

Ref: 24043
26 August, 2026

NZSki Limited



RE: e3s 24043 – Remarkables Upgrade and Doolans Expansion TECIA Stakeholder Response (DOC)

1 Purpose

NZSki received preliminary feedback from the Department of Conservation (DOC) relating to a draft version of the Terrestrial Ecological Impact Assessment (TECIA; dated 10 April 2026) associated with the proposed Remarkables Upgrade and Doolans Expansion; the TECIA was subsequently updated prior to lodgement. Following lodgement, two Teams meetings on 4th and 7th August 2026 were held with DOC. This memo has been prepared in response to the matters raised by DOC experts in their review of the draft TECIA and matters raised in the meeting. Matters of discussion include the assessment and effects relating to avifauna (Section 2.1), terrestrial invertebrates (Section 2.2), vegetation (Section 2.3), and wetlands (Section 2.4).

While e3Scientific is the primary author of this response, input has been provided by the project lead Entomologist Will Frost, and advisor John Marris, from Lincoln University regarding the invertebrate related queries.

2 Matters of Discussion

2.1 Avifauna

Proposed mitigations for direct impacts of works on nests include a) avoidance via exclusion zones around nests until chicks have fledged and b) moving the nests, or destroying them. I have serious concerns around part b) of this mitigation approach and whether it would actually result in any effective risk mitigation. Best practice for mitigation of effects of forestry operations on falcon (and kea) recommends a set-back distance for mechanical operations of 100-200 m from nests (see NZJECol33_1_32.pdf, Falcon-Forestry-Management-Protocols and Kea

Forestry Guidelines), which is preferred mitigation recommendation, not translocation or destroying nests. In light of these concerns, see final bullet point below re: concerns around the lack of requirement for offset or compensation as part of this application.

Within Appendix F – Wildlife Act permit application, I have concerns with the response under section “How adverse effects are avoided and minimised, and the offsetting/compensation proposed to address unmitigated adverse effects (clause 2(1)(k))” i.e.: “The assessment of effects following the implementation of the proposed management measures concludes that the level of effect of the affected species will be Low. No offset or compensation has been assessed as necessary as part of this application as there are no unmitigated adverse effects”. I do not agree that the level of effect to the affected bird species will be ‘low’ and therefore disagree with the rationale that “no offset or compensation is necessary.” If nests cannot be avoided, and attempts are made to relocate these, then young are very likely to be harmed or killed. Table 18 lists residual effects of habitat loss on avifauna as low through to high, and effects of construction noise as moderate.

e3s response – Further detail regarding the avoidance and mitigation of both kārearea/eastern falcon (*Falco novaeseelandiae* subsp. *novaeseelandiae*) and New Zealand pipit/pīhoihoi (*Anthus novaeseelandiae* subsp. *novaeseelandiae*) has been provided below. Following the implementation of these measures, there is not expected to be any harm or physical disturbance to kārearea. Additionally, the mitigation implemented in conjunction with low NZ pipit numbers, (compared to habitat at similar elevations within the Ecological District (ED)), will result in a very small loss of individuals (if any), which warrants the Low assessed effect on pipit populations and conservation of the species. This is supported under the EIANZ Guidelines assessment criteria being assessed as a Low effect. It is noted that the TEclA acknowledges that outside the parameters of the Wildlife Act application, there will be residual effects observed on foraging habitat of both NZ pipit and kārearea; resulting in an overall Net Loss in this regard. However, these are not specifically relevant to the Wildlife Act application framework.

NZSki has revised the need for inclusion of kārearea within the wildlife permit. A 200 m buffer from all disturbance footprints will be surveyed by a Suitably Qualified and Experienced Professional (SQEP; Ecologist/Ornithologist) for the presence of nesting kārearea. If a nest is identified, a 200 m exclusion zone will be established around the location for all personnel and machinery. The exclusion will remain in

place until the nest has either been identified to have failed due to natural causes or chicks fledge the nest. The suitability of the exclusion distance will be regularly reviewed by the SQEP for the safety of the birds and personnel. Consequently, eastern falcon are no longer part of the Wildlife Act Authority.

New Zealand pipit/pīhoihoi (*Anthus novaeseelandiae* subsp. *novaeseelandiae*) are recorded to have a high tolerance to disturbance, with records of chick raising in close proximity to publicly maintained (mown) trails (Beauchamp, 2019). Further, breeding populations already occur within and adjacent to skifields (Coronet Peak and the Remarkables). Therefore, a 50 m exclusion around pipit nests will be suitable and monitored by the SQEP.

Figure 1 depicts the areas within 50 m of the disturbance footprint where suitable habitat is present (green). New Zealand pipit are in relatively low abundance within the Doolans Basin, as described within the TEclA (e3Scientific, 2026c). Therefore, the presence of nesting individuals within the disturbance footprint and/or 50 m surrounding this, is considered low. The exact locations where wildlife relocations will occur is not known. It is preferable that nests are not moved greater than a few metres from its origin, if at all, due to physical markers being important for birds to locate nests. Therefore, encouraging renesting of a new clutch is assessed as the most suitable alternative in the unlikely scenario of a nest being present, therefore the following mitigation methodology / steps are proposed:



Figure 1: Pipit nesting habitat.

Step 1 - Prior to vegetation clearance or alteration (i.e. Step 2), a Suitably Qualified and Experienced Professional (SQEP) Ecologist/Ornithologist will undertake a survey to identify any nests within the proposed disturbance footprint (see Figure 1) and the surrounding 50 m buffer. The nest survey will be completed within five days of proposed vegetation clearance or alteration. Where works are undertaken within five days of the survey and no nests are identified, works may proceed.

Step 2 – Below 1,700 m asl, in areas of suitable pipit habitat where no nests are identified during Step 1 and earthworks are scheduled to occur more than five days after the nest survey, the following vegetation reduction steps are proposed. These measures are intended to minimise the future risk of injury or mortality by removing suitable nesting habitat within the works footprint before egg laying occurs, thereby encouraging pipits to establish nests in adjacent, unaffected habitat.

- a) Vegetation will be reduced within the earthwork's footprint to a height of 20 cm in places where suitable pipit nesting habitat overlaps with the earthworks footprint (hatched polygon over green and yellow in Figure 1).

- b) All vegetation reduction work is to be undertaken as soon as able, immediately following the initial survey outlined in Step 1 (i.e. within five days).
- c) The area that is to be subject to vegetation clearance is to be clearly marked on site.
- d) Alternatively to Step 2, Step 1 may be repeated by a SQEP, where the area of disturbance will occur within five days of survey.

Following completion of the vegetation clearance, earthworks can occur within the cleared areas for the remainder of the construction season unless pipit nests are identified within the area after the vegetation clearance has occurred or extensive regrowth of tussock occurs that would result in the reestablishment of viable nesting habitat (characterised as natural tussock form and density, greater than 40 cm in height).

Step 3 – If a nest is present within the earthworks footprint, the first action is to determine if it can be actively avoided through timing of works. If such avoidance measures are not possible, as a last resort, the nest will be removed and eggs destroyed to encourage renesting outside of the disturbance footprint. The method in which the nest will be destroyed is as follows:

- a) The eggs will be collected, recorded (date, time, location, and number of eggs), transported in a protective and insulated casing, and candled to ascertain each eggs relative development.
- b) If the embryo is observed to be less than 80% developed (i.e. has not developed a nervous system yet), the egg will be placed in a standard freezer (-18°C) for 24 hours (Leary, et al., 2020).
- c) If the embryo is observed to be more than 80% developed, the egg will be destroyed via controlled and instantaneous crushing.
- d) All dispatched eggs are then to be handed to DOC for research, cultural, or storage purposes.

Step 4 – Where nests are present outside the disturbance footprint but within the 50 m buffer, monitoring of the nest will be undertaken by a SQEP, as the pair may be tolerant of nearby disturbance and may therefore be unaffected by disturbance within 50 m of their nest location. If the nest is observed to be abandoned (more than six hours of inactivity) the SQEP will record the date, time, location, number of eggs, and the distance from nearest point of disturbance. The eggs will then be collected and dispatched as per Step 3 above.

