In the matter of	an application by NZSki Limited to upgrade the Remarkables Ski Area and the Doolans Expansion [FTAA-2605-1236]
By	**NZSki Limited**
	Applicant

Statement of Evidence of Matthew John Dale (Ecology) on behalf of Te Rūnanga o Moeraki, Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou, Hokonui Rūnanga, Waihōpai Rūnanga, Te Rūnanga o Awarua, Te Rūnanga o Ōtaka Aparima, Te Ao Marama Incorporated and Aukaha (1997) Limited

27 October 2026

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Introduction

Qualifications and experience

1 My full name is Matthew John Dale.

2 I am the owner and director of Waterscape Connections Limited, an independent environmental consultancy based in Ōtepōti/Dunedin.

3 In addition to project-based roles supporting mana whenua and community groups throughout Te Waipounamu, I am also contracted to the position of Kaiwhakahaere Whakakaupapa Taiao (Environmental Project Manager) for Kāti Huirapa Rūnaka ki Puketeraki.

4 I hold the following qualifications: A Bachelor of Biological Science (Ecology) from La Trobe University and a Postgraduate Diploma (Ecology) from the University of Otago. I am also a member of the New Zealand Freshwater Sciences Society.

5 I have previously been employed by the National Institute for Water and Atmospheric Research (2004-2006), the Otago Regional Council (2006–2016), and Te Rūnanga o Ngāi Tahu (2016-2023).

6 I have over 20 years' experience as an ecologist, with a focus on freshwater fish monitoring and management, hydroecology, mahika kai, terrestrial ecology and pest management.

Involvement in project

7 I am familiar with the project area, having undertaken a site visit to the Rastus Burn and Doolans Basin and having undertaken native fish surveys in the wider Nevis catchment and Whakatipu Basin. I have also been involved in the early resource consent application at this site while previously employed by the Otago Regional Council from 2006 to 2016.

8 This evidence responds to the substantive application (**Application**) by NZSki Limited (**Applicant**) as circulated 28 August 2026.

Purpose and scope of evidence

9 The purpose of this evidence is to provide a summary of the existing environment in the Doolans and Rastus Burn basins, summarise the likely impacts of the proposed activity on ecological values, identify any technical or structural deficiencies in the application, and recommend any further consent conditions/activities to mitigate or offset the impact of the proposed activities.

10 In addition to evidence provided based on my own expertise, which focuses on freshwater ecology and broad-scale ecosystem management, I will also be drawing on and summarising evidence provided by the ecology advisory group that has supported Kā Rūnaka through their engagement with NZSki, as well as evidence provided by other submitters.

11 All application documentation examined in the preparation of this evidence is listed below.

(a) A.10 – Substantive Application Report Section 3 – Project Description.

(b) A.17 – Substantive Application Report Section 10 – Approvals Relating to the Conservation Act.

(c) A.18A – Substantive Application Report Section 11 – Approvals relating to Wildlife Act – Redacted.

(d) A.19 – Substantive Application Report Section 12 – Approvals relating to the Freshwater Fisheries Regulations.

(e) Appendix C – e3Scientific Ecological Memorandum.

(f) B-08A – Remarkables Ski Area Upgrade and Doolans Expansion – Doolans Creek Water Take.

(g) B-09 – Remarkables Ski Area Upgrade and Doolans Expansion – Freshwater Ecological Impact Assessment.

(h) B-12A – Remarkables Ski Area Upgrade and Doolans Expansion – Terrestrial Ecological Impact Assessment – Part 1.

(i) B-12 – Remarkables Ski Area Upgrade and Doolans Expansion – Terrestrial Ecological Impact Assessment – Part 2.

(j) B-12 – Remarkables Ski Area Upgrade and Doolans Expansion – Terrestrial Ecological Impact Assessment – Part 3.

(k) B-12 – Remarkables Ski Area Upgrade and Doolans Expansion – Terrestrial Ecological Impact Assessment – Part 4.

(l) B-13A – Remarkables Ski Area Upgrade and Doolans Expansion – Lizard Assessment and Management Plan.

