MITCHELL DAYSH
an EMM Global company

Memorandum

To: NZSki Limited

From: Mitchell Daysh Limited

Date: 3 September 2026

Re: Effects Management and Compensation Overview Addendum

1. INTRODUCTION

1.1 Purpose and Overview

The purpose of this document is to provide further information as to how the effects management hierarchy – a core concept of both the National Policy Statement for Freshwater Management ("**NPS-FM**"), National Environmental Standard Resource Management (National Environmental Standards for Freshwater) Regulations 2020 ("**NES Freshwater**") (in respect of natural inland wetlands and streams) and the National Policy Statement for Indigenous Biodiversity ("**NPS-IB**") – has been applied to the Remarkables Ski Area Upgrade and Doolans Expansion Project (the "**Project**"). Initial comments on the substantive application for the Project from several parties[1] have included seeking further information as to how the effects management hierarchy has been applied in the design (including the mitigation actions) of the Project.

From the outset it is acknowledged that the Project will result in residual environmental effects once all avoidance, minimisation and remediation measures have been implemented. Offsetting is challenging in this sensitive alpine ecosystem. The proposed conditions included within the substantive application includes the requirement to develop (alongside regulators and iwi) and implement a Biodiversity Compensation Project to address the residual effects of the Project. It is important to note that the intention of the Biodiversity Compensation is to address the residual effects of the Project in an integrated manner, addressing terrestrial and freshwater related effects. It is acknowledged that the compensation proposed as part of the Project does not adhere to the principles of compensation in the NPS-IB and NPS-FM as an overall 'net gain' has not been confirmed via compensation modelling. The Project does not, therefore, strictly

[1] Including from Otago Regional Council, Central Otago District Council and the Department of Conservation

conform to the requirements of the NPS-IB and NPS-FM / NES Freshwater. While these statutory documents are relevant to the Panel's Resource Management Act 1991 ("**RMA**") decision making, under the Fast Track Approvals Act ("**FTAA**" or the "**Act**") a project's inability to meet these provisions does not preclude approval under the FTAA. Instead, the FTAA provides the Panel with discretion to weigh the broader purpose of the FTAA, prioritising significant regional or national benefits over an inability to meet other RMA requirements. For completeness, the substantive application notes that the benefits are as follows:

- The implementation of comprehensive effects management measures, including the Biodiversity Compensation Project;
- The Project will increase the skier capacity of the Remarkables Ski Area from approximately 3,500 skiers at one time 6,000 skiers, providing greater skiing opportunities for visitors to the local and international visitors;
- An increase in annual holidaymaker spend attributable to the Remarkables Ski area of between $112 to $168 million;
- The contribution of the Remarkables Area to the regional GDP is forecast to increase by between $170 and $197 million (2025 pricing);
- Job opportunities are forecast to increase by between 1,242 and 1,851 across the Otago region;
- During construction alone:
    - the $193.3 million in capital infrastructure investment by NZSki will result in a GDP effect of $61.9 million; and
    - approximately 81 annualised construction jobs in the heavy and civil construction sector will be generated, however when focussed on the short construction window (November to May), a peak employment will be in the order of the 150+ jobs over the construction season.
- The Project will enable the development of additional "ski area infrastructure", which is considered regionally significant infrastructure and specified infrastructure (respectively) in relevant regional and national policy documents; and
- The Project will increase the ski area's resilience to the effects of climate change and increasingly variable weather patterns by virtue of Doolans Basin being on a southfacing slope. The Doolans Basin, therefore, has a greater capacity to retain snow, improving its longer-term resilience to potential effects of climate change.

1.2 The Fast Track Approvals Act Overview

The FTAA includes a discretion for the Panel to decline an approval if, in complying with section 81(2) of the Act, it forms the view that there are one or more adverse impacts in relation to the approval sought, and those adverse impacts are sufficiently significant to be out of proportion to the Project's regional or national benefits under section 81(4) of the FTAA, even after taking into account any conditions that the Panel may set in relation to those adverse impacts and any conditions or modifications that the applicant may agree to or propose to avoid, remedy, mitigate, offset, or compensate for those adverse impacts.

It is further noted that section 85(4) of the Act sets out that a panel *may not* form the view that an adverse impact meets the threshold in section 85(3)(b)[2] that the adverse impact is inconsistent with or contrary to a provision of a specified Act, or any other document (in this case the provisions of the NPS-FM / NES Freshwater and the NPS-IB that require the implementation of the effects management hierarchy) that a panel must take into account or otherwise consider in complying with section 81(2).

As explained in section 6 of the substantive application, the Project's benefits are substantial and, while some residual adverse effects are inevitable for any development within a sensitive alpine area:

- A wide-ranging suite of measures is proposed to address the Project's adverse effects, including direct mitigation, rehabilitation measures and an extensive residual effects management package (including the Biodiversity Compensation Project);
- The Project's residual adverse effects are not sufficiently significant to be out of proportion to its regional and/or national economic benefits.

The technical assessments have carefully considered the avoidance, mitigation and remediation measures to appropriately address the potential adverse effects of the Project. These measures are summarised in section 7 of the substantive application, and briefly in the sub-sections below. NZSki proposes implementing these effects management measures by way of the proposed conditions provided in **Part E** of these

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[2] This section of the FTAA sets out that:

(3) A panel may decline an approval if, in complying with section 81(2), the panel forms the view that—

(a) there are 1 or more adverse impacts in relation to the approval sought; and

(b) those adverse impacts are sufficiently significant to be out of proportion to the project's regional or national benefits that the panel has considered under section 81(4), even after taking into account—

(i) any conditions that the panel may set in relation to those adverse impacts; and

(ii) any conditions or modifications that the applicant may agree to or propose to avoid, remedy, mitigate, offset, or compensate for those adverse impacts.

application documents. NZSki has developed the compensation package that is discussed later in this document.

1.3 Technical Assessments

The information in this memorandum is based on the following technical reports prepared for the Project:

> Remarkables Ski Area Upgrade and Doolans Expansion – Terrestrial Ecological Impact Assessment (prepared by e3 Scientific);

> Remarkables Ski Area Upgrade and Doolans Expansion - Freshwater Ecological Impact Assessment (prepared by e3 Scientific);

> Remarkables Ski Area Upgrade and Doolans Expansion – Lizard Assessment and Management Plan (prepared by e3 Scientific); and

> Remarkables Ski Area Upgrade and Doolans Expansion – Tracks, Stream Crossings and Stormwater Freshwater Ecological and Hydrological Impact Assessment (prepared by e3 Scientific).

It is noted that there has been some criticism from parties that the above reports separately address components of the Project[3]. The substantive application document (Part A) prepared by Mitchell Daysh Limited addresses the Project as a whole and provides the overall assessment of effects. In addition, the substantive application assesses the Project against the provisions of the relevant statutory policy documents based on the findings of each technical report that was prepared to support the substantive application.

2. APPROACH TO AVOIDING EFFECTS

2.1 Overview

As set out in the project description section of the substantive application, the Project design refinement process focussed on how effects could be avoided – this occurred prior to the assessment of effects being commissioned, although the design refinement process was informed by ecological advice. Further details of this are provided below in the subsequent sub-sections.

From the outset, it is noted that through the standard RMA / NPS-IB effects management lens, avoiding vegetation clearance / disturbance of moderate to high value vegetation within the Project Area would be the effects management response that best protects the ecological values. However, any development in the Remarkables Ranges would likely result in a similar (or greater) level of effect – meaning that there could be no expansion (or

[3] Including from Department of Conservation and the Otago Regional Council

creation of new) of ski areas. There is clearly a functional need for ski infrastructure to be located in alpine areas – with some degree of adverse effects on alpine ecology being largely unavoidable.

Under the FTAA, however, the Panel's task is to assess the adverse impacts in the context of the significant regional benefits of the Project. Any residual adverse impacts after taking into account the conditions imposed, the Applicant's agreed or proposed measures to avoid, remedy, mitigate, or compensate for those impacts, must therefore be weighed against those benefits.

2.2 Iterative Design Process

NZSki has prepared a comprehensive memorandum that discusses the site selection process undertaken for the proposed Project infrastructure, with a focus on the Doolans expansion. It demonstrates the functional need for the infrastructure to be located in the proposed configuration, to enable a commercially viable ski area expansion. This memorandum is attached to this document as **Attachment A**. The information contained in this memorandum does not repeat that information, however this information shows the processed followed by NZSki and how effects have been avoided through siting and design process. This information is summarised in the following sections.

2.3 Site Selection

The layout of the ski infrastructure included in the substantive application was selected after an extensive master planning process, including site selection workshops which considered the functional, operational, environmental, technical and commercial factors that influence the feasibility and performance of the expanded ski area. Key considerations that impacted site selection included:

- Topography, elevation and aspect;
- Environmental effects on terrestrial and freshwater ecology, hydrology, and landscape values;
- Skier amenity and accessibility;
- Gondola line engineering constraints;
- Avalanche and rockfall natural hazard areas;
- Capital and operating costs;
- Constructability;
- Maintenance access; and
- Long-term operability and reliability.

During alignment selection for infrastructure, priority was given to avoiding disturbance to (as informed by ecologists):

> Cushion bogs, seepage wetlands, and riparian wetlands;

> Permanent or intermittent watercourses or flow paths;

> High-value snowbank habitats of limited extent;

> High-value cushionfield areas;

> Known locations of abundant or highly isolated rare or threatened species, whereby the disturbance may result in a proportionally large number of species being affected; and

> Terrain where disturbance would present elevated instability or debris flow risk or require larger disturbance extent to be functional.

The memorandum contained in **Attachment A** sets out that NZSki avoided Dracophyllum shrubland, cushionfield and wetlands because effects there were considered by the Project ecologists would be more severe. Infrastructure is generally proposed to be constructed in rockfield (no vegetation present) or tussock grassland (some of the lower value vegetation communities within the Project area) because these areas are likely to be more resilient to the types of effects expected.