If works within the disturbance footprint are ongoing, do not cease for more than 5 days, and/or works have not increased in extent, and a pipit then establishes a nest within 50 m of the works no action is required to be undertaken (i.e. the pipits are expected to be tolerant of the in-place disturbance regime and unlikely to be affected by ongoing works).

Step 5 – All losses of eggs will be recorded and should be retrospectively compensated for.

“Where kea are observed within or nearby either catchment during development seasons, the following measures will be undertaken under supervision of a suitably qualified and experienced ecologist/ornithologist: All tools, consumable items, and loose or soft constructions material will be secured in a way that is inaccessible to kea”. This is best practice for construction in kea habitat and should not be limited to ‘where kea are observed within the development season’, this should be enforced regardless of whether kea are observed or not, as they are known intermittent visitors and all efforts to keep them safe around construction sites within their habitat need to be made.

e3s response – Agree. The TEclA will be updated to reflect this (in Table 18 and Recommendation 29).

Another threatened avifauna species with potential to be affected but not recorded during field surveying is rock wren (Xenicus gilviventris – Nationally Endangered). Rock wren are characteristic of South Island alpine ecosystems, living between the climatic treeline and the nival zone, particularly where sub-alpine vegetation, and rocky bluff systems with boulderfields are present. The surveying carried out is unlikely to have detected rock wren in low numbers. Targeted surveying along the bottom of rocky bluffs and through boulderfields would be more likely to detect this species if they were present. This species should at least be considered in the EIA. There are a couple of sightings (unverified) of rock wren from this general location on iNaturalist: South Island Wren - Species Map - eBird.

e3s response – The avifauna fieldwork completed for the TEclA included multiple field staff experienced in rock wren (*Xenicus gilviventris*) habitat, calls, and sighting. The primary method of identifying avifauna species was through 5MBCs and viewpoint surveys, however, additional extensive walking surveys were also conducted in boulder field habitat, specifically searching for presence of rock

wren. Observed rockfield and boulder field habitat lacked shrubland or isolated herbfield species often associated with suitable rock wren habitat and was particularly unstable being within active rock fall and avalanche paths, which limits vegetation growth and stable breeding and foraging habitat. Furthermore, there are no records of rock wren within the Remarkables Range or within the Remarkables Ecological District across any databases (eBird and iNaturalist) or published literature. Michelsen-Heath & Gaze (2007) identified the nearest historic or current population to be within the Eyre Mountains, separated by Lake Whakatipu, forming a natural barrier; also noting that populations east of the main divide are less prevalent, with less than 2 % of all records being recorded within these easterly regions.

As there are no previous rock wren observations within the study area, nor wider Ecological District, and there were none observed during the extensive avifauna survey, rock wren are not stated within the TEcIA. It is noted that kea (*Nestor notabilis*), were also not observed during survey, however, as they are known to occur infrequently within the Remarkables Range and have large foraging ranges, they have been included in the TEcIA.

Construction of new access roads is mentioned in the EIA, but the potential indirect impacts of these roads are not addressed. The main concern I have with this is that these provide a fast track for predator access. Page 35 of the EIA states that "A full suite of pest species are present in the study area including deer, goats, chamois, rabbits, possums, hares, rodents, mice, stoats, ferrets and feral cats." By creating new access roads into this catchment, there will likely be an increased effect of introduced species, particularly feral cats which are known to use these access routes readily. Acknowledgement of this increased risk is missing from the EIA or any proposed offset (such as predator trapping along access routes).

There are already multiple unofficial formed tracks present from Gibbston Valley and Nevis Valleys into the Doolans. The addition of one track might see a minor increase in predation levels. Notwithstanding this, NZSki confirmed that, as part of their existing operations, they undertake regular pest management, including monitoring and management of feral cats. This pest management will be formalised further as part of its recently renewed concession for the Remarkables Ski Area, in which NZSki is committed to developing a Pest Control Plan to manage the distribution of pests within the Rastus Burn that are present as a result of, or exacerbated by, the activities authorised by its concession. NZSki is proposing to extend this Pest Control Plan into the Doolans Basin, as part of its expansion into

this area. It is understood that this outcome is detailed in both the draft resource consent and concession conditions appended to the substantive application (refer to Part H, Document H.02 Condition BIO.16 to BIO.19 and Document H.03 Special Conditions 48 to 54).

After all engagement up to 20th August:

After the meeting with DOC's avifauna expert on the 7th August, it was understood all issues raised have been addressed and there are no outstanding issues.

2.2 Invertebrates

Seasonal limitation: Current sampling restricted to mid-late summer; likely under-represents alpine invertebrate diversity and conservation values (many taxa are active in spring-early summer). Seasonal importance is well established in Patrick et al. 1992 (Patrick et al. 1992. Lepidoptera and other insects of the Rastus Burn Basin. The Remarkables, Otago. Journal of the Royal Society of New Zealand) but not clearly integrated into the current baseline interpretation.

e3s response – Given the scope of TEcIAs and limitations in alpine sampling (discussed further below), invertebrate surveys are never expected to detect all invertebrate taxa. Consequently, given these standard limitations, a desktop review was completed to support fieldwork surveys. The primary focus for both surveys and desktop review, was upon groups of invertebrates that can be quantitatively assessed under the New Zealand Threat Classification System (NZTCS) and those that may be susceptible to environmental change as a result of behavioural or life cycles dependencies.

For the target Lepidoptera species, the sampling period of February-March was preferable, falling well within the flight periods for the majority of taxa. This is similarly reflected for Orthoptera and Coleoptera taxa, with work undertaken during periods of weather when these taxa are active. Due to the nature of unfavourable and unpredictable weather conditions in alpine zones, weather windows were maximised within periods of favourable weather. Noting that sampling generally cannot be completed earlier or later due to extensive coverage of snow and variable wind and rain temperatures during spring and autumn months. It is acknowledged that there may be a small series of taxa which are under-represented by alpine sampling timeframes. However, as is common, this is dealt with via desktop review, with a larger range of additional taxa

incorporated via desktop review, with a focus on identifying species with a threat classification greater than Not Threatened under the NZTCS and/or that are considered to be of ecological significance within the context of the Ecological District, and whose conservation may be at increased risk as a result of the project.

Taxonomic gaps: No explicit consideration of alpine cicadas (Cicadidae), a highly endemic and ecologically informative group in South Island alpine ecosystems. Coarse taxonomic resolution in parts (family/genus level).

e3s response – Specifically regarding cicada, *Maoricicada nigra* subsp. *frigida* and *Maoricicada otagoensis* subsp. *otagoensis* are recognised subspecies of the New Zealand endemic alpine cicada genus *Maoricicada*, known from the Otago alpine zone and could be present within the disturbance footprint. Initial taxonomic separation of these species was undertaken in the 1970s by morphology, acoustic characteristics, and geographic distributions, prior to the development of genetic analysis tools. While these taxa are taxonomically recognised, there is currently limited published evidence demonstrating that they represent Evolutionarily Significant Units (ESUs) or should be assessed as separate management units from their parent taxa. Furthermore, there has been no formal assessment of Cicadidae under the New Zealand Threat Classification System. Accordingly, these two species are considered distinct components of the indigenous alpine invertebrate fauna assemblages, as are many of the Not Threatened invertebrate species, however, are not assigned elevated ecological significance solely on the basis of their subspecies status.

Unlike other species that lack threat status, but were included within the TEcIA, *Maoricicada* are polyphagous and therefore the proposed disturbance is unlikely to have more than Very Low to Low effect on the population. Therefore, the lack of a formal designation under the NZTCS does not warrant tentative elevation of a threat classification in the context of the project assessment.