(m) B-18A – Remarkables Ski Area Upgrade and Doolans Basin Expansion – Wastewater Treatment and Disposal Feasibility Report.

(n) B-20A – Remarkables Ski Area Upgrade and Doolans Expansion – Reservoir Concept Report.

(o) B-21A – Remarkables Ski Area Upgrade and Doolans Expansion – Water Intake Concept Report.

(p) Doolans Terrestrial Ecology Management Plan.

(q) FTAA-2605-1236 – Remarkables and Doolans – RFI Response – Ecology Addendum.

Expert Witness Code of Conduct

12 Although these proceedings are not before the Environment Court, I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving oral evidence before the Hearings Panel. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Summary of evidence

13 This evidence addresses the ecological effects of NZSki Limited's proposed Remarkables Ski Area upgrade and Doolans Basin expansion, with particular emphasis on freshwater hydrology, alpine aquatic ecosystems, habitat integrity, indigenous fauna and the adequacy of effects management. My assessment draws on the Applicant's technical reports, my ecological experience and specialist advice available to Kā Rūnaka.

14 The Doolans Basin is an unusually intact and connected alpine environment containing high-value streams, tarns, wetlands, tussocklands and naturally uncommon ecosystems. Its ecological importance derives not only from individual habitats and species but also from the diversity, representativeness and connectivity of the wider landscape. These attributes are relevant to its capacity to support indigenous biodiversity under a changing climate.

15 The proposed abstraction of up to 30 L/s from Doolans Creek would occur in a high-value, naturally fishless alpine reach. The Applicant has assessed flow and aquatic effects and proposes a 33.5 L/s residual flow. However, in my view, the available assessment does not adequately quantify site-specific changes in wetted habitat or test the combined effects of

abstraction and plausible future changes in snowmelt and seasonal low flows over the proposed 35-year consent period.

16 The proposed conversion of Tarn 3 into a lined reservoir would permanently remove approximately 4,450 m² of natural tarn habitat. Although the Applicant identifies lower aquatic diversity than in some other surveyed tarns, it assesses Tarn 3 as having high ecological value. Its loss would also diminish the natural range of freshwater habitats in the basin, with implications for ecological resilience under changing climate conditions. Avoidance alternatives should receive careful consideration.

17 The Applicant proposes construction-phase bird management, including nesting protections for kārearea and pīhoihoi. These measures may address direct disturbance, but cultural effects on Kāi Tahu taonga species require consideration by mana whenua. For lizards, the Applicant estimates that 300–600 McCann's skinks may be injured, killed or displaced without salvage. The proposed $80,000 lizard compensation comprises $60,000 for research and $20,000 for translocation; I consider that its outcomes and deliverability require clearer demonstration.

18 Permanent terrestrial habitat loss, fragmentation, snowmaking and grooming also warrant consideration beyond construction disturbance, including under future climatic conditions. The proposed biodiversity compensation framework has potential merit, but its objectives, measurable outcomes, funding adequacy, implementation responsibilities and monitoring should be resolved sufficiently to support enforceable conditions before approvals are granted.

Existing environment

Hydrology and aquatic ecology

19 The Doolans Basin is a largely undeveloped, high-altitude freshwater environment comprising Doolans Creek Right Branch, numerous small tributaries and ephemeral headwaters, alpine wetlands and a series of tarns. The catchment upstream of the proposed intake remains largely free from anthropogenic influence and is dominated by tussock grassland and alpine/subalpine vegetation.

20 Doolans Creek Right Branch is a steep alpine stream draining elevations of approximately 1,380–1,750 m. It has a predominantly step-pool morphology, coarse bed material, exposed bedrock in steeper reaches and a naturally flashy flow regime associated with storms and snowmelt. Flows are generally lower from January to June and increase substantially during the September–November spring snowmelt period. The creek ultimately

joins Doolans Creek Left Branch and then the Nevis River, which in turn flows into Kawarau River before joining the Mata-Au/Clutha River in Lake Dunstan.