Where disturbance could not be avoided on high value vegetation communities / wetlands / waterbodies, design measures focus on reducing the extent and intensity of effects. These measures include:

> Using downslope build-out with retaining solutions in preference to deep cut slopes where appropriate. Retaining walls are being utilised to minimise loss of rock downslope onto neighbouring vegetation. An example of this design is along the track from the top of Sugar Bowl to Helicopter Ridge where road design decisions have been made to significantly reduce the loss of the rock downslope;

> Keeping formation and earthworks widths as narrow as practicable while maintaining safe and functional access; and

> Locating roads and utility infrastructure within a single shared corridor to avoid creating multiple parallel disturbance areas.

Where avoidance is not practicable due to terrain, gradient, safety, or operational requirements, the focus was on minimising effects, as described in **Attachment A**.

In constrained locations, effects are addressed through:

> Locating wetland and waterway crossings at the narrowest feasible points;

> Maintaining natural flow paths and hydrological connectivity;

> Drainage, erosion and sediment control design; and

> Construction sequencing to reduce duration and extent of exposed ground.

Further details are provided in the following section.

3. EFFECTS MANAGEMENT AND RESIDUAL EFFECTS

3.1 Terrestrial Biodiversity

The preceding section provides an overview of how the 'avoid' step in the effects management hierarchy of the NPS-IB and NPS-FM has been implemented in the design of the project.

The following table provides an overview of the terrestrial ecological effects of the Project. This table is replicated from Table 18 in the terrestrial impact assessment prepared by e3 Scientific. The level residual effects is the level of effect expected after the mitigation / minimisation and remediation measures have been implemented.

Table 1: Ecological Impact Assessment Summary for Terrestrial Ecology (Excluding Wetlands)

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
Vegetation Loss	High alpine cushionfield (2.13 ha of disturbance)	High	High	• Delineation of disturbance footprint • Disturbance footprint surveyed to record the plant species to be translocated • All At Risk – Declining and Threatened plant species to be translocated • Clusters of At Risk – Naturally Uncommon and Data Deficient plant species to be translocated (maximum of 500 clusters of each species). • Monitoring of the above to ensure 60% survival rates. • Appropriate erosion and sediment controls implemented during earthwork activities.	• All batter slopes / exposed surfaces, temporary access routes, laydown areas and surplus disturbed areas will be re-vegetated in accordance with the DOC/NZSki re-vegetation protocols.	**Moderate**
	Snow tussock grassland (0.17 ha of disturbance), cushionfield (5.16 ha of disturbance), rockfield (4.84 ha of disturbance) and rocky outcrop	Moderate	Moderate			**Moderate**
Fragmentation – Vegetation Communities	Cushionfield, high alpine cushionfield, rocky outcrop	N/A	Moderate	As per vegetation loss above	As per vegetation loss above	**Moderate**
	North facing tussock grassland, *Dracophyllum* scrub, cushionfield, high alpine cushionfield, rockfield, rocky outcrop	High	N/A	As per vegetation loss above	As per vegetation loss above	**High**

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
Infrastructure impediment	Eastern falcon (*Falco novaeseelandiae novaeseelandiae*)	Moderate	Moderate	• External window finishes will be designed to break up the line of sight, therefore, reducing bird strike (including monitoring). • If any bird strike of Threatened or At Risk bird species is recorded, further deterrent measures must be implemented.	N/A	Low
Weed introduction / mobilisation	Disturbed areas	Moderate	Moderate	• No soil from outside the study area is to be brought onto the site. • Prior to any machinery or equipment entering the study area it must be cleaned and checked for soil that could potentially contain seeds or exotic plants. • A quarantine area will be established near the Remarkables ski field base to enable checks and cleaning of machinery before moving onto the ski field. • No soil is to be moved upslope more than 100 vertical metres, or between catchments. • No disturbance is to occur outside the proposed earthworks footprint unless this could result in a reduced footprint.	• Existing weed infestation are to be controlled to ensure no increase in current population / distribution.	Low
	Snow tussock grassland, north facing tussock grassland, *Dracophyllum* scrub, cushionfield, high alpine cushionfield, rockfield, rocky outcrop and snowbank	Very high	Very high			Low

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
				• Any changes shall be checked by an ecologist prior to proceeding with the works.		
Sedimentation	Disturbed areas	Moderate	Moderate	• All unvegetated trail surfaces are to be finished with large coarse rock rather than fine gravels. • Implementation of appropriate erosion and sediment controls. • All stockpiled material is to be contained within the disturbance footprint and not to be deposited atop any indigenous vegetation.	N/A	Low
	Snow tussock grassland, north facing tussock grassland, *Dracophyllum* scrub, cushionfield, high alpine cushionfield, rockfield, and rocky outcrop	High	High		N/A	Low
	Snowbank	Very high	Very high		N/A	**Moderate**
Habitat loss - avifauna	Eastern falcon (*Falco novaeseelandiae novaeseelandiae*) nesting	Low	Low	• As per the minimisation measures set out for vegetation loss. • Where works take place in the breeding season, nesting habitat within the disturbance footprint will be surveyed. • Where construction works could cause direct disturbance to a nesting individual specific measures are to be undertaken (including (where appropriate) the establishment of exclusion zones, moving of nests if appropriate, moving of chicks to rehabilitation centres, destruction of nests).	N/A	Low
	Eastern falcon (*Falco novaeseelandiae novaeseelandiae*) foraging – high quality	Moderate	Moderate		N/A	**Moderate**
	NZ pipit (*Anthus novaeseelandiae novaeseelandiae*) nesting below 1700m – Doolans only	High	N/A		N/A	Low
	NZ pipit (*Anthus novaeseelandiae*	High	N/A		N/A	**High**

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
	novaeseelandiae) foraging above and below 1700 m - Doolans			• All staff to be trained in appropriate falcon interaction etiquette.		
Habitat loss – herpetofauna and invertebrates	McCann's skink (*Oligosoma maccanni*)	Very low	N/A	• Lizard habitat reduction (removing suitable lizard habitat slowly to encourage lizard relocation). • Construction / clearance activity within lizard habitat to occur when temperatures are greater than 14°C. • Application of lizard incidental discovery protocol.	N/A	Very low
	Plutella sp.1 (CO), and *Sigaus campestris*	High	High	• As per the minimisation measures set out for vegetation loss. • All invertebrate host specific plant species are to be translocated. This relates to all species within the Cardamine genus, *Aciphylla aurea* and *Aciphylla latipinna*. • All vegetation community remediation is to be undertaken in proximity as close as possible to the donor site to retain invertebrate biodiversity in remediated and adjacent habitat and species genetic diversity across spatially differentiable locations.	N/A	**High**
	Hypsithocus hudsonae, Neoramia alta, *Rorea otagoensis*, *Anagotus latirostris*, *Duvaliomimus walkeri*, *Mamoea montana*, *Xanthohoe frigida*, *Pyrausta comastis*, *Peripatus* sp. (Remarkables), *Subantarctia centralis*, *Huttonia* sp., *Scoparia pan*opla, *Scoparia niphospora*, and *Pasiphila* sp.	Moderate	Moderate		N/A	**Moderate**

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
	Inophloeus inuus	Moderate	N/A	• All plants must be translocated in tracts of vegetation material as large as possible to ensure as much of the habitat and ground dwelling terrestrial invertebrates are preserved and are to recolonise or dispersal into comparable habitat post-movement.	N/A	Low
Construction material and design (Doolans & Rastus Burn)	Kea (*Nestor notabilis*)	Very high	Very high	No lead-based materials or finishes will be used in construction or maintenance of any infrastructure.	N/A	Low
Construction noise	Eastern falcon (*Falco novaeseelandiae subsp. novaeseelandiae*)	Moderate	Moderate	N/A – construction noise is temporary in nature	N/A	**Moderate**
	NZ pipit (*Anthus novaeseelandiae subsp. novaeseelandiae*)	Moderate	Moderate	N/A – construction noise is temporary in nature	N/A	**Moderate**
	Kea (*Nestor notabilis*)	Very high	Moderate	N/A – construction noise is temporary in nature	N/A	**Moderate**
	Invertebrates(*Dasyuris partheniata, Plutella* sp.1 (CO), *Xanthohoe frigida, Pyrausta comastis, Dasyuris micropolis, Nivetica nervosa, Sigaus campestris)*	High	High	N/A – construction noise is temporary in nature	N/A	**High**

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
	Invertebrates (*Scoparia panopla*, *Scoparia niphospora*, *Pasiphila erotica*, *Pasiphila* sp., *Hypsithocus hudsonae*, *Neoramia alta*, *Mamoea montana*, *Rorea otagoensis*, *Anagotus latirostris*, *Inophloeus inuus*, *Taenarthrus capito*, *Duvaliomimus walkeri*, *Peripatus* sp. Remarkables, *Subantarctia centralis*, and *Huttonia* sp.)	Moderate	Moderate	N/A – construction noise is temporary in nature	N/A	**Moderate**
Operational noise	Kea (*Nestor notabilis*)	Very high	Moderate	• All tools, consumable items, and loose or soft constructions material will be secured in a way that is inaccessible to kea. • Interactions are minimised where possible to reduce potential habituation. • If kea become a nuisance kea safe 'playgrounds can be installed to distract kea during work hours. • All measures will remain in place until risks are removed from potential kea interaction.	N/A	Low

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
Increased human presence and skifield operation	Kea (*Nestor notabilis*)	Very high	High	• Kea interaction and etiquette signage • Staff training • No rubbish bins are to be stored externally • Annual rubbish collections will be undertaken within and adjacent all tracks and ski area infrastructure.	N/A	Low
	All threatened plant species	Moderate	Moderate			Low
Cumulative effects	The current extent of vegetation loss associated with the existing Remarkables ski area is approximately 60.60 ha. This area equates to less than 0.16% of the comparable vegetation above 1100 metres elevation in the Ecological District. The additional area of disturbance associated with the Doolans expansion covers an area of approximately 15.94 ha. This would equate to 0.04% of the Ecological District above 1100 metres. Given the cumulative effect on the ecological values of the subalpine and alpine environments remains low at less than 0.2%, e3s considers the Doolans expansion represents a **Low cumulative effect** on the terrestrial ecology of the Ecological District.					

