (paragraph 43 of his evidence-in-chief 15 July 2016) of areas south and east of SH8 that '*... parts of the area south and east of SH8 which lie on naturally uncommon ecosystems (moraines, outwash gravels and ephemeral wetlands) and are uncultivated are most likely to meet [criteria for significance]. Other uncultivated parts of the area (on river gravels) are also likely to meet [criteria for significance] as they provide habitat for threatened plant and bird species. ... Areas with severe degradation and/or high rabbit numbers should not be excluded from survey, as such areas may still provide habitat for threatened plant and bird species'.*

²⁷ Proposal Summary 2017.

49. These 1,265 hectares cover the highest and youngest moraine landforms in the north and west of the property south of the State Highway. They also cover a meltwater channel that cuts through these moraines; and small parts of a high river-cut escarpment and the low terrace of the Pukaki River below that escarpment.
50. The ecological features of these areas are described in the CRR 2007, the DOC Recommendations Report 2007, and the Wardle Botanical Report 2006, and on those assessments are clearly ecologically significant and deserve designation to Crown ownership and control as a conservation area²⁸. I consider that these areas are clearly significant as per the definitions and methodologies referred to in paragraph 12-13 above.

Areas recommended for freehold disposal

51. Approximately 3,645 hectares identified as having significant inherent values in the expert reports (listed in footnote 2) are recommended for freehold disposal subject to no protection²⁹. This is despite their identification as SIVs by experts in 2006, being recognised in national guidance as national priorities for protection in 2007³⁰ and given IUCN red list categories in 2012 (see footnote 24).
52. On review of the CRR 2017 and the Scion Report I cannot see any assessment of what would be required to promote the management of those areas in a way that is ecologically sustainable, as defined in paragraph 24 and described in paragraph 47. The Proposal Summary 2017 (including its paragraph 3.1) does not provide any such assessment.

Inadequate coverage of areas identified for Crown ownership

53. The 1,265 hectares proposed for restoration to full Crown ownership and control covers 26% of approximately 4,910 hectares of land identified by DOC as having SIVs for lizard,

²⁸ Or alternative protective mechanism so long as that could be shown that alternative would achieve protection.

²⁹ Therefore 85% of the total area proposed for freeholding (4,310 hectares) has been identified as having significant inherent values and there are no provisions proposed to protect them.

³⁰ *Ministry for the Environment 2007. Protecting our places: introducing the national priorities for protecting rare and threatened native biodiversity on private land. Wellington, Ministry for the Environment.*

bird, invertebrate, aquatic and/or botanical values. They are not representative of the range and diversity of SIVs present across those 4,910 hectares.

54. Most of the most significant, rarest, and most vulnerable ecological values on the property – those that most deserve protection – are found only on the 3,645 hectares (74%) of identified SIVs for which no protection is proposed, for example:

- a. the connected sequence of increasingly older moraines that lie south of the proposed conservation area with their tussock grasslands, shrublands and interstitial wetlands;
- b. the major system of dry meltwater channels that cut through 'Balmoral' moraines and cross the State Highway between the homestead and Lake Pukaki, and emerge onto the outwash plain;
- c. the unique 'necklace' of Balmoral terminal moraine lumps on the outwash plain that demarcate the furthest extent of ice; and
- d. the Pukaki outwash plain itself.

55. The conclusions of the experts (in reports listed at footnote 2) were that these areas deserve protection. The area proposed for protection via designation as a Conservation Area provides no protection for these values. No alternative protective mechanisms are currently proposed.

56. These areas represent nationally significant and exceptional landform and indigenous ecological attributes that are connected to each other, as well as to other ecosystems on Simons Pass and the wider landscape. Their maintenance is required to sustain ecological functioning and therefore ecological sustainability.

Adequacy of DOC assessments

57. On those 3,645 hectares of identified SIVs for which no protection is proposed, I support the conclusions reached by the expert assessors for DOC. I confirm that the reasons given for identifying those areas they found to be ecologically significant are sound.