21 Water quality in the Doolans Creek Right Branch is high, with surveys undertaken by the Applicant showing cool, clear and well-oxygenated water throughout the study area typical of undisturbed alpine streams. Algal cover was limited, which the assessment attributes to the cold, low-nutrient conditions, while submerged bryophytes/mosses occurred at several sites. The invasive diatom Didymo was, however, recorded at the proposed weir site in January 2026.

22 The macroinvertebrate community of the upper reaches of Doolans Creek provides strong evidence of an unmodified ecological condition. With a Macroinvertebrate Community Index (MCI) score of 124, a Quantitative Macroinvertebrate Community Index (QMCI) of 7.7, and an EPT taxa (Ephemeroptera, Plecoptera and Trichoptera—mayflies, stoneflies and caddisflies) representing 93% of macroinvertebrate abundance, all pointing towards conditions representative of a pristine reference state.

23 Due to natural downstream barriers, there are no fish present in the immediate vicinity of the project area. The absence of fish at the intake does not, by itself, establish an absence of effects on mahika kai values in the wider catchment.

Terrestrial ecology

24 The Doolans Basin represents an exceptionally intact alpine environment with very high ecological significance. The basin supports a high diversity of indigenous alpine habitats arranged across a naturally connected landscape.

25 A particularly important component of the existing environment is the presence of numerous naturally uncommon ecosystems (NUEs). These include terrestrial systems associated with moraines, acidic-rock screes and alpine deflation surfaces, together with six different wetland NUEs.

26 The physical landscape itself also has significant ecological and geomorphological diversity. Particularly distinctive features include well-preserved nested moraines and tarns associated with repeated late-glacial advances, an extreme alpine deflation surface, an extensive low-relief tussock-covered moraine bench, wind “touch-down” deflation surfaces around the margins of the moraine bench, wetland string mires, taramea, wīwī and koromiko/kōkōmuka .

27 It is important to note that while the individual components of habitat types, flora, fauna, and physical landscape features are of high to very high values, the interconnectedness, representativeness and close to pristine condition create a combined ecological values set that is much greater than its component parts.

Avifauna

28 Six indigenous avifauna species are known from the project area: eastern falcon/kārearea, New Zealand pipit/pīhoihoi, paradise shelduck/pūtakitaki, Australasian harrier/kāhu, southern black-backed gull/karoro, and kea. All except kea were observed during the ecological surveys in the Doolans Creek area.

29 Kārearea, pīhoihoi, kāhu, karoro and pūtakitaki are recognised as a taonga species under Schedule 97 of the Ngāi Tahu Claims Settlement Act 1998. Accordingly, assessment of the effects of the proposed activity on these species should consider not only their ecological conservation status and the effectiveness of proposed mitigation measures, but also their cultural significance to Kāi Tahu.

30 Of these species identified by the Applicant, kārearea and pīhoihoi are known to nest within, or nearby to the project area.

31 Suitable nesting habitat for pīhoihoi occurs principally within snow tussock and north-facing tussock grasslands, while wetlands, seepages, cushion bogs and cushionfields provide foraging habitat.

32 Both the Rastus Burn and Doolans basin provide nesting and foraging habitat for kārearea. Field observations indicate that there is likely one pair of kārearea using the upper Rastus Burn basin and one pair using the upper Doolans catchment.

Lizards

33 A desktop assessment undertaken by the Applicant identified several indigenous lizard species with the potential to occur within the project area. McCann's skink (Oligosoma maccanni) was considered to have a high likelihood of occurrence, while the newly recognised Central–Southern skink (Oligosoma aff. inconspicuum "Central–Southern"), classified as At Risk – Declining, was assessed as having a moderate-high likelihood. Other potentially occurring species included Short-toed gecko and Orange-spotted gecko, while southern grass skink, Nevis skink and Lakes skink were considered less likely.

34 McCann's skink was the only lizard species detected during the surveys undertaken by the applicant. McCann's skink is classified as Not Threatened and is relatively widespread across Otago, Southland and Canterbury. Within the project area it was found predominantly below approximately 1,600 m elevation in both the Rastus Burn and Doolans catchments. Above 1,600 m, animals were present at relatively low abundance and were largely restricted to warmer, north-facing tussock slopes.