It is also important to note that e3 consider the effects on the following vegetation communities (not referenced in the table above) to be 'low' and no further mitigation is required under the EIANZ guidelines. A 'low' level of effect is akin to a 'minor' adverse effect. It is our understanding that that RMA 'avoid' policies do not prohibit 'minor or transitory' adverse effects. In this regard, it is noted that there will be minor / low effects on the following vegetation types:

> North facing tussock grassland (2.64 ha disturbance / an estimated 0.09 % of this vegetation community lost within the comparable ecological district);

> Dracophyllum scrub (0.18 ha of disturbance / an estimated 0.01 % of this vegetation community lost within the ecological district);

> Snowbank (0.001 ha of indirect disturbance / an estimated 0.024 % of this vegetation community lost within the ecological district); and

> Disturbed vegetation (1.4 ha of disturbance / an estimated 0.05 % of this vegetation community lost within the ecological district).

Adherence to the effects management hierarchy of the NPS-IB requires that:

> Where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible; then

> Where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided; then

> If biodiversity compensation is not appropriate, the activity itself is avoided.

For the purposes of the above table, it is considered that, where the residual effects assessed are greater than 'low', offsetting / compensation is required. As has previously been described offsetting would be very challenging in this alpine environment.

Following the initial lodgement of the substantive application and development of the initial proposed conditions, NZSki has refined the compensation package to be implemented as part of the Project – noting that this is to address the residual adverse effects of the Project. The proposed compensation package now includes:

> The funding of predator control and planting works to a total of $75,000 per annum for duration to the concession – 40 years (the original resource consent conditions proposed $75,000 per annum until approximately 13 ha of land is revegetated). Consideration will be given to other projects or initiatives identified by DOC, the Mana Whenua Advisory Group or Councils;

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

- Increasing the proposed annual concession fee from 2.5% of gross annual revenue to 3%; and
- A payment of $20,000 to DOC to be utilised for the construction of a boardwalk over the wetland leading to Lake Alta.

The proposed conditions include the requirement for a Biodiversity Compensation Project project plan be developed in consultation with key parties - including mana whenua, DOC, and the relevant councils.

It is proposed that the nature of the biodiversity compensation be further developed and refined during subsequent workshops with the relevant parties.

3.2 Wetlands

The following table provides an overview of the wetland related effects of the Project. The level residual effects is the level of effect expected after the mitigation / minimisation and remediation measures have been implemented.

Table 2: Ecological Impact Assessment Summary for Wetlands

Effect	Value Affected	Level of Effect (Pre Effects Management) Doolans	Level of Effect (Pre Effects Management) Rastus Burn	Minimisation	Remediation	Level of Residual Effect
Vegetation Loss	Cushion bog wetland, riparian wetland and seepage wetland	Moderate	Moderate	• All mitigation measures as per the terrestrial vegetation loss table above. • All hydrological function and connectivity of all wetlands and streams will be maintained. • Designs will be provided for each stream/wetland crossing, including a hydrological assessment and any rehabilitation required (and these designed approved by an ecologist). • Post completion confirmation that hydrological functioning is being maintained. • Monitoring (photo monitoring points and vegetation quadrats) annually for 3 years and biennially for a further 4 years.	If monitoring shows hydrological function is not being maintained, work will be undertaken to ensure hydrological function is restored.	**Moderate**
Fragmentation – Vegetation Communities	Cushion bog, riparian wetland and seepage wetland	Very high	Very high			**Moderate**
Weed introduction / mobilisation	Cushion bog wetland, riparian wetland, and seepage wetland	Very high	Very high			Low
Sedimentation	Cushion bog wetland, riparian wetland and seepage wetland	Very high	Very high			**Moderate**

Adherence to the effects management hierarchy of the NPS-FM requires that:

> Where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible; then

> Where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided; then

> If biodiversity compensation is not appropriate, the activity itself is avoided.

As described in the memorandum contained in **Attachment A**, all wetlands within the Project Area were avoided as a priority. Where they were not able be avoided, minimisation and remediation measures have been proposed (as described in the table above).

For the purposes of the above table, it is considered that, where the residual effects assessed are greater than 'low', offsetting / compensation is required. As has previously been described offsetting would be very challenging in this alpine environment.

It is intended that the Biodiversity Compensation Project addresses the residual effects on wetlands.

3.3 Streams

The effects on streams of the project are considered across three assessment reports prepared by e3 Scientific:

> Remarkable Ski Area Upgrade and Doolans Expansion - Freshwater Ecological Impact Assessment;

> Remarkable Ski Area Upgrade and Doolans Expansion - Tracks, Stream Crossings and Stormwater Freshwater Ecological and Hydrological Impact Assessment; and

> Remarkable Ski Area Upgrade and Doolans Expansion - Doolans Creek Water Take Assessment of Effects.

Physical works will disturb small, localised areas of stream and wetland habitat. Instream works affect approximately 112 m^2 of streambed across Doolans Creek tributaries and the Rastus Burn, with 40 m^2 of Doolans Creek tributaries permanently modified by culverts, equivalent to 0.5% of the tributary network. Wetland disturbance totals 0.233 ha with permeable track designs maintaining hydrological connectivity.

Overall, e3 notes that the works associated with the Tracks, Stream Crossings and Stormwater *"occur within a high value alpine setting within the Doolans Basin and moderate value alpine Rastus Burn but are limited in scale, duration, and intensity, and supported by robust mitigation. Hydrological effects from temporary diversions are short-lived; stormwater will remain predominantly as sheet flow filtered through tussock vegetation; and sediment*

generation is expected to be minimal. Residual effects on streams, wetlands, hydrology, and sedimentation are assessed as Low, and cumulative effects remain Low.

In addition, there will be approximately 20 m^2 of stream modification via the installation of a weir in Doolans Creek.

In terms of the proposed water take, e3 Scientific have determined that there will be no adverse effects on downstream water users or flows, particularly as the take will only be operational during the winter months and a residual flow of 33.5 L/s will be maintained downstream of the take.

The following tables provide an overview of the effects of the project on streams and wetlands. This table is replicated from e3 Scientific Table 13 and Table 16 in the freshwater ecological impact assessment and tracks streams and crossings reports respectively. The level of residual effects is the level of effect expected after the mitigation / minimisation and remediation measures have been implemented.

Table 3: Ecological Impact Assessment Summary for the Proposed Reservoir and Associated Earthworks

		Ecological Value	Magnitude of Effect	Level of Effect	Recommended Impact Management (Avoid/Mitigate/Remediate)	Residual Impact
Weir Installation	Weir Earthworks Permanent loss of 20 m^2 of streambed habitat by placement of the concrete and metal weir structure.	High	Low	Low	• CEMP will be produced that outlines the Erosion and Sediment Control best practice approaches to be followed. • The CEMP will incorporate the in-water works guidelines (MfE, 2021) to be followed such as working from the banks where possible, limiting the works area to the extent practical and preventing cement from entering flowing water. • Undertake earthworks during a dry period and associated low flow e.g. below median flow at the Nevis River at Wentworth Station recorder (11.7 m^3/s).	Low
	Sediment mobilisation and deposition There is potential for sediment associated with earthworks being mobilised and depositing in high value streambed downstream and smothering bed substrate and aquatic life.	High	Low	Low	• Follow Erosion and Sediment Control best practice such as geotextile and silt fence use e.g. Auckland Council (2016) as outlined in the CEMP. • Any disturbed streambanks are to be replanted with at dense plantings of suitable native Carex/tussock grasses.	Low
	Cement Use of cement within the streambed can raise the alkalinity of the water to levels toxic to aquatic life. It is not expected that any cement would be used in flowing water.	High	Low	Low	• The works area should be dewatered and ensure cement use is isolated and any high alkalinity water pumped to a tanker and trucked offsite for disposal into a tradewaste system. This method should be included in the CEMP.	Low
Water abstraction	Removal of up to 30 L/S (2592 m^3/day, 41,240 m^3/year) Up to a 46% reduction in MALF flow over 600m of Doolans Creek, for a total of 16 days per year.	High	Low	Low	• No further actions required.	Low

		Ecological Value	Magnitude of Effect	Level of Effect	Recommended Impact Management (Avoid/Mitigate/Remediate)	Residual Impact
	Reduced area for macroinvertebrates. Water abstraction only to occur May to October. Water reused in catchment during spring snowmelt. At least 33.5 L/S flow maintained below the weir at all times.					
	<u>Pipe back flushing</u> Has potential to return and deposit sediment and gravels to the stream	High	Low	Low	• Include the back flushing process within the CEMP to ensure no sedimentation effects.	Low
Tarn Reclamation	<u>Loss of 4450 m^2 tarn habitat</u> Lowest quality tarn in the Doolans Basin but naturally uncommon waterway. Tarn 3 is to be replaced with lined water storage reservoir. Represents 16% of Doolan Basin tarn habitat.	High	Moderate	High	• Currently, the overall loss of the tarn habitat associated with the reclamation for the reservoir establishment remains high, prior to the details of the compensatory measures being confirmed and implemented.	High

Table 4: Ecological Impact Assessment Summary for Proposed Tracking, Crossings, Diversions and Associated Earthworks