Unverified identifications or missing taxa for conservation-significant taxa. For example, *Xanthorhoe frigida*; At-risk declining (feeds on *Pachycladon* according to the recently released Lepidoptera assessment) - MK, CO, OL, FD, Chancellor Hut (Fox Glacier), Rastus Burn (Remarkables); Brian Patrick has 9 site records from Canterbury to Western Otago.

e3s response – *Xanthorhoe frigida* was considered within the TEcIA. However, as the conservation status of Lepidoptera (moths and butterflies) in Aotearoa New

Zealand, 2025 (Hoare et al., 2026) was not released until April, 2026, its previous threat status of Threatened – Nationally Critical was used throughout the assessment. In preparing the report e3s have attributed weighting to the host plant of *Pachycladon novae-zelandiae*, being the only species in the *Pachycladon* genus known to occur within the study area. This weighting can be observed throughout the impact assessment noting the effect of habitat loss as a result of the occurrence of *Pachycladon novae-zelandiae* and subsequent mitigation measures to translocate host specific plant species.

Record 'Not threatened but Range Restricted' in their notable taxa. Such as the cave wētā *Pharmacus notabilis* which should be included as its RR.

e3s response – e3s acknowledge the presence of Range Restricted species within the Not Threatened classification. However, e3s defers to the expertise of the NZTCS assessment panel, where a species is assessed as Not Threatened, the range restriction is not significant enough to warrant inclusion in a higher threat category. Therefore, e3s have not provided elevated weighting of Not Threatened species within TEclA.

Taxonomic certainty: unclear if specialist verification was undertaken for notable taxa (Data Deficient / At Risk / Threatened / undescribed).

e3s response – Appendix D of the TEclA presents the invertebrate taxa identified, along with the identifier. Identifications were undertaken by William Frost, Dustin Lamont, Dustin Edmundson, and John Marris, with specific input also provided by Cor Vink.

Desktop review and literature coverage: No inclusion of NZAC (via BSI) and Te Papa database searches. Lack of key regional references (e.g. Patrick et al. 1992; Long et al. 2025. A new genus of jumping spiders (Araneae: Salticidae) inhabiting the South Island New Zealand rocky alpine zone. New Zealand Journal of Zoology; check references from John Marris (Lincoln University) on various beetle genera such as Tenebrionidae are a notable category up high, Curculionidae, Carabids, and Scarabs also) and various DOC unpublished report and tenure review surveys from the surrounding mountains (e.g. Hector Mountains).

e3s response – Both the Coronet Peak and Walter Peak Land tenure reports were utilised within the desktop review. In addition to the key resources noted within

the TEcIA, the desktop review included species based on recordings of specimens from the: New Zealand Arthropod Collections; Lincoln University Invertebrate Collection; Lepidoptera and other insects of the Rastus Burn Basin - the Remarkables, Otago (Patrick et al., 1992); and Fauna of New Zealand no.69 (Carabidae) (Larochelle & Larivière, 2013). References not cited in the draft TEcIA will be included in an updated version to reflect their inclusion (in Section 2.1). Several species were also suggested based on recommendations by Will Frost, John Marris, and Robert Hoare, and their professional opinion and experience of species distributions locally.

We note that multiple taxa from the Curculionidae, Carabids, and Scarabs genera were identified and are presented in Appendix D of the TEcIA.

Effects assessment: The Vegetation, Weed, Invertebrate and Wetland Management Plan' has not been written yet, resulting in difficulty to reviewing residual effects and mitigation package. Residual effects assessed before mitigation detail (outlined in 'The Vegetation, Weed, Invertebrate and Wetland Management Plan' which have not been written yet) is defined, resulting in difficulty to reviewing these effects and limits confidence.

e3s response – e3s notes the management plan has since been prepared, however, was outside the scope of e3s' work. The magnitude of effects and subsequent level of effects assume a specific outcome from the management plan based on the mitigation measures detailed in Table 18 of the TEcIA. The Terrestrial Ecology Management Plan (TEMP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the TEMP.

2.3 Vegetation

2.3.1 Offsetting and Compensation

I also agree with the TEIA that offsetting the residual effects within a harsh alpine environment is not an achievable outcome (due lack of feasible locations for offsetting as the environment is largely intact and cannot be recreated). However, I disagree with the statement (p.144) that 'In accordance with the effects management hierarchy, where offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided'.

Without having seen the full application, I note that the NPSIB effects management hierarchy requires that where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided, and that if biodiversity compensation is not appropriate, the activity itself is avoided.

Compensation is not appropriate here, because the values at the Project site are not able to be compensated for. The examples (a) and (c) of Appendix 4 (2) also both apply. The terrestrial ecological values are irreplaceable because they are unique (there is no duplication of this system in the ED, and its conservation and biodiversity values add significantly to the value of an overall network of protected areas of biodiversity); and they are vulnerable given the numerous Threatened and At-Risk species and the presence of naturally uncommon ecosystems and other wetlands. I also know of no technically feasible options through which to secure a net gain for biodiversity within timeframes in the order of a human generation or even much longer (centuries or millennia).

Therefore to my understanding, the appropriate planning response under the NPSIB is avoidance and not compensation.

e3s response – Although the values present within the study area are distinctive and contain multiple At Risk and Threatened species, the basin is not considered unique, whereby the ecological values are not represented elsewhere within the ED. Although minor variability in species assemblages is expected (as would be in any two locations separated by one or more topographical barriers), the upper catchments of the below locations appear comparable to that of the proposed disturbance footprint (see Figure 2 - Figure 4 for imagesⁱ):

- Upper Wye Creek and Wye Creek South Branch;
- Doolans Creek Right Branch tributaries (west of Mt Salmond, south-west of Glen Roy Raceman's Hut);
- Doolans Creek Left Branch;
- Nevis Burn;
- Stewarts or Schoolhouse Creek;
- Commissioners Creek; and,
- Staircase Creek.

ⁱ Sourced from Goole Earth (Map data © [2026] CC BY 4.0 Land Information New Zealand (LINZ))

These areas all present similar ecological gradients, with interconnected tussock grassland, wetland, rockfield, rocky outcrop, and cushion field communities evident across various elevations and aspects. This is supported by the characterisation within the Threatened Environment Classification (MWLR, 2012), highlighting that the land environments are not vulnerable or irreplaceable given the amount remaining and formally protected.

e3s notes that the individuals and assemblages of plants that may be disturbed as a result of the proposal represent a small portion of those present within the Doolans Basin and ED. Therefore, the values will continue to persist in the surrounding landscape. Furthermore, as mitigation, the TEclA proposes that Threatened and At Risk species are to be translocated in an attempt to protect these flora populations. Further effects management (offsetting and compensation) was not within the scope of e3s' work.