Assessment of effects

Hydrology

35 The Applicant had proposed to take up to 30 L/s from the Doolans Creek with a volume of 38,872 m^3/month, and 41,240 m^3/year. A residual flow of 33.5 L/s has been proposed at the point of take, which represents 54% of the estimated 7-day mean annual low flow (MALF) of 67 L/s at this site.

36 Being relatively high in the catchment, it is expected that base flows will increase steadily further downstream, and the proposed take will have its largest impact in the 600m immediately downstream before the next tributary inflows enter the Doolans Creek.

37 In the alpine environments of the Mata Au/Clutha catchments, including the Doolans Basin, climate modelling indicates that increasing temperature will affect snow accumulation, snow-cover duration and the proportion of precipitation falling as snow, with consequent changes to the timing and magnitude of snowmelt-derived runoff (Poyck et al., 2011).

38 This is directly relevant to Doolans Creek because the Applicant describes the catchment as substantially snowmelt-fed and recognises that precipitation below approximately 1,100 m is more likely to fall as rain and contribute directly to streamflow rather than being stored in the snowpack.

39 In my opinion, a climate-change assessment of the proposed abstraction should examine not only changes in annual water availability, but also seasonal shifts in runoff, the frequency and duration of low-flow periods, and the extent to which snowmaking demand may coincide with those periods.

40 This is particularly important because a reduction in snowpack storage could change the timing of water availability even where annual precipitation remains relatively stable. The ecological concern is therefore not limited to changes in annual water yield, but extends to the timing and duration of low flows when abstraction is occurring.

41 Although the flow data provided by the Applicant indicates that a residual flow of 33.5 L/s would not have been reached over the current monitoring period (from May 2025), this represents a relatively short monitoring period and should be treated with caution when making predictions on the hydrological impact of the proposed take/residual flow under both current climate and future climate change scenarios.

42 The Applicant's assessment does not quantify these potential changes or provide future MALF estimates under climate-change scenarios, making it difficult to assess the impacts of the proposed take over the duration of the 35-year resource consent.

43 A robust assessment would test the proposed 33.5 L/s residual flow and maximum take against plausible future climate scenarios over the proposed 35-year consent term, including sensitivity testing for warmer, lower-snow winters and prolonged autumn and winter low flows. It should identify the assumptions and uncertainty in any projected flows, rather than relying solely on the short-term observed record.

Aquatic values

44 The proposed point of take is located within the upper reaches of Doolans Creek that has been assessed by the Applicant as having High ecological value. Although the reach is naturally fishless, it provides habitat for alpine macroinvertebrate, algal and moss communities.

45 In addition to supporting the aquatic biota listed above, Doolans Creek occurs within a currently undeveloped alpine basin with a high degree of naturalness and representativeness.

46 Climate change adds a further pressure to these high-value aquatic communities: warmer stream temperatures and changes in the duration and timing of low flows may reduce available wetted habitat, alter conditions for cold-water alpine taxa, and encourage nuisance algal growth.

47 The ecological consequence depends on the magnitude, frequency and duration of these changes, and on the sensitivity of the organisms present. The high ecological condition reported in the Applicant’s surveys make this an important question to consider.

48 In my view, the combined effects of abstraction, and the effect of future climate conditions on seasonal flow require explicit assessment, rather than treating the proposed take as an isolated pressure.

49 The Applicant has recognised that the proposed water take has the potential to alter instream habitat characteristics through reductions in water depth, velocity and wetted width and changes in sediment deposition, however this has not been quantified through site specific investigations such as Instream Flow Incremental Methodology (IFIM) or habitat reduction methods.

50 The lack of a site-specific assessment on the effects of reduced flows on aquatic ecosystems, makes it difficult to quantify the effects of the proposed water take and residual flow on Doolans Creek, however the most noticeable effects (such as reductions in wetted width, depth and velocity) are likely to occur during the overlap between snowmaking and natural low flows in late Autumn and early Winter. It is expected that this risk will be increased under the current climate change predictions for the Remarkables area.