58. I consider that those assessments are incomplete, however:

- a. an area of outwash plain in the south-west of the property ('southwestern outwash') was identified in the CRR as significant for bird fauna and invertebrate fauna but not for its botanical values. This area is also likely to be significant for its botanical and other ecological values because:
 - i. I understand that the botanical experts were unable to survey this area in any detail in 2006 because their time was limited;
 - ii. even if no botanical values remain (which I doubt based on experience elsewhere in the Basin and my visit in May 2012) I cannot see why this area was not considered significant for the ecological connectivity it provides; and
 - iii. expert survey and assessment for the CRR came before full recognition of the special character and critically endangered status of outwash gravel landforms themselves (see paragraphs 62 e-g below) and prior to the rapid land use change that has occurred across similar ecosystems in the Mackenzie Basin and beyond in recent years.
- b. The 'farm block' was not assessed to have SIVs by the original assessors (reports at footnote 2). In my view reassessment is required due to the length of time passed since those reports were completed. As I have said, the 2017 ecological context is fundamentally different to that in 2006. The block likely retains indigenous ecological features and great potential for ecological recovery because it is a compact area completely surrounded by extensive connected sequences of indigenous vegetation. I understand, the prominent shelterbelts have now been removed. In my opinion the area is likely to also deserve protection by a mechanism that will sustain its values and enable their recovery.

59. A map identifying these areas is attached at **Attachment C**.

60. I have also marked three areas (A, B and C) on **Attachment C** which I consider are unlikely to support significant inherent ecological values, in agreement with the expert assessors.

Updated assessment of areas not identified for Crown ownership

61. In my opinion, the areas recommended for protection as “Simons Pass Drylands CA” by Ms Wardle in her recommendations map for DOC in 2006 (Expert Recommendations Map 2006, attached here at Attachment B) warrant Crown ownership and control in their entirety³¹. These areas cover approximately 3,650 hectares of identified and described SIVs for which no protective mechanism or mechanisms are currently proposed.

62. Although the significance of these areas was appreciated in 2006 and 2007, both the context of those values (the degree of loss and consequently their rarity, see paragraphs 40 to 44 above) and the appreciation of their ecological significance has greatly increased in the last decade. For example:
 - a. Simons Pass is almost entirely made up of ‘originally rare’ indigenous ecosystem types (inland outwash gravels, moraines and ephemeral wetlands) that since the assessments were named national priorities for protection and have now been assessed as critically endangered using the IUCN’s ecosystem red-list criteria;
 - b. significant ecological areas on Simons Pass cover the majority of a full glacial landform sequence of connected ‘originally rare’ ecosystems, indigenous vegetation and species habitats, and a striking environmental and biological gradient. This is now one of only two such sequences of indigenous vegetation remaining in the Basin and nationally, and the driest of all. These features make it exceptionally important for the long term ecological persistence of the indigenous flora and fauna;

³¹ I understand that mechanisms to allow some pastoral use could still be applied to land designated for full Crown ownership and control. I consider that this would be acceptable so long as this use was consistent with protection of significant ecological values and ecological sustainability. Determining this would require consideration of the proposed use next to the values present, that is evidence-based. Given uncertainty, a proper adaptive management process would need to be allowed for. This would require an experimental design (with a proper control and preferably, replication) and monitoring designed with a robust enough methodology and appropriate statistical power to detect adverse effects and adjust management treatments accordingly.