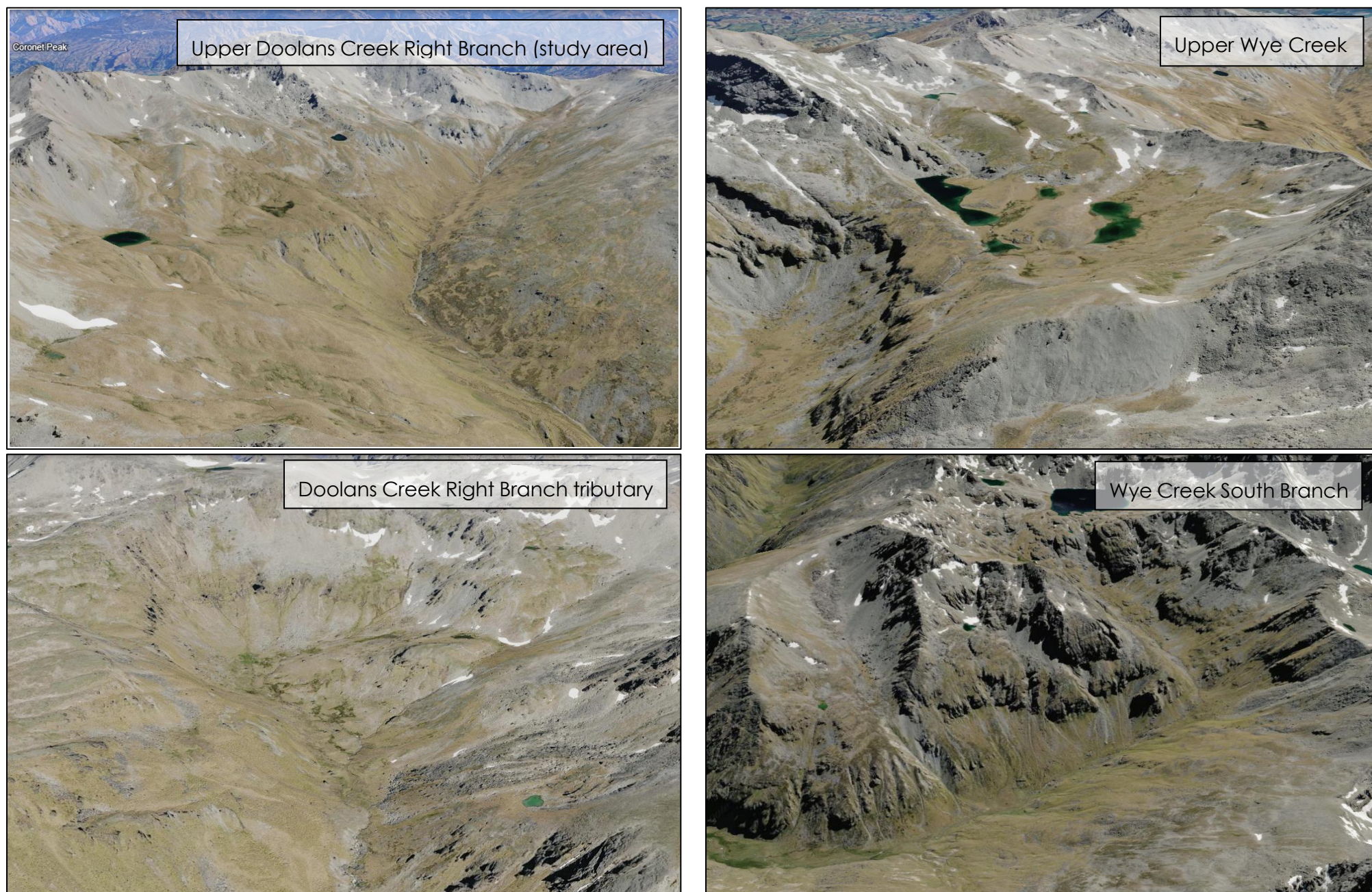


Figure 2: Aerial imagery of the study area and adjacent alpine basins.

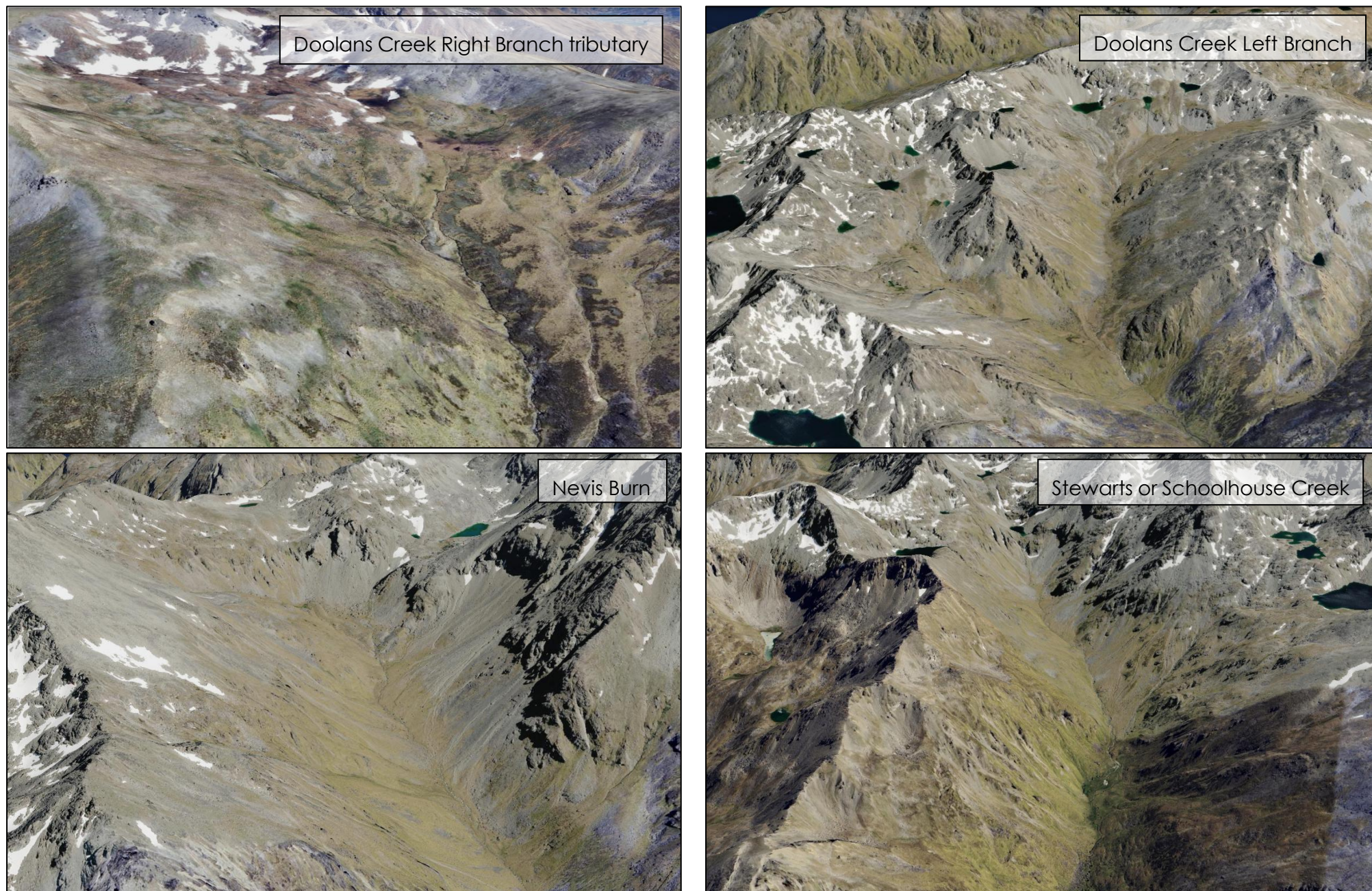


Figure 3: Aerial imagery of the adjacent alpine basins.