51 In my view, a site-specific flow–habitat assessment, supported by sensitivity testing of future flow scenarios, is needed to determine the scale of the combined effect rather than assuming that every flow reduction produces the similar ecological response.

52 The Applicant has proposed that “Tarn 3” be substantially modified into an engineered, lined water-storage reservoir, resulting in the permanent loss of this high value habitat.

53 Although Tarn 3 has lower aquatic diversity than the other tarns in the Doolans basin, it is assessed as High ecological value, principally because of its naturalness, representativeness, uncommon ecosystem status and ecological context. Its seasonal fluctuations are also part of its natural character rather than evidence that it lacks ecological value.

54 The natural benthic environment of cobble and sandy substrate would be replaced by an engineered liner; the existing macroinvertebrate, zooplankton, algal and other aquatic habitat would therefore be permanently lost or fundamentally transformed.

55 The natural seasonal hydrological regime, filling following snowmelt and progressively contracting during summer, would also be replaced by a managed water-storage regime determined principally by abstraction, snowmaking demand and reservoir operations.

56 The scale of loss is particularly relevant: 100% of Tarn 3 and approximately 13.5% of the tarn habitat within Doolans Basin would be permanently lost as a result of the proposed activity.

57 The significance of this loss is heightened in the context of climate change. Natural alpine tarns and associated wetland margins contribute to habitat diversity across differing water levels and seasonal conditions. Permanently removing one of these features reduces the range of natural aquatic habitats remaining in the basin at a time when altered snowmelt, evaporation and hydroperiods may place additional pressure on those habitats. This is a concern about ecological resilience and the irreversibility of habitat loss, rather than a claim that Tarn 3 alone materially regulates catchment flows or supports significant aquatic values at the current time.

58 In addition to the direct loss of aquatic habitat, the proposed destruction of Tarn 3 should be considered in the context of the long-term resilience of the Doolans Basin to climate change. Alpine ecosystems are particularly vulnerable to increasing temperatures, reduced snow-cover duration and changes in hydrological regimes, with specialist alpine species often having limited opportunities to migrate to higher elevations or alternative habitats (Gottfried et al., 2012).

59 The diversity of aquatic and terrestrial habitats within the Doolans Basin, including tarns, wetlands, seepages and alpine streams, provides a range of environmental conditions that can support the persistence of indigenous species under changing climatic conditions. This habitat diversity is particularly important for specialist alpine species as local microclimates can provide refugia that buffer terrestrial and aquatic populations against climate-related environmental change (Brown et al., 2007, Scherrer & Körner, 2011; Morelli et al., 2016).

60 Tarn 3 contributes to this habitat diversity through its naturally fluctuating water levels, seasonal hydrological regime and associated aquatic communities. Its permanent conversion into an engineered water-storage reservoir would remove a distinct component of the natural alpine habitat mosaic and reduce the range of ecological conditions available within the basin. In my view, this loss is particularly significant given the exceptional naturalness and ecological connectivity of the Doolans Basin, and the increasing importance of maintaining diverse and intact alpine ecosystems to support the resilience of indigenous biodiversity under future climate change scenarios.

61 In its assessment of environmental effects, the Applicant has stated that “Given the high naturalness of aquatic habitat within the Doolans Basin and the engineering design element requiring the tarn to be fully lined no avoidance, mitigation, remediation nor offset is available to manage the effects of this activity” (e3Scientific Limited. 2026a).

62 Although the destruction of the Tarn 3 may be one of the more economically palatable water storage options available to the Applicant, in my view, strong consideration should be given to alternative options to avoid the impact on Tarn 3 as a unique ecological feature within the Doolans Basin.

Avifauna

63 To manage direct impacts and disturbance effects on kārearea the Applicant has proposed that kārearea, nesting habitat is to be surveyed shortly before works during the breeding season, with a 200 m exclusion zone around nests potentially affected by construction until chicks have fledged.

64 For pīhoihoi/NZ pipit, the approach includes pre-construction nest surveys, and reducing vegetation height and degrading habitat in potential nesting habitat within the disturbance area before the commencement of the nesting season. Should any nesting occur within the disturbance area and avoidance is not possible, provision has been made for the removal of nests and destruction of eggs under the proposed Wildlife Act framework.