- c. together with the connected lower part of the outwash plain on Simons Hill, the property represents one of New Zealand's environmental extremes or limits, of importance for the future evolution of the biota;
- d. the indigenous flora of the site is a nationally outstanding, assemblage of threatened and at risk plant species adapted to New Zealand's driest habitats. It is not replicated anywhere else to my knowledge;
- e. outwash gravels underlie a considerable fraction of the SIVs not identified for crown ownership. They may be considered the most ecologically and biologically distinctive of the Basin's ecosystems. They and their endemic biota:
 - i. are found nowhere else, and are unquestionably under the greatest threat of imminent clearance and loss; and
 - ii. have special character, especially as last remaining examples of the evolutionary response of the native biota to protracted arid conditions in New Zealand;
- f. the undeveloped outwash gravels are:
 - i. now recognised to support a greater number of the Mackenzie Basin's known threatened or declining plant species (29) than any other type of habitat (even more the highly distinctive ephemeral wetlands, with 20) and also more naturally uncommon or data deficient plant species (12) than any other. A number of these species were identified on the Simons Pass outwash in the botanical survey and are listed in the Wardle Botanical Report 2006 and the CRR 2007;
 - ii. also a principal breeding habitat for endemic threatened (Nationally Vulnerable) banded dotterel (*Charadrius bicinctus bicinctus*). Those on Simons Pass represent a significant and growing fraction of the remaining breeding habitat for these species nationally because of massive conversion and modification of these breeding habitats within the Basin and elsewhere nationally; and

- g. The indigenous invertebrates of undeveloped outwash gravels are also highly endemic and little studied.

Progressive reduction of areas identified for protection through the tenure review

- 63. In **Attachment D** I provide maps that show a time series of changes to the recommendations for protection and freeholding on Simons Pass through the tenure review process. The maps clearly show that there has been progressive disregard for the recommendations of experts for protection over the time since they were made.
- 64. This trend is in direct opposition to the growing significance of those values and scientific appreciation of their importance over that time, and I can see no ecological basis for it. I have not seen any ecological report supporting those changes.
- 65. The values identified for protection in 2006 remain little changed at the site. I understand that a ryecorn crop was sown on parts of the outwash plain in 2013 or 2014 but this activity was not continued. Based on my ecological site inspections elsewhere on the Pukaki outwash plain, I consider that this activity will have had only minor and reversible adverse effects on the ecological features. I have viewed Ms Lucas' reports and photographs from her recent site visit for EDS, which confirm that the effects of the ryecorn sowing are barely visible now.

Management of the land in a way that is ecological sustainable

- 66. Apart from on the land proposed for Crown ownership, I consider that the Preliminary Proposal completely fails to give effect to the object of promoting management of the land in a way that is ecologically sustainable. I consider that the advice in the Scion Report is defective and simply fails to take into account the relevant factors³², and so too is the interpretation and inference in the Proposal Summary 2017.
- 67. In reviewing the Preliminary Proposal and associated documents I cannot see where relevant scientific evidence has been considered, or ecological expertise consulted, in determining whether the ecological sustainability object will be achieved. For example,

³² as set out in the Landcare Research ES Report and Barton Report

research showing the ability of indigenous vegetation on similar landforms to recover given relief from grazing (see paragraph 37, above) is not referred to.

68. In my opinion, management in a way that is ecological sustainable would not be promoted by enabling freeholding. For example:
- a. from my experience it is likely that conversion of areas of freehold land to irrigated pasture or crops will occur. Although consent for any further pastoral intensification or subdivision may now be required under the District Plan, in my experience RMA provisions can and do change, and cannot be relied to promote ecological sustainability³³; and
 - b. if management that is ecologically sustainable is to be promoted, provisions are needed to give effect to the requirements I set out at paragraph 47 above. Based on my experience, freeholding is less likely to be compatible with those requirements than other possible designations (such as management as Crown land by DOC or continuation as a Crown Pastoral Lease).

CONCLUSION & RECOMMENDATIONS

69. I consider that:
- a. the areas marked “Simons Pass Drylands CA” in **Attachment B** have significant inherent ecological values deserving of protection;
 - b. management of the areas marked “Simons Pass Drylands CA” in **Attachment B** in such a way that their SIVs are sustained is critical to achieving ecological sustainability of the Mackenzie Basin’s international, nationally and regionally unique ecosystem; and

³³ The Barton Report (p. 25) sets out the difference between sustainable management under the RMA and ecological sustainability in the CPLA. I also note that there are (or have been) exemptions for land freeholded in tenure review from some provisions of some District Plans, for example in Central Otago District, and previously in Waitaki District.