Activity and Potential Effect		Ecological Value	Magnitude of Effect	Level of Effect	Recommended Impact Management (Avoid/Mitigate/Remediate)	Residual Impact
Culvert and track Crossings	<u>In-water Bed Disturbance - Doolans</u> Trenching for the services installed beneath the access tracks is required to be 1m wide by 2m deep. Where trenching intersects small watercourses in-water works is required. Dewatering, bed disturbance, sediment mobilisation and blasting may affect streams. Cement use may be required but water will be isolated from flowing water. A total of 96 m of the 8.2 km streambed length is proposed to be disturbed for fords, with 40m length lost to culverting.	High (Doolans tribs)	Low	Low	• No further actions are required, however the following standard ESCP actions are recommended. • Earthworks should be undertaken during a dry period where stream flow is stable and low. • The CEMP and the Erosion and Sediment Control best practice approaches outlined in Enviroscope (2026) are to be followed. • The CEMP will incorporate relevant in-water works guidelines (MfE, 2021) such as working from the banks where possible and limiting the works area to the extent practical. • The works area should be dewatered with a short diversion in place to ensure is the works area is isolated, and sediment laden water is pumped nearby sediment control devices e.g. sediment sump or turkey nest. • Any disturbed streambanks shall be protected with geotextile matting and are to be replanted with dense plantings of eco-sourced native tussock grasses. This rehabilitation work will reduce the likelihood of bank erosion. • Soil binding polymers are not to be used. • The works area should be dewatered and ensure cement use is isolated, and any high alkalinity water pumped to a tanker and trucked offsite for disposal into a tradewaste system. This method should be included in the CEMP. • The use of cement for bulkheads and its use is to be included in the CEMP.	Low
	<u>In-water Bed Disturbance – Rastus Burn</u> No concrete required. A total of 16 m of streambed proposed to be disturbed across two crossings. The tracking is in place so disturbance area is limited to trench width and culvert replacement.	Moderate (Rastus Burn)	Low	Low		
	<u>Stream Habitat Modification</u> Permanent modification of 40 m^2 of streambed habitat by placement 5 culverts. Benthic macroinvertebrate communities at these sites are excellent.	High	Low	Low	• No further actions recommended.	Low

Activity and Potential Effect		Ecological Value	Magnitude of Effect	Level of Effect	Recommended Impact Management (Avoid/Mitigate/Remediate)	Residual Impact
	Represents a very small proportion of streambed within the tributaries of Doolans Basin. No fish present.					
	<u>Temporary Waterway Dewatering and Diversion</u> Short duration damming, dewatering of works area and diversion past the works area. Macroinvertebrates able to find refugia. Sediment laden water to treatment devices.	High	Low	Low	• No further actions recommended.	Low
Reservoir Diversion	<u>Reservoir Inflow Diversion</u> Water will be diverted around the reservoir in armoured swales and discharged into terminal armoured soakage fields. Local intermittent stream hydrology affected but downgradient wetlands not affected. Results in an overall gain of intermittent stream habitat.	High	Low	Low	• No further actions recommended.	Low
Stormwater	<u>Stormwater Run-off & Sedimentation</u> Tracking construction phase will mobilise sediments and capture devises are established. Ongoing maintenance is required to ensure stormwater does not impact waterways. Potential for sediment associated with earthworks being mobilised and depositing in high value streambed downstream and smothering bed substrate and aquatic life or infilling wetlands. Appropriate methods and	High	Low	Low	• No further management actions recommended. • Validation monitoring recommended: Deposited fine sediment cover is to be assessed within 1 year of tracking earthworks completion downstream of Culvert B at Trib C site and at the Doolans Creek Weir using the SAM2 method and should remain within 10% of pre-works levels.	Low

Activity and Potential Effect		Ecological Value	Magnitude of Effect	Level of Effect	Recommended Impact Management (Avoid/Mitigate/Remediate)	Residual Impact
	management actions proposed to avoid effects.					
Stormwater	<u>Stormwater Discharge</u> New building roof water will be collected. There is potential for zinc and copper to be contributed to nearby receiving waterbodies at elevated levels.	High	Low	Low	• Validation monitoring - monitoring for zinc, copper and dissolved carbon during the spring snow melt and two first flush summer/autumn rainfall events at the stormwater outlet for the first two years post building establishment. • If elevated zinc and/or copper above DGV 99% threshold is found within stormwater then further receiving water sampling is recommended. • Monitoring for zinc, copper and dissolved carbon during the spring snow melt and two first flush summer/autumn rainfall events in Trib A for the first two years post building establishment. • Deposited sediment (if present) is to be collected in Trib A and at the Doolans Creek weir site and zinc and copper levels characterised annually for first 2 years post-building establishment. • Instream macroinvertebrate community to be assessed upstream and downstream of Gondola Base building stormwater outlet to Trib A during summer months annually for 2 years. Downstream %EPT abundance, %EPT Taxa richness, %mayfly abundance are to remain within 10% of upstream proportions. • If monitoring indicates macroinvertebrate community change or elevated levels of copper or zinc are present in the water or sediment, then management such as diverting first flushes to ground soakage or installing universal pollutant treatment (UPT) would need to be implemented to decrease concentrations.	Low
Biosecurity	<u>Didymo</u> Potential for the spread of the invasive algae Didymo from Rastus Burn and Doolans Creek to the Doolans Basin tributary	High	Moderate	High	• Biosecurity measures are in place after the last Rastus Burn stream crossing to ensure didymo is not transferred to Doolans Basin tributary streams. These measures should be detailed in the CEMP.	Moderate

Activity and Potential Effect		Ecological Value	Magnitude of Effect	Level of Effect	Recommended Impact Management (Avoid/Mitigate/Remediate)	Residual Impact
	streams. Could cause an associated shift in freshwater community structure.				• Biosecurity measures are in place for any equipment used within the Doolans Creek before it is used/driven back through the Doolans Basin tributary streams. • Post construction signage and decontamination stations should be established to minimise the risk of members of the public utilising the tracks spreading didymo to the Doolans Basin tributaries.	
Project	<u>Cumulative Effects</u> The local direct physical disturbance of 112 m and loss of 40 m of permanent and 55 m of intermittent watercourse. Indirect effects on hydrology in combination with other human actions are very limited at the Doolans Basin scale.	High	Low	Low	• No further actions recommended.	Low

3.4 Tarn 3

The memorandum contained in **Attachment A** describes the water infrastructure options that were considered to provide sufficient water for snow making. The proposed water take from Doolans Creek is considered to be the only feasible option for abstracting water. However, given the volume required for snow making, water storage is required. Several options were investigated by NZSki to provide the required water storage (including Tarn 3, natural depression, Tarn 1, Tarn 2 and engineered tanks), with Tarn 3 being the best practicable option for the following reasons (as summarised from the NZSki memorandum):

> An impractical number of engineered water storage tanks would be required to provide sufficient water storage – resulting in a high cost, high landscape effects and still required land disturbance to create flat land;

> The natural depression is outside of the area proposed to be developed as part of the Project, requires substantial pumping as well as a greater length of pipe and trenching. This area also contains a high abundance of naturally uncommon plant species;

> Tarn 1 and 2 are both surrounded by very high value littoral wetland zones that would be significant impacted and would require infrastructure be construed within the margins of the tarns; and

> Tarn 3 is not a wetland and does not have any threatened plants associated with it. This tarn is also within the area proposed for development, requires less ground works and once constructed, will resemble its pre-development form. There are also no wetlands 100 m downstream.

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 as a freshwater body. The effects management hierarchy of the NPS-FM only relates to natural inland wetlands and rivers / streams. As such, we are not aware of any statutory requirement for the strict adherence to the effects management hierarchy achieving net zero or net gain for a waterbody such as Tarn 3. Regardless, the Biodiversity Compensation Project is intended to compensate for the effects on Tarn 3 as NZSki recognises a loss of values associated with the proposed development of Tart 3.

4. CONCLUSION

This document, along with the memorandum appended as **Attachment A**, have shown how the 'avoidance' step in the effects management hierarchy has been implemented as part of the Project. The way the Project has addressed the need to avoid effects is in the design of the Project itself – through the site selection of infrastructure. As described in the memorandum

prepared by NZSki, while avoidance of the highest value vegetation communities and freshwater bodies was the priority, due to the functional and operational needs of ski area infrastructure full avoidance of these vegetation communities and waterbodies was not always practicable. The various technical assessments supporting the substantive application then address the effects of the Project that could not be avoided during the site selection process and documents how those effects are proposed to be minimised and remediated (and are summarised in this document).

Some residual effects of the Project cannot be fully addressed through avoidance, minimisation and remediation / restoration. The Project is predicted to result in moderate to high residual adverse effects on a number of terrestrial ecological and wetland values prior to consideration of any compensation, largely as a consequence of the permanent loss or modification of high-value ecosystems, and associated habitats. While the Biodiversity Compensation Project is expected to materially improve outcomes for some species and ecological processes, and it is anticipated to provide significant biodiversity benefits in some parts of the conservation estate, it does not fully address the loss of habitat extent and ecological value associated with all affected ecosystem types and species. Under a standard RMA process, it may be that the inability of the Project to demonstrate a 'net gain' in ecological / freshwater values (via offset or compensation models) following the adherence to the effects management hierarchy is a fatal flaw. However, under the FTAA, the key test is whether the residual adverse effects of the Project are sufficiently significant to be out of proportion to its regional and/or national economic benefits. In undertaking this test, policy considerations including the NPS-IB and NPS-FM, should not be determinative.

Attachment A – NZSki Site Select Memorandum

Infrastructure Site Selection Technical Memorandum :

Functional Needs Assessment for Remarkables Upgrade and Doolans Expansion Infrastructure

Executive Summary

Following consideration of the available alternatives, NZSki has confirmed that the configuration proposed in the substantive application is the preferred option for The Remarkables Upgrade and Doolans Expansion Project.

The proposed gondola stations, ski and access trails, base amenities, Doolans water take, reservoir storage, wastewater, power, snowmaking and carparking solutions are interdependent components of The Remarkables Ski Area Upgrade and Doolans Expansion Project. Together, they provide the uplift capacity, terrain capacity and supporting visitor amenities required for a commercially viable ski area expansion. Snowmaking infrastructure is also critical to improving the resilience of the investment during adverse or low-snow seasons.

The layout of the ski infrastructure included in the substantive application was selected after an extensive masterplanning process, including site selection workshops which considered the functional, operational, environmental, technical and commercial factors that influence the feasibility and performance of the expanded ski area.