65 In addition to managing the impacts on kārearea and pīhoihoi, the Applicant has proposed further management actions to address potential impacts on kea. The suitability of these measures is outside of my area of expertise and should be addressed by the relevant experts in this field.

66 In my view, the proposed management steps (that are within my area of expertise) during the construction phase of the project will adequately avoid, remedy or mitigate the likely effects on avifauna.

67 While the proposed measures may adequately manage direct disturbance to nesting kārearea and pīhoihoi, this does not necessarily demonstrate that effects on the cultural values associated with these taonga species have been adequately addressed. Assessment of those cultural effects is appropriately undertaken by mana whenua.

Lizards

68 The approximately 3.47 ha of identified lizard habitat occurs within the proposed earthworks footprint. This represents approximately 4% of the estimated 85.5 ha of lizard habitat within the wider Lizard Management Plan (LMP) site and about 0.8% of the total 413.35-ha LMP area.

69 McCann's skinks are relatively sparse above 1,600 m but become considerably more widespread and abundant at lower elevations, particularly within Doolans Basin. The project is estimated to directly affect

approximately 300–600 McCann's skinks, though the Applicant notes that this is an estimate based on expert opinion rather than detailed population modelling.

70 The Applicant has stated in its LMP that “No lizard salvage will be undertaken. This will result in injury, death and displacement of 300-600 McCann’s skink in and near the earthworks footprint. The effects of this are addressed through compensation.” (e3Scientific Limited, 2026b).

71 The Applicant has outlined remediation and mitigation through the creation of rocky habitats and the sequential removal of vegetation, however the lack of lizard salvage and reliance on compensation to address effects on lizards is inconsistent with the principles of the mitigation hierarchy, which states that activities should be prioritized in the following order, avoid → minimise → remedy → offset → compensation.

72 The basis for my concern is that the Applicant predicts mortality or displacement of 300–600 skinks while proposing no salvage. Habitat creation and compensation may provide future benefits, but they do not prevent those immediate losses. I therefore consider that the Applicants’ preference for compensation over avoidance and minimisation creates the needs for a higher degree of certainty for ecological outcomes than what is currently demonstrated.

73 The Applicant proposes $80,000 of lizard-specific compensation, directed toward two principal activities: an eDNA-focussed research project ($60,000), and the translocation of Lakes skink to the Whakatipu Lizard Sanctuary at Kelvin Heights ($20,000). This is additional to the project's wider Biodiversity Compensation Package.

74 The proposed research project is intended to test whether environmental DNA (eDNA) provides a more efficient and reliable method of detecting cryptic alpine lizard populations, focussing on orange-spotted gecko, lakes skink, Central-Southern skink, short-tailed gecko and the Nevis skink.

75 The proposed eDNA study does have merit in potentially improving available methods for cryptic lizard detection, however it is inconsistent with the principles for biodiversity compensation in that although the study could successfully answer the methodological research question, there is no guarantee of finding any new populations or producing a direct improvement in the abundance, habitat area or security of an indigenous lizard populations.

76 It is not to say that the proposed research does not have merit, however it should be given less weight than compensation measures that have more direct and measurable biodiversity outcomes.

77 In my view, the proposed translocation of Lakes skink to the Whakatipu Lizard Sanctuary is likely to provide direct and measurable positive outcomes for this species, however based on my experience in the Macraes Ecological District it is unlikely that the translocation and associated monitoring could be completed within the currently allocated budget of $20,000.

78 To address uncertainty, the proposed compensation should focus on clear and measurable outcomes for the enhancement of lizard biodiversity, rather than a broad commitment to undertaking the two projects while placing a cap on the funds allocated to lizard compensation.

79 As an example, these outcomes may include:

(a) The translocation of a fixed number of Lakes skinks to the Whakatipu Lizard Sanctuary, with the number of lizards translocated commensurate to the impact of the proposed activity.

(b) The translocation of lizards is informed by a translocation management plan to ensure that:

(i) The source population can sustain the removal of these lizards.