- c. that the Preliminary Proposal's designations would be unlikely to achieve protection of significant inherent ecological values or ecological sustainability.

Dr Susan Walker

18 July 2017

Attachment A: Detail of experience and knowledge of Simons Pass

I have specific experience and knowledge of the ecology of Simons Pass.

In preparing evidence before a RMA hearings committee in December 2009³⁴ I was provided with, and used, GIS shapefiles of the significant inherent values (Botanical, Invertebrate, Lizard, Bird, and Landscape³⁵) and GPS locations of the threatened and notable plant and animal species identified on Simons Pass in inspections for tenure review. I was provided with original botanical report (October 2006) and combined recommendations map (December 2006) prepared by Ms Wardle for the Department of Conservation (**DOC**). I met and discussed the ecological values of the site with three of the experienced ecologists involved in those surveys: Ms Comrie, Mr Head and Mr Chinn of DOC.

Between 2009 and 2012 I reviewed a number of different ecological assessments and provided court affidavits on the question of whether the vegetation of the property met criteria in the Mackenzie District Plan indigenous vegetation clearance rules³⁶. I undertook this work at the request of the Royal Forest and Bird Protection Society Inc (**Forest & Bird**). I met and discussed the ecological values of the site with other experienced ecologists involved in these proceedings (Mr Lloyd of Wildland Consultants and Dr Grove of Environment Canterbury).

On 25 May 2012 I undertook a site visit on Simons Pass with the lessee Mr Valentine, his wife Mrs Valentine, some of their contractors and staff, and Forest & Bird staff. On that visit I traversed much of the area, spent time on the ground, and had extensive discussion with the lessee's ecological consultant at that time (Dr Norton) who was at that time more familiar than I with the ecological values. I then provided a letter of advice to Mr Anderson (Forest & Bird's solicitor) on

³⁴ in the matter of resource consent applications by various parties to take and use water in the Upper Waitaki Catchment

³⁵ As identified as part of the reports referenced at footnote 2 above.