Key considerations that impacted site selection included:

- Topography, elevation and aspect;
- Skier amenity and accessibility;
- Environmental effects on terrestrial and freshwater ecology, hydrology, and landscape values;
- Gondola line engineering constraints;
- Avalanche and rockfall natural hazard areas;
- Capital and operating costs;
- Constructability;
- Maintenance access; and
- Long-term operability and reliability.

Alternative water take and water storage options have also been considered, including options that would avoid the loss of Tarn 3. These alternatives have been assessed as either infeasible or as providing a higher level of overall environmental effects.

The proposed infrastructure solutions and locations are the preferred means of achieving the Project's purposes while managing the adverse effects of the Project.

No other technically available options have been identified that would maintain the viability of the Project and provide comparable regional economic benefits, deliver the required infrastructure functions, and manage environmental effects to an equivalent or better level.

1. Introduction

1.1 Document Purpose

This memorandum documents the site selection process undertaken for the proposed Project infrastructure, with a focus on the Doolans expansion. It demonstrates the functional need for the infrastructure to be located in the proposed configuration, to enable a commercially viable ski area expansion.

The memorandum documents the rationale for selections of the proposed infrastructure, including gondola alignment, gondola station locations and base amenities, ski trail locations, construction access routes, and water take and storage locations by describing:

- Why the infrastructure is required - the gondola, ski trails, access roads, snowmaking, buildings and supporting services;
- What locations and alternatives were considered;
- The environmental constraints that informed site selection;and
- The preliminary engineering requirements that informed the site selection.

1.2 Project Context

Refer to the Environmental Setting and Project Description. .

1.3 Project Purpose

The Project will improve the visitor experience by increasing ski area capacity through expanded infrastructure and terrain.

The total capacity of the expanded ski area, based on the area of available ski terrain balanced against available uplift and skier amenities, will be designed to increase from 3,500 to 6,000 unique skiers per day.

The ski area currently often exceeds capacity at peak times throughout the season. Tourism and regional growth are forecasted to increase, exacerbating pressure on the existing ski area infrastructure. The expansion is designed to accommodate and alleviate this growth by enhancing the visitor experience through expanded terrain access and provision of expanded amenities.

1.4 Why the Doolans?

To accommodate the growth in skiing demand from tourists and locals in Queenstown-Lakes and wider Otago, NZSki has selected to expand into the Doolans Basin, which is immediately adjacent to, and south-east of the existing Remarkables Ski Area.

The Doolans Basin offers a unique combination of scale, terrain, accessibility, operational efficiency and long term resilience. No other identified terrain offers the same combination of operational, commercial, environmental and strategic advantages as the Doolans Basin.

2. Infrastructure Requirements

2.1 General Ski Area Functional Requirements

Ski areas have a functional need to be in an alpine location with reliable natural snowfall. To maintain commercial viability, ski areas require substantial infrastructure to provide a an experience to meet the demands of modern skiers and snowboarders. This includes, but is not limited to:

- Skier access using aerial ropeways (chairlifts, gondolas) and surface lifts to provide safe and efficient access to ski runs;
- Ski trails from beginner level progressing levels of ability, that are contoured to provide a suitable ski surface;
- Snow grooming vehicles to move snow back uphill and maintain a smooth snow surface;
- Snowmaking on main ski trails to support reliable operations through changeable weather and climate change impacts – requiring water take, storage, pumping, pipes, power, communications, above ground snow producers;
- Skier amenities such as indoor shelter, sanitary facilities, ski equipment rental and food to provide an enjoyable experience, that requires buildings, potable water supply, power supply, wastewater services, waste and recycling services;
- Operational controls such as safety fences, explosives storage, signage;
- Skier medical facilities, rescue helicopter helipad;
- Road access and snow clearing equipment for transport to and from the valley to a base amenity area;
- Road access within the ski area for maintenance and operations;
- Maintenance facilities for servicing of equipment and over-snow vehicles; and
- Bulk fuel storage to supply snow grooming vehicles and snow clearing equipment.

2.2 Expansion Area Site Selection

NZSki has made significant investments in developing the existing ski area over the last 12 years to maximise the capacity of the existing concession area. This includes three new high speed chairlifts, new surface lifts, earthworks to create new intermediate and learners ski terrain, as well as construction of a new base amenities building and installation of extensive snowmaking infrastructure.

However, analysis by ski area designers has shown that the capacity of the existing ski area has been maximised and to accommodate growth, further expansion is necessary. It was shown that the current ski area has a comfortable carrying capacity (CCC) of approx. 5,000 skiers per day, which exceeds the total downhill capacity (SAOT) of the existing ski area of approximately 3,900. This imbalance results in no lift lines but congested ski trails. This shows that adding new lifts to the existing ski area will make minimum difference to the overall skifield capacity and guest experience, and more ski trails are required.

NZSki's business case identifies significant expansion as a response to existing capacity constraints across terrain and facilities. Smaller terrain additions may provide marginal gains but would not materially change carrying capacity, guest experience or accommodate the forecast long-term growth of the ski area.

Expanding in terrain adjacent to the existing ski area is commercially viable as it creates numerous economies of scale, with the ability to build and expand upon existing infrastructure. The expansion can be connected directly to existing infrastructure, services and operations, unlike more remote terrain options which would function as standalone developments with significantly higher capital and operating costs.

Creating a new ski area independent of The Remarkables (and also independent of any adjacent property development) to accommodate growth is deemed to be commercially infeasible, even if there was a suitable site identified.

The Doolans offers a unique combination of scale, terrain, accessibility, operational efficiency and long term resilience. No other identified terrain offers the same combination of operational, commercial, environmental and strategic advantages as the Doolans.

Alternative neighbouring sites and smaller terrain additions that were not considered feasible to accommodate forecast growth of beginner and intermediate skiers are:

- Wye Valley - The terrain would have gentle slopes and could accommodate wide ski runs best suitable for beginner skiers. This option would allow for a significant increase of resort capacity, especially within the target group of The Remarkables. However, due to constraints around the conservation status of the land and its cultural values, expansion into the Wye Valley was not further explored, although there is suitable ski terrain and it is accessible from the existing ski area.
- Terrain around Single & Double Cone & Lake Alta – There is no suitable ski terrain. There are significant landscape and recreational values that would be affected by any new ski related development.

- Expanding up Sugar headwall above the existing lift – This would enable only a marginal step up in capacity due to it being advanced terrain only. This area is also a known natural hazard zone.
- Expanding up onto Helicopter Ridge and not continuing over into the Doolans - No intermediate or beginner ski terrain can be built here—specifically from Helicopter Ridge into Sugar Bowl—that would provide enough additional capacity to handle the forecast growth.
- Lift access in Homeward Basin and Scarpa – this was explored and there are technically feasible lift alignments in both of these locations, and some additional gains in terrain capacity. However, Scarpa face is largely too steep for a reasonable ski run development. The only feasible option at Scarpa, based upon the information from ILF ski designers and confirmed by NZSki , is a ski run along the ridgeline northerly of the face. However, heavy wind exposure is unfavourable at this location. Also, the run-out elevation is too low to maintain season-long resilient and commercially feasible operations, when considering the ongoing impacts of climate change. NZSki already observes that there is limited snow cover in these areas most winters. It is likely for the majority of the ski season that these two areas would only be able to operate on snowmaking snow and would have inadequate natural snow cover. Extensive snowmaking would be required, and this is likely to be difficult as snowmaking conditions would be very marginal in the lower sections of these basins due to the lower elevation in comparison to the Doolans. Also, additional corresponding water take would be needed, and the Rastus Burn catchment is already over-allocated. For these reasons this was not explored further.

The Doolans Basin is the only expansion area capable of delivering a step change in capacity, terrain diversity and long-term resilience for The Remarkables. It is uniquely positioned adjacent to the existing ski area, provides the intermediate terrain needed to address current constraints and future growth, offers favourable snow retention characteristics for future climate resilience due to its aspect and elevation, can be integrated efficiently with existing infrastructure and operations, and is the only terrain block of sufficient scale to materially transform the guest experience and long-term commercial performance of the ski area.

No alternative sites outside of the Doolans Basin have been identified that would be commercially and operationally feasible for NZSki to operate. Any site should have a southerly aspect, be at greater than 1600m asl, close to Queenstown, have a technically and commercially feasible access route, significant intermediate ski terrain, available water, available grid connection with significant electrical capacity for lift and snowmaking operations, and manageable natural hazards, before assessing in any detail environmental, cultural, landscape and historical effects.

Within the Doolans Basin itself, the selected location maximises the available ski terrain from installation of only one access lift. The initial masterplan prepared showed lift and trail options within the upper reaches of the Doolans Basin, which have not been proposed as

part of this application. This avoids earthworks and associated ecological and landscape effects associated with the initially proposed additional chairlifts and ski trails.

Placing the lift further east towards the head of the creek at one of these other proposed alignments in the initial masterplan, instead of its selected location, would limit the amount of lift accessible ski terrain, reduce intermediate / learners terrain, reduce vertical ski metres, increase natural hazard risk, and therefore create a less compelling visitor experience that would not warrant the investment in the infrastructure.

2.3 Remarkables Upgrade and Doolans Expansion Functional Requirements

The expansion of the Remarkables Ski Area into the adjacent Doolans Basin necessitates both expansion of the existing and the establishment of new infrastructure.

Each type of infrastructure has unique functional and locational requirements, while the ski area as a whole must operate as an integrated network. Any masterplanning, therefore, must account for the overall visitor experience, including skier flow from arrival to snow, terrain progression and distribution, the balance between uplift capacity and terrain capacity, queue management, congestion, and clear wayfinding. Because these elements are interconnected, a change to one item of infrastructure can affect the location, function, or performance of others.

The Project Masterplan considers:

- New skier access lift(s) and intermediate ski trail(s) into and within the Doolans;
- Expansion of the snowmaking system to support the new ski trail(s), and associated supporting expansion of existing or new water take, storage and pumping capacity;
- Expansion of skier indoor amenities in the Rastus Burn to limit overcrowding and associated increase in wastewater disposal requirements;
- Power upgrade to operate the new access lifts and supporting systems;
- Provision of emergency shelter and amenities in the Doolans, requiring potable water, firefighting and wastewater solutions;
- Installation of operational controls for the expanded ski area;
- New road access for construction and maintenance of all new infrastructure;
- Upgrade and expansion of carparking and transit facilities.