(ii) The receiving environment has sufficient carrying capacity for translocated lizards.

(iii) Sufficient genetic diversity is maintained in the translocated population.

(iv) Monitoring is undertaken to assess the effectiveness of the translocation and inform further management actions as needed.

80 To ensure that the proposed compensation package adequately addresses the residual effects of the proposed activity, any translocation or research plan should be completed as part of the fast-track process and included in the relevant consent conditions, rather than being completed at a later date following the granting of the Wildlife Authority.

Terrestrial habitat

81 Information provided by the Applicant indicates that the direct disturbance footprint for the Rastus Burn and Doolans alpine project is approximately 15.94 hectares in total. 13.8 ha of which will not be revegetated, which represents permanent vegetation loss associated with ski trails, roads, buildings and other infrastructure.

82 The Doolans Basin is of exceptionally high ecological significance, with very high ecological integrity and natural character. It represents a largely intact alpine ecosystem and may be the only alpine basin within the Ecological District that has not historically been subject to pastoral grazing, providing an important and potentially unique ecological baseline (Walker, *pers comm*).

83 The Doolans Basin supports outstanding ecological diversity, habitat pattern and connectivity, with intact habitats extending across multiple aspects and elevations. These include interconnected mosaics of terrestrial vegetation, wetlands, unvegetated habitats and naturally uncommon ecosystems in a combination considered unreplicated elsewhere within the Ecological District (Walker, *pers comm*).

84 The Doolans Basin has exceptional rarity and distinctiveness, supporting numerous naturally uncommon ecosystems, At Risk vascular plants and rare or poorly known invertebrates. It also contains exceptionally well-preserved glacial and geomorphological features, including nested moraines, tarns alpine deflation surfaces, a wetland string mire, which collectively contribute to its distinctive ecological and landscape character.

85 The Doolans Basin's large extent, intactness and unmodified ecological connectivity are particularly important in the context of climate change, providing opportunities for indigenous flora and fauna to move across environmental and elevational gradients, adapt to changing conditions and persist over time. These attributes give the Doolans Basin exceptional value for maintaining indigenous biodiversity and ecological resilience.

86 The climate-change implications of fragmentation or permanent habitat loss should therefore be considered alongside the immediate area of disturbance, including whether remaining habitat networks retain sufficient environmental and elevational variation to support ecological responses to warming. This is an assessment of ecological resilience rather than a prediction that particular species will relocate. Connected habitats across aspects and elevations provide a wider range of microclimates and potential movement pathways. Fragmentation or permanent removal of

distinctive habitats can reduce those options, although the magnitude of any climate-related population effect has not been modelled for this site.

87 Several distinctive features would be directly affected or destroyed, including the extreme alpine deflation surface at Helicopter Ridge associated with the proposed mid-station, a nested moraine crossed by the main trail, the moraine bench affected by the Doolans Base Station and learners' slope, and wind-deflation surfaces around the margins of the moraine.

Snow making and grooming

88 Much of the assessment of environmental effects provided by the Applicant focusses on the direct impact of construction activities such as vegetation clearance, soil disturbance, etc.

89 However the Applicant has undertaken limited assessment of the consequences of depositing and subsequently melting a large volume of dense artificial snow across alpine terrestrial environments on both the current environment and future climate change scenarios.

90 Artificial snow differs physically from natural snow. Artificial snow can impose approximately 135% of the static weight of natural snowpack and introduce substantially more water, potentially up to four times the water mass. The denser snowpack can therefore increase soil compaction, promote basal ice formation and soil saturation, and reduce oxygen movement into the soil. Prolonged saturation can further increase the susceptibility of soils to compaction by grooming machinery (Meijer *et al,* 2014).

91 Artificial snow also changes the timing and magnitude of snowmelt. The literature cited indicates that dense artificial snow can persist for approximately 2–4 weeks longer than natural snow and contain approximately 2–4 times as much water. Consequently, spring melt may occur later and produce a larger and more rapid pulse of runoff. Where soils are compacted, saturated or still frozen, infiltration can be reduced, increasing surface runoff, erosion and sediment delivery to downslope terrestrial and freshwater habitats (Meijer *et al,* 2014).