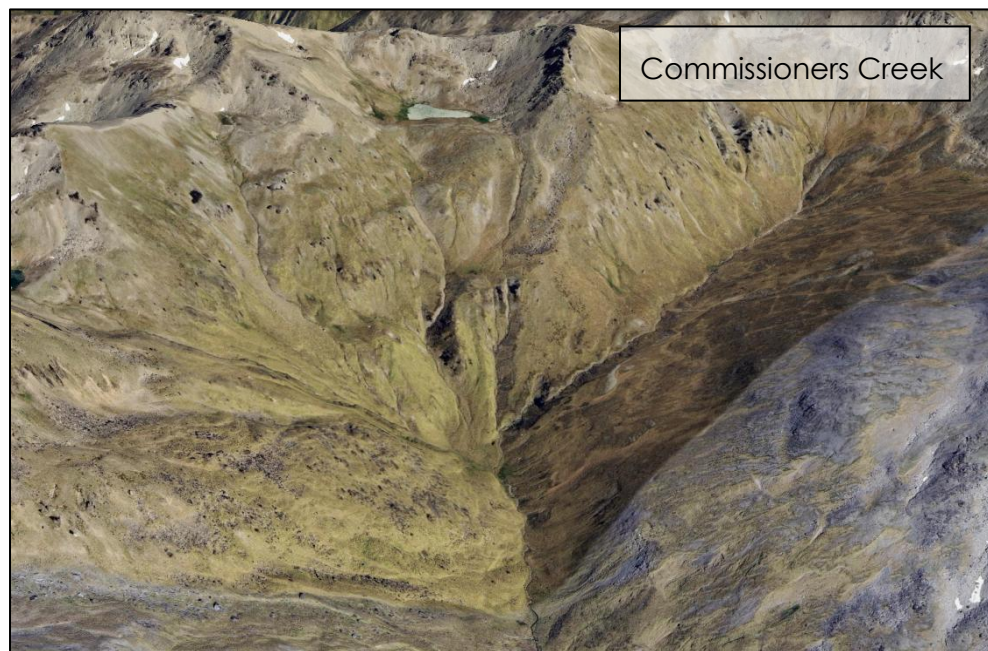
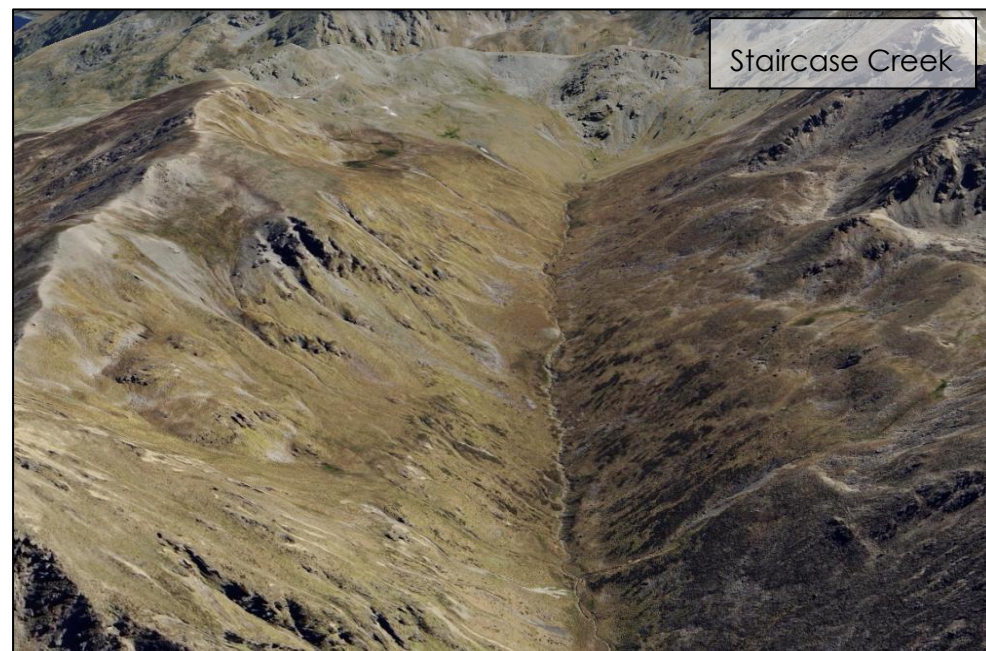
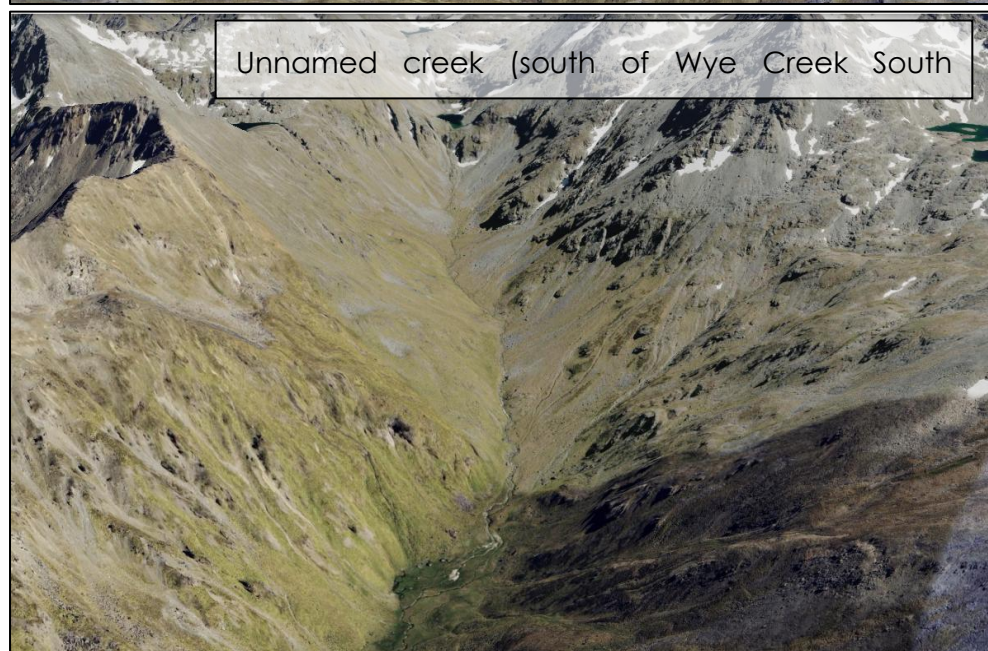


Figure 4: Aerial imagery of the adjacent alpine basins.

2.3.2 Duration of Impact and Closure Planning and Conditions

Most of the effects will be either permanent or very long lived (centuries). The extent of the required earthworks alone is massive and will traverse, and have irreversible effects on the ecology of, some extraordinary and extreme natural landforms (e.g. the highly visible and distinctive wind-sculpted Doolan's saddle).

The longevity of the project as a viable concern is objectively limited due to accelerating climate change (and could potentially be quite short lived, if all risks are considered). If the proposal is approved, I suggest that it should have a comprehensive closure plan and provisions to restore the conservation land to its original ecological state.

e3s response – It is understood that the requirements of the existing Rastus Burn concession in respect of what happens on the termination or expiry of the concession have been replicated in the proposed conditions in the new concession being sought for activities in the Doolans Basin.

2.3.3 Vegetation and Flora Assessment

The flora recorded was smaller than known from previous reports, and the TEIA acknowledges the limitations of this survey compared to previous more comprehensive and less time-limited surveys.

Although the terrestrial vegetation survey methodology appears reasonable, 2 x 2 m plots are really too small to characterise the flora at any community. The team obviously recognised this and searched around and outside each 2 x 2 m plot – I assume that time constraints meant they did not switch to more adequately-sized plots after an initial trial.

e3s response – Extensive botanical survey efforts have previously been completed within and surrounding the Study Area (Simpson, 2021; Simpson, 2018). These surveys have allowed for a high degree of understanding of the species present within the study area and wider landscape encompassing additional elevations and highly specialised localities that are not all represented within the study area. As such, a reduced number of plant species would be expected to be recorded. The work completed by e3s in 2025-2026 aimed to build upon this knowledge base providing a measure of prevalence and abundance within vegetation

communities as well as the relative distribution of rare plant species throughout proposed study area.

Furthermore, assessment quadrats were placed in areas representative of the surrounding vegetation. Additionally, as mentioned, a minimum 10 m radius surrounding all quadrat locations was searched to provide additional information regarding the prevalence of species both confirmed and not recorded within the quadrat extent. The number of quadrats assessed per community is relative to the occurrence of the vegetation community within the study area. Therefore, it is noted that due to the isolated occurrence of multiple of the vegetation communities, a limited number of spatially distinct quadrats were able to be undertaken. Subsequently, the survey undertaken in some of these less prevalent communities, represents areas of less floristic variation as a result of limited occurrence within ecological variables (i.e. slope, elevation, aspect and ecotones).

Rarefaction curves have been produced below (see Figure 5). The two curves that do not flatten off as much as would be expected are an artifact of the limited occurrence and/or altitudinal ranges, of those particular vegetation communities. Specifically, the Rocky Outcrop community has a small spike in the last surveyed quadrat, which was at a lower altitude and included some species that do not occur within the typical altitude of this vegetation community in the study area, and would not be expected to continue to provide additional species within the comparable habitat. The Snowbank community curve also appears to still be trending upward, however, the total area of snowbank within the study area is significantly smaller and a comparatively high percentage of the localities it occurs at were surveyed. Additionally, no disturbance of the snowbank community is proposed to occur.