All of the above are fundamental to the functionality of the expanded ski area. Removing any of the above would materially comprise the constructability and operability of the expanded ski area, as well as skier convenience and overall quality of the ski experience, reducing the attractiveness and commercial potential of the development.

2.4 Ski Area Expansion Design Key Priorities

The following sets out the key priorities for the expanded ski area:

- **Access Lift** *because* this is essential to accessing the Doolans Basin and expanding skier terrain.
  Functional requirements: The lift(s) must provide access between the existing ski area and the Doolans Basin and facilitate efficient movement within the expanded ski area. The lift(s) should be accessible to all users, regardless of skiing ability. The gondola must provide sufficient uplift capacity to balance terrain capacity and skier demand. It must follow terrain that can physically support ropeway engineering requirements, and be capable of being constructed and operated safely and efficiently. Sufficient flat loading and unloading areas need to be provided. It needs to be able to be integrated with the wider ski area network.

- **New Intermediate Ski Trail** in the Doolans *because* the current and forecast future skier market for the Remarkables is predominantly learner and intermediate.
  Functional requirements: New trails should be no harder than intermediate 'blue' grade to support the target skier market and maintain commercial viability. Although one groomer width, approximately 6 m, is the minimum physical width, a 30 m trail width is required for safe skier spacing, effective grooming and an appropriate intermediate-level experience. It needs to be integrated with the load and unload stations of the access lift.

- **New Learners Terrain** *because* The existing learners area is highly congested and there is no capacity to expand to new learners terrain within the existing basin.

  Functional requirements: Learners terrain must be easily accessible to provide a safe learning experience, i.e. accessed easily by foot, escalator, elevator, surface conveyor or aerial gondola, and not require any skiing or snowboarding skill to load or unload from a chairlift. It should also be designed and located where it can be inclusive, with emphasis on ensuring people with different mobility needs can access and use the terrain. The maximum grade of the terrain should be relatively flat, considered 'green' skier level. There needs to be flat congregation space at the top and bottom of the terrain and any surface lift for allow for snowboarders to strap in and out of their bindings. They should be close to indoor amenities to improve the beginner experience.

- **Snowmaking** is essential *because* of the increased weather variability associated with climate change. Snowmaking enables a viable commercial proposition at times when natural snowfall may be limited.
  Functional requirements: Its primary function is to improve operational reliability and climate resilience by maintaining skiable terrain during periods of limited natural snowfall. The snowmaking system is required to provide reliable snow coverage on the Doolans main ski trail, enabling a minimum snow depth of 50 cm within a 72-hour snowmaking window that is suitable for grooming and safe skier use. The

system must include water take, storage, pumping, distribution pipes, power, communications and snowmakers infrastructure, and operate as an integrated component of the expanded ski area. This requires water take infrastructure, pumphouse building(s), integrated service trenches, in-ground snowmaker distribution pits and above ground snowmakers and power transformers, all of which must be accessible by 4WD for maintenance.

- **Doolans Building** is essential *because* it provides an emergency shelter in the event of the access lift being unable to operate.
  Functional Requirements: provide emergency indoor shelter, support the overall skier experience by providing at least basic amenities (potable water and toilets), and provide off-line storage of gondola cabins.

- **Expansion of Existing Building** is essential *because* it supports the overall skier experience for expanded skier numbers and integration of the Rastus Burn gondola base station. An expanded building limits overcrowding and provides expanded rental, retail, guest services, staff, storage, restaurant and sanitary facilities. This then necessitates expanded wastewater solutions.

- **Expanded Carparking and Transit** facilities are essential *because* it enables the efficient arrival and shuttling of increased numbers of guests whilst promoting mode shift.

- A **power upgrade** is essential *because* all of the above infrastructure needs power to operate and the currently available power is at capacity.

- A **wastewater upgrade** is essential *because* the above expansion of amenities requires an upgrade of the wastewater solution and renewal of the existing consent.

3. Masterplan Process

3.1 Design Philosophy

The overarching design philosophy for The Project is to create a minimal viable infrastructure footprint for the ski area extension. NZSki has taken an effects led design approach to the Project, with the initial siting of ski infrastructure and trails designed to avoid or minimise various areas of highest ecological and landscape value. The Project has been designed from this starting point with the remainder of the effects seeking to be appropriately avoided, minimised, remedied or mitigated to the extent practicable.

This includes effects on:

- Freshwater values (i.e. changes to wetlands, streams, hydrology and subsequent effects on ecosystems);
- Terrestrial ecology values (i.e. avoid vegetation loss and habitat fragmentation wherever possible, with priority given to at risk or vulnerable plant species as identified in the ecological assessment of the Project Area);
- Avifauna values;
- Herpetofauna values;
- Landscape values;
- Cultural values;
- Recreation values; and
- Traffic impact.

Where effects cannot be avoided, they are to be minimised wherever practicable, with due cognisance of:

- Functional need for some infrastructure to be in certain locations or configurations for constructability, operational reliability, operational safety, and/or visitor experience reasons;
- Capital and operational cost effectiveness, to maintain business sustainability.

Where residual adverse effects are expected, these will either be appropriately compensated for or suitably managed through development and implementation of management plans.

3.2 Masterplan Design

The following general process was taken for establishing a masterplan for the expansion:

- Assessment of capacity of existing lifts, terrain and facilities by expert ski area designers;
- Assessment of forecast customer demand and corresponding impact on ski area functional requirements;
- Review of possible development areas (Existing ski area, Scarpa, Homeward, Wye-Creek, Doolans) ;
- Evaluation of terrain with slope, elevation and fall-line analysis;

- Establishment of initial ecological constraints to inform initial network design;
- Initial draft of ski run, ropeway and snowmaking network masterplan;
- High level ecological review;
- Ecological values assessments and refinement of ecological constraints mapping
- Concept geotechnical studies for access tunnel;
- Review and adaptation of ropeway alignment, station and tower locations, ski runs and access road;
- Concept design of supporting infrastructure such as wastewater, water take and water storage;
- Further ecological studies, such as further wetland delineation;
- Refinement of infrastructure design and earthworks footprints; and
- Final assessment of effects.

3.3 General site selection requirements

General site selection requirements that were integral to the development of the masterplan are:

- All infrastructure footprints are to be minimised as much as practicable, whilst maintaining constructability, operability and visitor experience outcomes.
- Environmental constraints are to be mapped and understood at a level that can inform infrastructure site selection.
- Infrastructure, service trenches and trails should be co-located as far as practicable so they have they smallest physical disturbance, so the vast majority of the proposed expanded ski area can remain unchanged.
- Location of infrastructure needs to take an integrated approach considering the overall ski area network inter-dependencies.

3.4 Masterplan Process - Expert Input

The masterplanning and site selection process undertaken was iterative, and the infrastructure design involved the following:

- Terrestrial and freshwater ecology experts (E3s, Ecological Solutions)
- Ski area design consultants (ILF Consulting);
- NZSki representatives ([redacted]);
- Civil designer (SouthernLand);
- Landscape expert (Boffa Miskell);
- Civil engineer (Stantec);
- Geotechnical expert (Engeo);
- Aerial ropeway suppliers (Doppelmayr, Leitner); and
- Economic analysis ([redacted]).

3.5 Masterplan Initial Considerations – Environmental Constraints Mapping

The first and most important piece of work in the masterplanning process was the preparation of an environmental constraints map. Since the initial revision, it has been

continually refined as continued field campaigns provide more information, to eventually become the mapping included within the substantive application.

The initial environmental constraints mapping included:

- High resolution aerial imagery flown in summer 2019-2020.
- Preparation of a digital terrain model by Southernand.
- A desktop review of all available previous study information of the Rastus, Doolans and Remarkables Range by e3s.
    - Of note, is that Simpson (2011) and Simpson and Jager (2021) identified four ecological communities in the upper Doolans Valley as follows: Tussock grassland, Cushionfield/Fellfield, Wetlands, and Rock field/scree and bluffs.
- A site walkover of the Project Area to ground truth the aerial imagery and become familiar with the topography, waterways, and vegetation communities.
- Based upon the initial desktop review, aerial imagery, and site walkover, the ecology was coarsely mapped by type, in accordance with the classifications from the earlier studies, to produce a constraints map in GIS, inclusive of wetlands, cushionfields, tussock and rockfields. Waterways and tarns were also shown.

Given e3s' previous ecological work at The Remarkables within the Rastus Burn, together with the information available from earlier field campaigns in the Doolans Basin, there was sufficient confidence that the initial coarse-level constraints mapping was adequate to inform the concept design. The constraints could then be refined through subsequent field assessments.

This site ecological constraints map was then used as input to the Ski Area Masterplanning Design, completed by ILF Consulting.

3.6 Environmental Peer Review

Due to the environmental values of the Project Area and the impact of these values on the masterplan design, NZSki engaged Ecological Solutions Limited to undertake a site walkover and a high-level assessment of the site constraints mapping produced by e3s and the ILF Masterplan concept from an ecological perspective. This was in order to identify any locations within the project area where development and ski field infrastructure are to be avoided because of high value or particular sensitivity, and to provide NZSki with additional confidence before they further advanced the design of the ski area and associated infrastructure.

"Ecological solutions noted that infrastructure would ideally avoid areas shaded red (Dracophyllum shrubland), green (cushion field) and orange (wetlands) because effects there would be more severe. The optimal chairlift alignment would be one that avoids …locating infrastructure within wetlands as a priority. Infrastructure would ideally be located in areas shaded grey (rock field) or blue (tussock grassland) because they are likely more resilient to the types of effects expected. Finer scale vegetation and habitat mapping would assist in

refining areas best avoided (particularly in locating specific naturally uncommon ecosystems).