92 Snow grooming creates a related but somewhat different suite of effects compared to artificial snowmaking. Grooming mechanically compacts the snowpack, increasing its density and reducing the insulating properties that normally protect alpine soils from very low winter air temperatures. The thermal conductivity of artificial snow is approximately twice as high in compacted natural snow, and approximately 2.5 times higher again in

compacted artificial snow, compared with uncompacted natural snow. The consequence can be substantially deeper penetration of frost into underlying soils (Meijer *et al,* 2014) and associated impacts on plant communities.

93 The effects of artificial snow and grooming on terrestrial ecosystems can also be exacerbated by increased temperatures associated with climate change. Climate change is expected to produce generally less persistent snow and altered/earlier snowmelt, leading alpine plant communities to slowly adapt to those conditions over time (Meijer *et al,* 2014, Poyck, 2011, Roux-Fouillet *et al,* 2011).

94 While the conditions described above are likely to occur in the wider Doolans basin, artificial snow making and grooming are likely to impose the opposite conditions, leading to local plant communities that are adapted to colder and wetter soils with shorter growing seasons.

95 Under current climate change predictions, it is likely that there will be a point where artificial snowmaking in the Doolans basin will no longer be viable, and that the ecosystems that have adapted to the conditions artificially imposed by ski field management will be maladapted to this new scenario. While it is difficult to predict the exact impact of this sharp transition, it is likely that impacts will be significantly more severe on managed ski slopes than in the surrounding landscape.

Compensation package

96 The Applicant has proposed a detailed effects management package outlining the steps taken to avoid, remedy or mitigate the effects of the proposed activity. A more detailed assessment of the suitability of this proposed package, particularly for vegetation and wetland effects, is best dealt with by specialists in these areas and are outside the scope of my evidence.

97 The principal mechanisms of compensation for the residual effects on terrestrial ecosystems are comprised of the following:

(a) A Biodiversity Compensation Project, funded by the Applicant at $75,000 per year for the duration of the Doolans concession.

(b) The funding of a lizard research project and skink translocation exercise (a one-off payment of $80,000);

(c) Increasing the proposed annual concession fee from 2.5% of gross annual revenue to 3%; and

(d) A payment of $20,000 to DOC to be utilised for the construction of a boardwalk over the wetland leading to Lake Alta.

98 To support the development and implementation of the Biodiversity Compensation Project, a Project Plan will be prepared within 18 months of construction activities commencing within the Doolans Basin, with DOC and the mana whenua advisory group invited to participate in its development.

99 Although the proposed framework for the Biodiversity Compensation Project has some merit, it is unlikely that the proposed compensation funding will be adequate to address the residual effects of the proposed activity on what is a unique and extremely high value ecosystem.

100 In my view, significantly more work is needed to develop a framework that adequately captures the residual effects and provides a transparent and repeatable method for assessing and prioritising compensation activities.

Conclusion

101 In my opinion, the Doolans Basin has exceptionally high ecological value because of its largely intact alpine habitats, uncommon ecosystems and ecological connectivity. The Panel should assess the proposed losses in the context of the whole habitat mosaic, not solely by the area of each affected feature.

102 The permanent loss of Tarn 3 is a significant and irreversible effect on a natural alpine freshwater ecosystem. The Panel should consider whether practicable alternatives can avoid this loss.

103 For Doolans Creek, I recommend a more explicit assessment of the proposed residual flow and abstraction regime, including site-specific flow–habitat relationships and sensitivity to climate-driven changes in seasonal water availability and low flows.

104 The long-term effects of artificial snow and grooming on alpine ecosystems require careful consideration, including their potential interaction with climate change. These effects are relevant to both the assessment of residual impacts and the design of monitoring and adaptive management.

105 In my view, the biodiversity compensation package should be supported by clear ecological objectives, a transparent basis for determining adequacy, defined implementation and funding commitments, and enforceable monitoring and reporting requirements. Important substantive details should not be deferred until after approval where they are necessary to determine whether residual effects will be appropriately addressed.

Matthew John Dale
27 October 2026

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