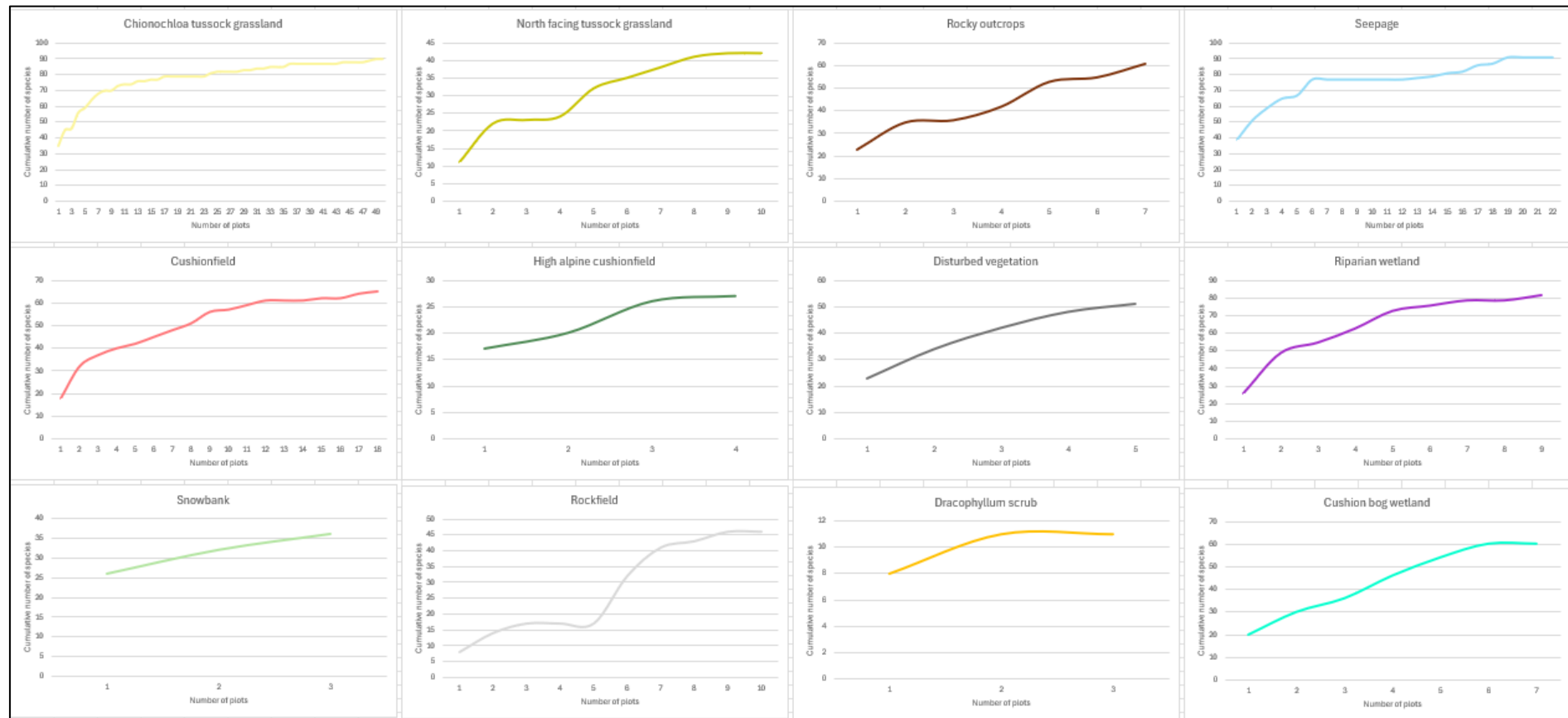


Figure 5: Rarefaction curves for each vegetation community.

2.3.4 Ecological Units

I disagree with the EIANZ assessment approach used in the TEIA which is to carve the ecological system up into vegetation types (after Singers & Rogers), which they refer to as 'ecosystems' and then assign a level of effect to each type. This disaggregation ensures that the overall value, and the overall effect (on what is in fact an entire, connected and essentially undisturbed ecological system) is minimised and underestimated. The impacts on the system should (at the very least) be also assessed as a whole and in the context of connected and interdependent ecological components.

e3s response – The TEcIA utilises the EIANZ and DOC guidelines (Davis, Head, Myers, & Moore, 2016; Roper-Lindsay et al., 2018) for assessment of ecological significance and overall level of ecological effects. The assessment of effects has been assessed in accordance with these available guidance documents. Considerable variation of the biological values occurs within the Singers and Rogers classifications. Where these differences arise, it would not be appropriate to assess values as the same, particularly as the vegetation communities have different ecological processes and support different fauna and flora species assemblages and are therefore, likely to be affected differently. Furthermore, e3s considers that detailed characterisation of ecological vegetation communities does not minimise or underestimate the assessment of effects. As when assessed cumulatively, the dominant vegetation types, i.e. tussock grassland and rockfield, are likely to skew the overall effects to being lower and by looking at individual vegetation communities the more ecologically unique or under-represented vegetation communities (e.g. snowbanks) and associated values are given due weighting with the potential impacts and level of effect accounted for.

Additionally, landscape scale effects and cumulative alteration of ecological processes have been assessed within the perceived cumulative effects (refer to Section 6.9 of the TEcIA) and fragmentation of communities and the ecological processes that they support (refer to Section 6.3 of the TEcIA). Noting that the TEcIA acknowledges that fragmentation will result in residual effects ranging from Moderate to High in several vegetation communities, with specific consideration given to the naturalness of the associated Basin (Rastus/Doolans; see Table 18 of the TEcIA) in assessing this.

Further, the Ecological District was incorporated into the determination of effects as all communities above 1,100m within the Ecological District were mapped and

used as part of the assessment. Specifically, the mapping was used to provide a quantitative estimation of the magnitude of effect that the proposed development might have relative to the Ecological District; please refer to Figure 8 and Table 14 of the TEclA.

To ensure the level of effect is not over or under estimated, the scale used in the assessment was consistent, i.e. the scale used for the values assessment was the same as the magnitude assessment. For this TEclA, the values assessment incorporates the ED and local scale, therefore the magnitude utilises the ED and local scale (using each where relevant and in line with policies and guideline documents).

The approach also lends itself to a false impression of accuracy, especially when estimates of extent are presented as hectares with 2dp. In fact, the precision of any estimates is likely to be very much lower than those numbers suggest, with likely errors in the tens to hundreds of hectares.

e3s response – The accuracy of vegetation mapping within and directly adjacent to the study area was undertaken to a high degree of detail, utilising various aerial imagery, Digital Elevation Models (DEMs), flow accumulation models, on ground mapping and ground truthing. These areas are expected to present highly accurate estimations of the disturbance to these vegetation communities within the proposed works footprint and are considered appropriate to be represented to 2 dp.

The precision in landscape scale mapping is a recognised limitation and has been rounded appropriately to account for uncertainty. Although Random Forest analysis areas are depicted to 2 dp, these numbers have only been used as a tool/guide in estimating the magnitude of effect and should not be interpreted as absolute estimations of area due to the recognised limitations of the training data and ability to provide confirmed ground truthing outside the study areas, within the parameters of the assessment.

2.3.5 Estimate of Extent of Similar Vegetation Elsewhere/Magnitude of Effect

The estimate of the extent of similar vegetation types in the ED is (probably greatly) exaggerated by the analysis approach used, and therefore the 'low' magnitudes of effects to the individual vegetation types and estimates of cumulative effect are unreliable and will need to be disregarded.

While I agree with the TEIA that the Remarkables ED is an appropriate frame of reference, there are topographic, environmental and ecological (including vegetation and compositional) gradients from north to south down the Remarkables and Hector Mountains. There are also clear contrasts in the vegetation (that can readily be seen in publicly available aerial imagery) between south, east, west and north facing basins, and between basins of different size across the ED. The estimated extent of vegetation in the TEIA does not take into account any of this variation. A brief critique follows.