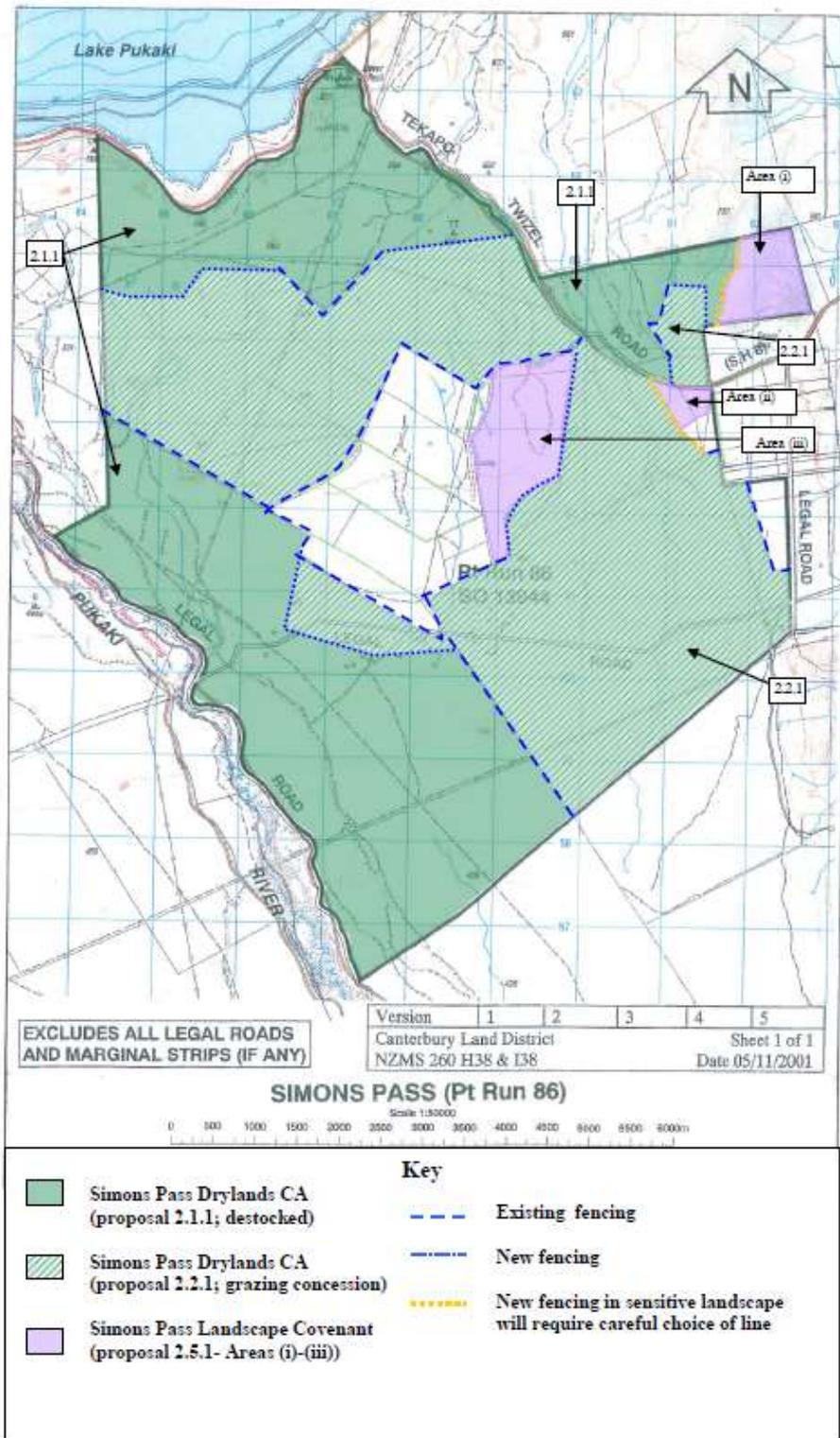
³⁶ Rule 12.1.1.g: Shrublands: the rule prohibits clearance of more than 2000sqm of specific shrubland complexes. Rule 12.1.1g Short Tussock Grasslands: the rule applies and clearance subject to regulatory oversight where tussocks exceeds 15% canopy cover. Rule 12.1.1h Indigenous Cushion and Mat Vegetation and Associated Communities: this rule applies and clearance subject to regulatory oversight where at least 50% of the vegetation ground cover comprises vascular and non-vascular indigenous species or where the number of vascular indigenous species is greater than 20.

12 June 2012 which summarised the ecological values of the property their significance. I am not aware of any constraint on my use of the information that I gained on that visit.