If these areas cannot be avoided, minimisation would be achieved by locating infrastructure outside the highest value areas and installing trenched infrastructure beneath them where required. The habitats which are easiest to remediate would be cushion fields (green) and tussock grassland (blue). This remediation would take the form of direct transfer of vegetation, perhaps with supplementary planting, and the main constraint would be finding locations to transfer the vegetation to be placed. The most likely location would be areas within the existing ski field area which require (re) vegetation".

3.7 Masterplan - Design Evolution

A summary of key points and changes along the design process are noted below. This is intended to provide a general guide, and is not an exhaustive list. Some tasks were conducted in parallel and followed an iterative refinement process.

Task	Description
Initial Scoping	Site Walkovers and Skiing expeditions over Helicopter Ridge, around Sugar Bowl and within The Doolans Basin. Desktop Review of Existing Field Surveys and Engineering Studies Desktop Review of CMS, and Remarkables reclassification information
Location Boundary	Exclusion of Wye Valley due to conservation and cultural value. Exclusion of any terrain upslope of Lake Alta towards single or double cone due to landscape significance.
Sugar Bowl Access to Doolans	Prior to confirming alignment of new Sugar Bowl chairlift in 2019, skier access to the Doolans from traversing the top of Sugar Bowl around the ridgeline to enter at the northeast of the Doolans was reviewed for inclusion in masterplanning. Decision was that it was too long a traverse (>2km) and weather-exposed with difficult entry to Doolans terrain. There were also consenting and rockfall risks of extending Sugar chairlift alignment up Sugar headwall.
Aerial Imagery	High resolution aerial imagery and DTM of Doolans Basin prepared in 2020.
Constraints Mapping	Based on existing information from surveys done to date, as well as aerial mapping of vegetation communities and waterways, e3s provided an initial environmental constraints map to guide Ski Area Design in 2020/2021.
Concept Ski Area Design	ILF Consultants engaged to prepare Concept Ski Area Design in 2021. Instruction from NZSki to review the existing operation and adjacent terrain to suggest a concept ski area design that could double the capacity of Remarkables. Provided the constraints map prepared by e3s. Direction from NZSki to: (i) Based on slope gradients, develop feasible blue and red intermediate ski trails within the Doolans Basin and existing ski area, using typical industry trail grading. (ii) Consider lift infrastructure alignment to provide the most effective and efficient access to these trails. (iii) Minimise infrastructure & construction in and across wetlands and waterways, highlight any areas where trails intersect these constraints and discuss alternatives. (iv) Minimise vegetation disturbance, by co-locating infrastructure & services where possible. (v) Assess known and possible avalanche hazard paths through assessment of slope angles across the terrain when locating infrastructure and trails. (vi) Complete solar analysis to identify restaurant locations. (vii) Consider resilience to climate change as part of the masterplan design for ski trails, lifts and building facilities through elevation choices and snowmaking system concepts. (viii) Calculate capacity of upgraded ski area.
Maximising Existing Concession Area (2014 to 2024)	Parallel Programme – maximising existing concession area. Whilst Doolans masterplan was being developed, parallel to this a 10yr plan for The Remarkables was delivered from 2014 to 2024 to maximise the opportunities within the existing Remarkables Ski Area. A new base building and learners area was established in 2014. Then, over the past ten years, three high speed 6-seater chairlifts have been installed – Curvey Basin (new chair), Sugar Bowl (replacement, new alignment), Shadow Basin

Task	Description
	(replacement, new alignment), along with a new learners conveyor. This programme has delivered significant increases in capacity and visitation and taken the current practical capacity of the ski area to approximately 3,500 skiers at one time.
Concept Design Review	Review of Concept Masterplan Design by NZSki and adjustment to localised conditions, environmental and business requirements.
Doolans Coal Pit Road Access Feasibility	Exploration of road access from Gibbston Valley, via an extension of Coal Pit Road through Wentworth Station. Desktop route prepared by civil designers. Site visit indicated cost prohibitive constructability and technical challenges associated with steep topography, ravines, waterways and natural hazards. Not considered further.
Rastus Burn to Doolans Tunnel Feasibility	Investigation of Tunnel proposed in Masterplan through Remarkables at the top of Curvey Basin. Comprising desktop study, site geotechnical investigation, geotechnical report including risk assessment by expert geotechnical consultant. Tunnel was assessed as potential alternative to an aerial ropeway and ski trail construction. A tunnel may have minimised ski area infrastructure earthworks footprint, minimised landscape impact on ridgeline, and increased operational reliability as can operate in windy conditions. However, the preliminary ground investigation and geotechnical feasibility study identified numerous risks and uncertainty associated with the ground conditions. Technical feasibility remained unproven. Any further progression of this option was assessed as high.
Ecological Field Survey	Field surveys and refinement of GIS constraints map. Wetland delineation at Doolans base area to identify if any locations for a base station could avoid wetlands. Lizard and inverterbrate field surveys.
Option Selection NZSki	Based on site walkovers and available information from the Masterplan constraints Mapping and tunnel supplier information, the concept masterplan design dropped the tunnel solution and reviewed the proposed lift alignment. Review of aerial ropeway infrastructure and selection of preferred configuration. One long gondola proposed from the existing base area instead of two chairlifts, and instead of the access lift starting at old Sugar base as it: • increased accessibility for non-skiers, • minimises tower locations and therefore vegetation and wetland effects, compared to a dual chairlift solution. • provides shelter for users in adverse weather event or mechanical stoppage. The suppliers off-line gondola cabin parking requirement requires significant building footprint space (700—800m2). This was challenged by NZSki, however, this was established as a functional need for the ropeway based on established international ropeway design standards. Gondola taken forward, with Rastus Burn base station adjacent to existing, midstation on helicopter ridge, and Doolan base at approx. 1600m.
Natural Hazards Assessment	Review of proposed alignment from a natural hazard perspective, to inform constraints prior to preliminary aerial ropeway engineering design.
Preliminary Ropeway Design	Preliminary ropeway design to establish -sizing and elevation of stations -number and height of towers

Task	Description
	-tower locations
NZSki, Ecology & Natural Hazard Review of Preliminary Ropeway Design	Review of preliminary design and refinement of ropeway station elevations and tower locations. Removal of tower construction areas out of ecologically sensitive habitats and existing ski runs. Consideration of temporary access routes that minimise vegetation disturbance. Modification of proposed towers and stations to accommodate ecological & natural hazard input. Iterative process with two suppliers.
Access & Ski Trail Design – Doolans	Removal of ski trails to skier's right of Doolans, despite promising ski terrain and trails proposed in masterplan, due to concerns from reviewers associated with effects due to proximity to significant tarns, waterways, wetlands and threatened vegetation. Review of proposed masterplan trails from ILF, additional site walkovers, updated GIS constraints mapping and DTM for civil design/maximum grades/minimal cut-fill used to establish one consolidated ski/access/services trail wherever possible.
Learners Area	Visitor experience feedback suggests expanded learners terrain is paramount. Assessed and proposed a Doolans learners area , following same constraints process as trail design,
Access & Ski Trail Design – Heli Ridge Access	Reviewed proposed trails from ILF along with suggested trails from NZSki team. Recognition of construction difficulties in this zone due to the terrain, a number of ideas were discussed and drafted.
Trail Design – Constraints Workshop	Workshop the proposed trails with ecology, civil design, natural hazards and landscape expert input to minimise earthwork effects.
Snowmaking	Based on preliminary ski trail design, snowmaking designers (TechnoAlpin) prepared a concept snowmaking design to establish water storage and demand requirements, based on broad assumptions on water take that were required to be confirmed through field measurements. Snowmaking plan incorporated learnings from the existing ski area operation and use of latest technology.
Water Take and Storage	Installation of water monitoring equipment in Doolans Creek. Options assessment for water take and water storage, followed by concept design.
Power	Snowmaking pumping concept and gondola concept established a concept power demand for the Project, to inform concept power design (substation, transformer, and cable sizing requirements). Co-location approach to trenching and substation location.
Wastewater	Options assessment. Establishment of co-located infrastructure where practicable, for pipes and treatment plant.
Simplification of Proposal	Removal of secondary ropeway (chairlift) in the Doolans Basin and associated supporting infrastructure (ski trails, access trails, snowmaking). Removal of separate day lodge.
Environment	Further field assessments and studies to support design changes from initial concept.
Services Curvey Trench Access	Addition of services trench from Curvey to Helicopter Ridge after constructability, risk and sequencing assessment. Reduces services cost , facilitates better integration with existing services network, and maximises availability of the construction access road.
Transport	Transport strategy. Carparking design adjacent to SH6, considering impact of loss of Carpark 3 to services infrastructure.
Effects Assessment	Final assessment of effects for integrated ski area expansion design.

4 Ski Area Network Design

4.1 Overview

In 2020 NZSki engaged a ski area designer, ILF, to prepare a conceptual masterplan as a desktop study to provide future directions for the further development of The Remarkables Ski Resort. It needed to balance of facilities and a variety of amenities to afford an exceptional guest experience.

The brief for the ski area designers was to apply typical ski area design principles to their masterplanning to provide adequate and complementary carrying capacity and ski terrain capacity for up to 7500 skiers per day, with creation of new intermediate terrain the focus.

The downhill capacity of ski runs should be in balance with the capacity of the ropeways, or uphill capacity as much as possible for each terrain area, in order to have a well-balanced operation of the ropeway and ski run network without excessive queues or trail congestion.

The downhill capacity is determined by the key figure “Skiers At One Time” (SAOT) which is derived from the area of ski runs and the average ski run density based upon on their difficulty classification. The uphill capacity is measured as “Comfortable Carrying Capacity (CCC)” which is derived from the uphill capacity of the ropeway, divided by the weighted vertical demand of the trails associated with the lift. The vertical demand varies with skier skill level, and with high speed ropeways, better grooming, and easier to use ski equipment, vertical demand has significantly increased over recent decades.

4.2 The Remarkables Existing Fall Line and Carrying Capacity Analysis

Evaluation of terrain with slope, elevation and fall-line analysis was completed, along with assessment of the uplift capacity of the existing infrastructure.