- Many GIS systems include a random forests prediction tool in their software these days, but those tools must be used within the bounds of model assumptions and rules in order to give reliable results. One of the key rules is that one cannot predict outside the range of the training data. Training data must be representative of the whole prediction region (and preferably drawn from a random distribution of samples across it).
- In the TEIA application of a random forests model, training data are from the Project area only (Rastus Burn and upper Doolans Creek Left Branch Basin) which is only in the far north of the prediction area. The model therefore cannot predict the extent of any vegetation types outside the Project area: if used beyond that area, the predictions are guaranteed to find the vegetation types (and only the vegetation types) present within the training area and the accuracy scores will be inflated and meaningless.
- The use of vegetation types for prediction (a 'classify then predict' approach) is also problematic. Because the training (response) data are aggregated into broad vegetation types before prediction, there is no way to know whether the broad, aggregated vegetation types which must be predicted elsewhere by the model are ecologically and compositionally similar or different. As noted above, it is highly likely that the composition and ecology differs between south, east, west and north facing basins, and between basins of different size across the ED.
- Each of the above problems guarantees that the extent to which the vegetation types and ecological values in Project site are also present elsewhere across the Remarkables ED will have been greatly exaggerated.
- In addition the results of the model (Tables 1 and 14) suggest very accurate assignment and mapping of vegetation type extent (2 decimal point accuracy for the hectare scale). That is misleading because it does not reflect the likely high degree of inaccuracy and uncertainty inherent in those estimates (even if the model had been valid).

On this basis, I think that the assessment will have considerably overestimated the extent of similar vegetation within the ED, and underestimated the magnitude of the effects.

A more appropriate and conservative assumption (in my opinion) would have been that the ecosystems of the upper Doolans Creek (Left Branch) basin in the Project area are comparable to those that occur in nearby basins of similar size, latitude, elevation and aspect along the ranges of the ED. In fact, there is only one such 'relatively' similar basin and that is the upper basin of the Doolans Creek Right Branch. And although that (Right Branch) basin is very similar in aspect and structure, it has a very different vegetation, with almost no tussock grassland on south, east, and north aspects, a very much more limited range of wetlands and wetlands contexts, and tarns embedded mainly in scree and rock landforms.

All other basins along the Remarkables and Hector Mountains ranges are smaller and more confined, with very much more limited ranges of vegetation types, vegetated aspects and wetlands. Aerial images readily show that their vegetation character is different, and the sequences and ranges of vegetation found within them are much more limited.

Hence the Doolans Creek (Left Branch) upper basin in the Project area is a unique basin in the ED. As can be readily seen in aerial images, the basin supports an exceptional and unreplicated variety of vegetation types that occur in continuous and uninterrupted sequences, and these values are not present anywhere else in the ED. Despite the flaws in the e3s model, the uniquely large extent of tussock grasslands in the Doolans Creek (Left Branch) upper basin is evident in the model in Figure 8 on p16 where it shows up as a swath of dark pink.

e3s response – e3s assumes that where the reviewer has mentioned the Doolans Creek Left Branch, they are referring to Right Branch and vice versa. e3s recognise the imperfections of the modelling used and do not assume that the output of the model provides Ecological District scale accuracy across all localities. However, standard methods of assessing the magnitude of effect ordinarily implemented by ecologists within Ecological Impact Assessments are highly qualitative and generally provide significantly reduced resolution and accuracy than the actual ecological effects. The intention of undertaking a level of geospatial analysis against comparable vegetation communities within an area recognised to contain comparable ecological values (the Ecological District), is to provide an

increased level of accuracy when assessing the magnitude of effect compared to standard methods ordinarily implemented by ecologists.

In acknowledgement of the limitations of the Random Forest model, the following actions were undertaken to manage bias associated with the training data and its position within the Ecological District; noting that this helped improve the overall accuracy of the output data.

- Use of training data to extrapolate percent of occurrence within coarsened vegetation classes (e.g. wetlands) are acknowledged to introduce bias in the presence of a wetland subclass. Therefore, percentage of vegetation communities lost within the ED is presented at two levels, the Singers and Rogers ecosystem types and the mapped vegetation communities resulting from e3s data.
- Assessment of individual units by expert interpretation via aerial imagery of areas beyond the surveyed training data area and manual correction and/or re-running of models based upon correction data.
- Splitting of Random Forest analysis across two representative elevations (>1500 and 1500-1100 m asl) where specific ecological communities are restricted. Therefore, limiting the over-estimation of vegetation communities that only occur within one elevational range.
- Use of wetness index, DEM slope analysis, and flow accumulation modelling for identifying tarns and wetlands (which were overlaid and compared against model outputs rather than incorporated directly into the model).

While these measures improved the overall accuracy of the modelling, the resulting output does not present a perfect representation of all vegetation types; rather, it provides a tool for quantifying the relative extent of individual vegetation types across the Ecological District. The Random Forest output was not intended to independently define final ecological unit boundaries; rather, it forms one component of a broader assessment process, and its outputs have been considered alongside other evidence. Accordingly, this output should be interpreted as one of several inputs used to inform the magnitude of effect. Additional considerations include expert interpretation, local ecological knowledge, comprehensive field studies within the study area, and comparison to data sets and aerial imagery displaying similar vegetation classes.

With specific regard to the Doolans Creek (Right Branch) upper basin being a unique basin in the ED, please refer to Section 2.3.1 of this document for our response.

2.4 Wetlands

The project's direct wetland footprint is split across two documents and is not reported as a single figure in any of them:

- ***The terrestrial EcIA reports approximately 0.20 ha of direct disturbance to wetland communities — 0.003 ha cushion bog, 0.03 ha riparian wetland, 0.17 ha seepage.***
- ***The FEcIA reports the reclamation of approximately 0.445 ha of tarn habitat (Tarn 3) but classifies tarns separately from the terrestrial wetland typology.***

The project therefore entails the direct loss of approximately 0.65 ha of natural inland wetland, more than two-thirds of it tarn habitat. That figure does not appear in any of the three reports. The application package needs a single integrated wetland accounting document that sums direct loss, identifies indirect hydrological effects on remaining wetland extent across both the Doolans and Rastus Burn catchments, and engages the regulatory tests at the project level. This is fundamental to understanding offsetting and compensation when managing the effect of this project.

e3s response – Tarn 3 does not have any wetlands associated with the littoral zone or the terrestrial edges of the waterbody. There are no terrestrial ecological values associated with the tarn extent; therefore, Tarn 3 has been characterised in the Freshwater and Hydrological reports. In the wider landscape, large tarns have been classified as waterbodies and assessed under the FEcIA as they have observable deep water, lack of hydrophytic vegetation, and rocky substrates. However, where wetland characteristics are present directly adjacent to the tarn as a result of its presence they have been attributed a classification under one of the wetland types within the TEcIA and assessed as such.

Freshwater bodies have been assessed in the FEcIA and the wetlands within the TEcIA, as would be expected based on ecological disciplines. The relevant information from the hydrological report has been incorporated into the TEcIA to appropriately assess the potential impacts to wetlands. To produce another document, as suggested, would be unnecessary duplication; the relevant

information is present in each report and incorporated across documents where necessary.

All three reports rely on the EIANZ (Roper-Lindsay et al. 2018) effects-magnitude framework, expressed as percentage loss against a denominator (Ecological District extent, basin-scale wetland extent, or Nevis catchment allocation), to arrive at Low or Moderate magnitude conclusions. None of the three reports works through the NES-FM regulatory pathway for natural inland wetlands. This is important for three reasons:

- **Cushion bog, riparian wetland, seepage and tarns are all types of natural inland wetlands within the meaning of the NPS-FM 2020. Activities affecting them are regulated regardless of percentage loss against any denominator. A 0.003 ha cushion bog disturbance is regulated; the report's "0.001%" framing is not the test that applies.**
- **NPS-FM Policy 6 requires that the loss of extent and values of natural inland wetlands is avoided, and where avoidance is not practicable, that the effects management hierarchy is applied to demonstrate no-net-loss. None of the three reports presents a no-net-loss demonstration. The FEcIA and the terrestrial EcIA both defer it to a future biodiversity compensation package.**

e3s response – e3s agree that biodiversity compensation is warranted under the NPS-FM to account for the wetland loss attributable to the project. Under best practice guidelines, commensurate compensation should be of equal or greater ecological value.

Preparation of a compensation package was not within the scope of e3s' work. We note that the Proposed Conditions include the requirement to prepare Biodiversity Compensation Project (that is yet to be designed), however, this has not been informed or reviewed by e3s.