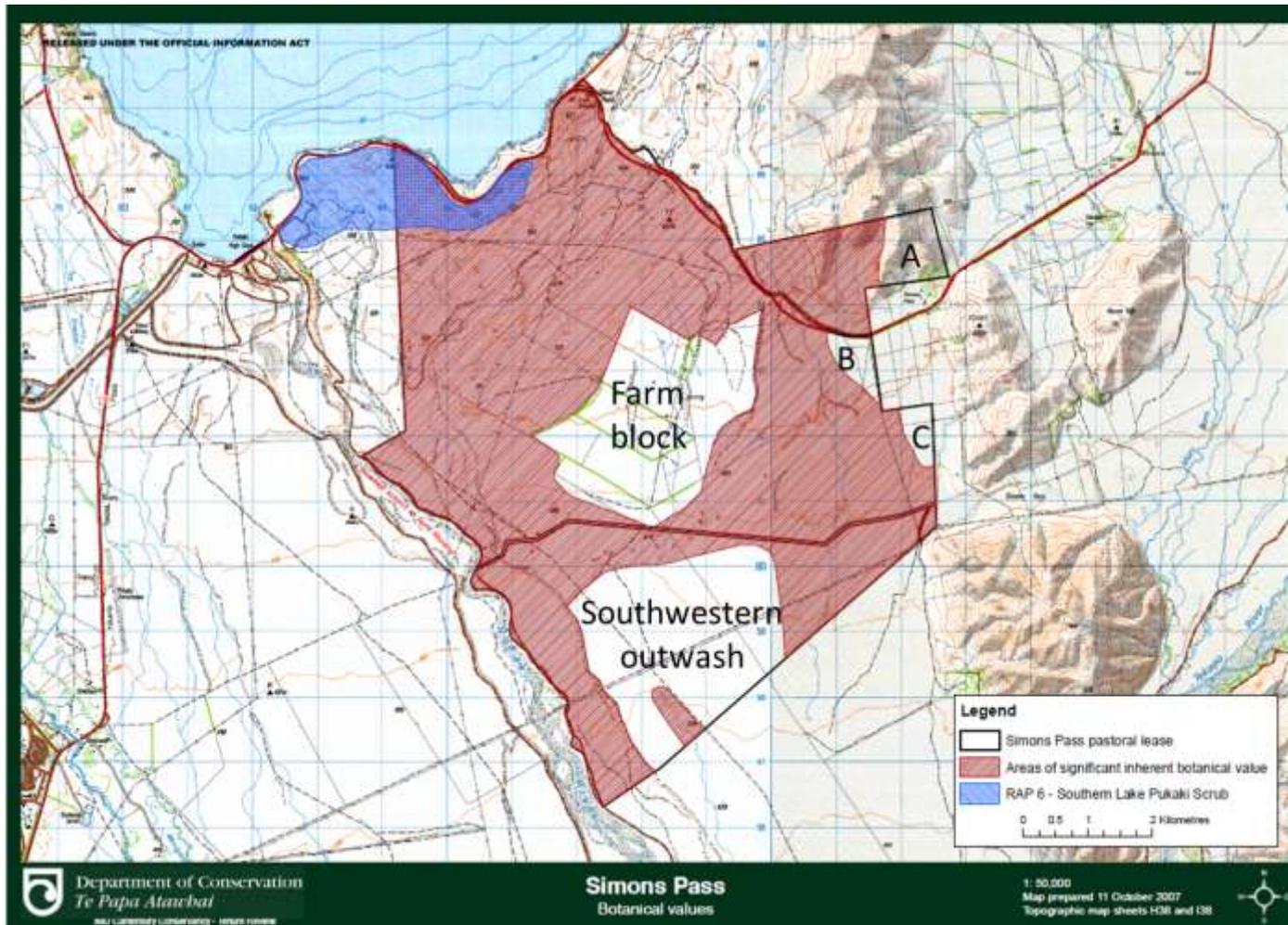
I was engaged by Forest & Bird to undertake an inspection of areas proposed for irrigation on Simons Pass and Simons Hill in January 2013. This I carried out on seven days (10–12 and 14–17 January 2013) assisted by the qualified botanist Ms Hayman and two university student interns. Following that visit I prepared a Landcare Research contract report (April 2013) and a High Court affidavit (June 2013) for Forest & Bird. I understand that I am prevented by an access agreement from using any information gained on my January 2013 inspection for purposes other than the associated RMA appeal by Forest & Bird. I have not relied on or referred to that information in this statement.

Attachment B. Expert Recommendations Map 2006. This map shows the areas recommended for protection by Ms Wardle in her advice to DOC in 2006. I consider areas marked “Simons Pass Drylands CA” still have significant inherent ecological values.

Map 5.1: Recommendations – Simons Pass Pastoral Lease



Attachment C. This map shows areas referred to at paragraph 58 and 59 that I consider warrant reassessment for their ecological value, and identifies those areas that I agree are unlikely to have significant inherent ecological values (A, B and C).



Attachment D. Time series showing the progressive changes to the recommendations for protection and freeholding on Simons Pass through the tenure review process.