Each report asserts that the avoidance step has been considered and effectively exhausted, but no evidence is provided of this:

- **The FEcIA discounts an alternative depression approximately 200 m north of Tarn 3 on pumping-distance and terrestrial-ecology grounds without any detail on why that was considered an unviable option**
- **The water take assessment is limited to alternative in-basin water sources of full required volume. There is little justification for the amount of water**

requested to be abstracted nor does it test reduced-demand, smaller-storage, engineered-tank or supplementation from existing Remarkables infrastructure.

e3s response – The alternative terrestrial basin is a north facing area of dry shallow soil substrates supporting an extremely high abundance of Naturally Uncommon plant species that are otherwise sparsely recorded within the wider Doolans landscape. This location was therefore not considered a feasible option and avoided, given the likely effect on a large portion of Naturally Uncommon plant species.

Additional avoidance steps of High – Very High ecological values have been undertaken throughout the development of the final alignment with iterations detailed within Part A Section 1.3.4 "Design evolution of the Project" of the Substantive Application. Specific design measures are also detailed in Part A, Sections 3.3.4, 3.4.1, 3.5.2, 3.5.4, 3.5.6.2, and 3.6.1.1 of the Substantive Application, with consideration also detailed throughout the "Construction Management Framework" (refer to Part B-26 of the application). Relevant avoidance measures have been described at the beginning of Section 6 of the TEcIA. e3s understands that further document detailing multidisciplinary avoidance measures undertaken by the project is being produced by NZSki and will be provided to ORC. Avoidance measures have been described at the beginning of Section 6 of the TEcIA.

It is difficult to assess residual effects against management plans, designs and compensation packages that have not yet been either written or sighted:

- ***The Vegetation, Weed, Invertebrate and Wetland Management Plan (VWIWMP).***
- ***The Erosion and Sediment Control Management Plan.***
- ***Stream and wetland crossing designs (number, location, type, hydrological assessment).***
- ***The biodiversity compensation package (referenced in the FEcIA and deferred to the Mitchell Daysh AEE in the terrestrial EcIA).***
- ***The "further site-specific" climate change assessment for operational matters deferred in the water take assessment.***

e3s response – e3s notes the Terrestrial Ecology Management Plan has since been prepared, however, was outside the scope of e3s' work. The magnitude of effects and subsequent level of effects assume a specific outcome from the management plans based on the mitigation measures detailed in Table 18 of the

TEcIA. The Terrestrial Ecology Management Plan (TEMP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the TEMP.

Each report addresses a slice of the project. None address the project as a whole at basin scale, and none integrate effects on the local ecology from the existing Remarkables ski area. The Wildlands (2011) survey of the existing Remarkables ski area found that ski-area wetlands are ecologically significant under QLDC criteria and that the greatest potential adverse effects on those wetlands arise from earth-moving activities that destroy or modify wetlands or their hydrology. The Doolans expansion is precisely that activity. A basin-scale cumulative effects assessment integrating the Doolans expansion and the existing ski-area infrastructure is required.

e3s response – The AEE (Part A, Section 6 of the Substantive Application) addresses the overall impact from the individual reports. Further, Section 6.9 of the TEcIA addresses the cumulative effects of disturbance of the existing ski field and proposed extension within the context of the Ecological District. e3s recognise Wildlands (2011) assessment of onsite wetlands being ecologically significant under the QLDC criteria. The TEcIA used the QLDC criteria in addition to the DOC, CODC, EIANZ, and NPS-IB criteria for assessing significance. This resulted in all terrestrial vegetation communities, including wetlands, being assessed as significant under all of the respective criteria (refer to Section 5 of the TEcIA) and the TEcIA concluding that there is a Net Loss of ecological values, including wetland values.

This report does not consider the tarn environments as wetlands which divides the project's wetland footprint in two — terrestrial wetland communities (~0.20 ha) addressed in this report, and tarn (~0.445 ha) addressed in the FEcIA. Aggregated, the project entails the direct loss of approximately 0.65 ha of natural inland wetland, more than 90% of it tarn habitat.

e3s response – Tarn 3 does not have any wetlands associated with the littoral zone or the terrestrial edges of the waterbody. There are no terrestrial ecological values associated with the tarn extent; therefore, Tarn 3 has been characterised in the Freshwater and Hydrological reports. In the wider landscape, large tarns have been classified as waterbodies and assessed under the FEcIA as they have observable deep water, lack of hydrophytic vegetation, and rocky substrates.

However, where wetland characteristics are present directly adjacent to the tarn as a result of its presence they have been attributed a classification under one of the wetland types within the TEcIA and assessed as such.

Freshwater bodies have been assessed in the FEcIA and the wetlands within the TEcIA, as would be expected based on ecological disciplines. The relevant information from the hydrological report has been incorporated into the TEcIA to appropriately assess the potential impacts to wetlands.

The wetland delineation methodology (s.2.3.2) is appropriate and correctly references MfE (2022). Cushion bog (WL9), riparian wetland (WL9) and seepage (WL17) are all natural inland wetland types therefore activities affecting them are regulated by the NES-FM regardless of percentage loss against the Ecological District. The use of the EIANZ effects-magnitude framework (e.g. arriving at "Low magnitude" from 0.001–0.01% of Ecological District extent) ignores the NES-FM directive to manage effects in order to achieve no-net-loss of wetland extent.

e3s response – e3s agree that biodiversity compensation is warranted under the NPS-FM to account for the wetland loss attributable to the project. Under best practice guidelines, commensurate compensation should be of equal or greater ecological value.

Preparation of a compensation package was not within the scope of e3s' work. We note that the Proposed Conditions include the requirement to prepare Biodiversity Compensation Project (that is yet to be designed and is subject of ongoing engagement between NZSki and several parties), however, this has not been informed or reviewed by e3s.

The report assesses unmitigated sedimentation effects on hydrologically connected communities as Very High magnitude / Very High level of effect, then reduces this to Moderate residual after a generic erosion and sediment control management plan (which has not been written yet). Cushion bogs are particularly sensitive to fine sediment because their hydric soil function depends on accumulated organic matter and undisturbed peat structure. Sediment deposition can alter pH, water-holding capacity and vegetation communities and alter the ecological character of the cushion bog over time. The sediment-effect assessment appears more relevant to managing construction-phase sedimentation but long term operational-phase sediment inputs require attention.

This is particularly pertinent given the large cushion bog located beneath much of the ski field area.

e3s response – Agree, the issues raised will need to be detailed within the site-specific Erosion and Sediment Control Plan (ESCP). As noted elsewhere, the magnitude of effects and subsequent level of effects assume a specific outcome from the management plan based on the mitigation measures detailed in Table 18 of the TEcIA. The Erosion and Sediment Control Plan (ESCP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the ESCP. Furthermore, e3s have assessed that even following the successful implementation of an ESCP, that the effects on wetland systems will still have a Moderate residual level of effect.

Recommendations 12–14 propose that hydrological function and connectivity will be "maintained," that designs will be provided for each crossing including drawings, methodology, materials, lengths and hydrological assessment, and that designs will be reviewed by a Hydrologist and Ecologist prior to works. This limits the information available to the Department as to how many stream and wetland crossings are required, where they are located, what design types are proposed. For example, based on my experience during the site visit it is likely there are locations where the Department may prefer bridges rather than culverts. At least an indicative crossings schedule needs to be included in the application package.

e3s response – e3s acknowledges the reviewers concerns. However, three design options for the stream/wetland crossings are provided in the 'Tracks, Stream Crossings and Stormwater Freshwater Ecological and Hydrological Impact Assessment' report (e3Scientific Ltd, 2026d) including the locations. Within the TEcIA, the magnitude of effects and subsequent level of effects assume a specific outcome from the management plan based on the mitigation measures detailed in Table 18 of the TEcIA. The Terrestrial Ecology Management Plan (TEMP) is expected to represent the mitigation measures of Table 18 and the proposed consent conditions, thus the residual effects can be understood via Table 18, the proposed consent conditions, and the TEMP. Where the design specifications do not indicate the design has a better than reasonable chance of successfully achieving the required outcomes the design should not be endorsed by the Hydrologist and Ecologist and works cannot be undertaken.

Thrust boring/directional drilling in conjunction with bridges capable of supporting construction machinery was explored during internal preliminary multidisciplinary discussions. However, this was not considered a viable option given the schist bedrock geology of the site.

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