The desktop study shows that the current ski area had a CCC of approximately. 5,700 skiers per day, which exceeds the total downhill capacity which is approximately 3,900 skiers at one time. In practice, this results in no lift lines but congested ski runs. This shows that adding new lifts to the existing ski area will make minimum difference to the overall guest experience and more terrain is required.

4.3 General Ropeway Network Design Considerations

The objective of the ropeway network design is to provide access to the maximum extent possible of ski terrain, while having the minimum number of ropeways possible to minimise cost and operational requirements. Design considerations include:

- Uphill capacity needs to be balanced with available downhill capacity, through choice of lift alignment, lift uphill capacity, and ski trails;
- Ropeways with a high vertical rise are most favourable due to high vertical drop (to fulfil skier vertical metres demand), and length of the ski experience;
- Function within the overall network, for avoidance of bottlenecks within the network and optimisation of guest flows;

- Repeatable ski runs, that can be skied repeatedly in a loop using one ropeway, are more attractive than runs which require consecutive lift rides to access and repeat;
- An easy way down, to avoid guests getting stuck in terrain that is too challenging for them it is beneficial to have one easy way down each ropeway. If this is not possible, warning notices are required at access points;
- Provide access to an appropriate balance of terrain for different skier levels. An optimum balance for Remarkables is 60% Green and Blue (novice/beginner/early intermediate); and
- Gondola versus chairlift – gondolas are the preference for beginners and non-skiing guests, as they are more accessible, do not require any skill to load or unload the lift safely, and provide protection against the weather. However, they also require more space with increased stations and storage requirements.

5 Site Selection - Doolans Access Ropeway and Station Locations

5.1 Functional Need for Selected Gondola Alignment

The proposed gondola station locations and overall ropeway alignment are fundamental to delivering an efficient and attractive skier experience. The gondola alignment provides the connectivity, accessibility and ease of movement required for the ski area to function as an attractive option for skiers and support the overall commercial viability of The Remarkables.

There are no other gondola alignment options available that would support the same level of connectivity, skier movement and vertical terrain metres to realise the overall economic benefit of The Project, that are as resilient to climate change as the proposed Project.

From the chosen gondola alignment, the design of ski runs, road access and services are all interdependent with the gondola station locations.

5.2 Gondola Specification

Gondola Carrying Capacity: the total uplift capacity of the proposed Doolans gondola is set at 2,400p/hr using 10 person cabins.

This specification best balances desired uplift against functional constraints and cost, as the next manufacturer sizing step above this is oversized at 3000p/hr, and adds additional size and cost to stations, drive equipment and towers.

5.3 Alternative Specification – Tunnel instead of Gondola?

A tunnel for skiers to enter the Doolans from the Rastus Burn into the Doolans from near the top of Curvey was the initial proposal in the masterplan, instead of the final gondola concept proposed within this substantive application. The tunnel option was taken forward and a geotechnical specialisted engaged. A site investigation comprising geotechnical drilling both in the Doolans and in the Rastus Burn was undertaken and a concept geotechnical design and risk assessment prepared.

The tunnel was worth serious consideration as it avoids the requirements for an access chairlift or gondola from the Rastus Burn, with all skiers entering the Doolans through the tunnel, which they were proposed to access using the existing Curvey Basin chairlift. A tunnel option would have reduced landscape effects at the ridgeline, be more resilient in high winds, and possibly have lower environmental effects than the proposed gondola.

However, the following the site drilling campaign, the geotechnical assessment indicated that the success of this option had a very high degree of uncertainty due to the complicated ground conditions, with significant depths of unstable talus material. The tunnel was found to carry an unacceptable level of technical and commercial risk to pursue further, and alternative options were then proposed.

5.4 Alternative Specification – Chairlift(s) instead of Gondola?

For beginners as well as all non-skiing activities gondolas are preferred by guests. They are considered more accessible and family friendly since children can safely enter and get off on

their own without assistance, and prams and wheelchairs can be transported easily. Gondola cabins to more remote locations, like Doolans base, also provide the additional benefit of being able to safely transport freight to satellite locations without requiring additional over-snow transport and the associated operational risks.

Chairlifts would be more difficult to construct and have a greater earthworks footprint than a gondola. Based on international design standards a chairlift ropeway line is suspended at a lower elevation than a gondola ropeway line. This means that the chairlift line profile more closely mimics the natural topography, and that subsequently a greater number of towers are required to maintain adequate clearance heights to ground as the topography changes. This is of importance given the need to rise up the steep incline to Helicopter Ridge. Two chairlifts would also occupy a larger earthworks footprint at the midstation than the proposed gondola, see figure below.

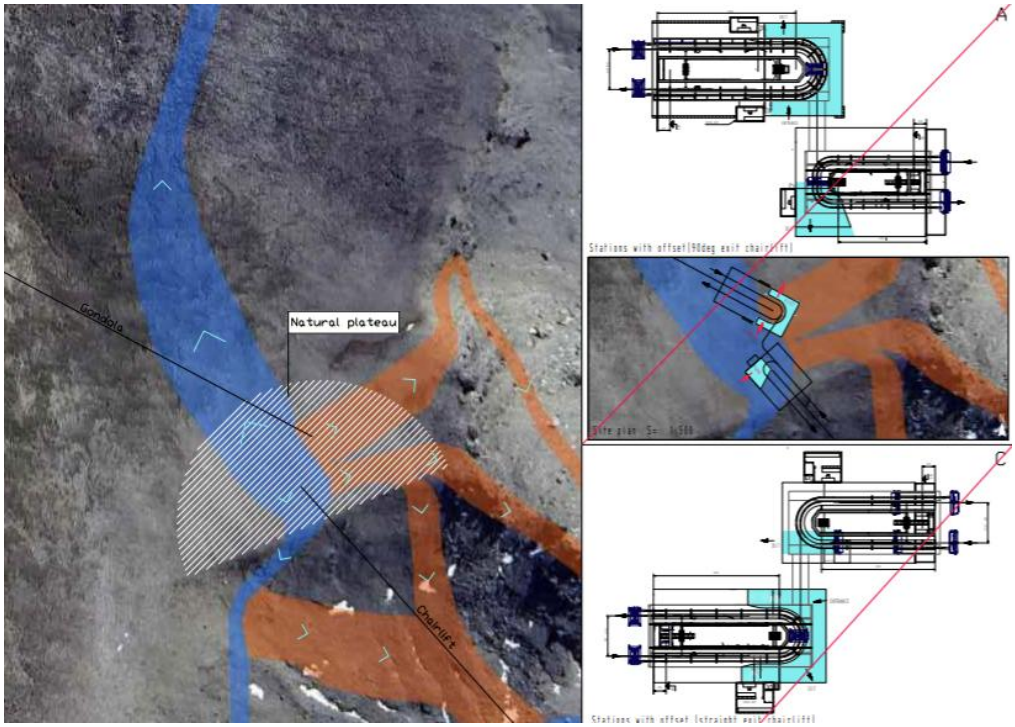


Figure 5.1 – Proposed Concept for two chairlifts at the Midstation – Stations occupy a larger footprint, therefore greater landscape and earthworks impact than gondola proposal.

One continuous chairlift with a midstation would also not be feasible from an operational perspective, due to regular misloads from skiers falling as they load/unload at the four different locations, resulting in operational slows or stops which would affect skiers on the entire line. In contrast, a gondola with step-free access should generally experience minimal stops.

For these reasons, a continuous gondola with a midstation has been selected over two separate chairlifts.

5.5 Alternative Specification – Two Gondolas?

One continuous gondola with a midstation was proposed as it minimises the building requirements on Helicopter Ridge, and the associated earthworks footprint, in comparison to building two separate stations on the ridgeline. One continuous gondola line has lower landscape and ecological effects. There are technical limitations in the maximum deviation of the gondola alignment either side of the midstation, which resulted in minor shifts of the midstation location as the design developed. There are also some operational considerations around wind resilience and operability that arise from only having one line that will be important to consider during detailed design.

5.6 Site Selection - Rastus Burn Base Gondola Station

Functional requirements for any gondola base station are to integrate into the existing trail network, not cross over existing ropeways, not adversely impact the existing ski network, have road access for construction, minimise construction earthworks over the station footprint, and be outside of avalanche risk zones.

Environmental constraints were also considered during initial masterplanning. Whilst there was a potentially flat area with existing road and ski access available, building a gondola station closer to the terrain park and swan lake (and associated downstream wetlands) was discounted.

Two feasible sites were identified for the gondola base station in the Rastus Burn. They were the old Sugar Bowl drive station (see Figures below), and a station above the existing parking drop zone, adjacent to the existing base building.

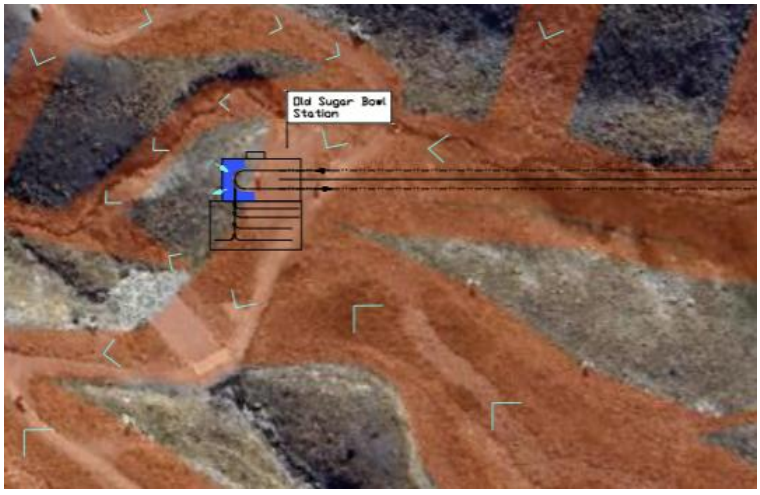


Figure 5.2 – Proposed Option for a Gondola Base Station, at old Sugar Bowl Chair bottom station

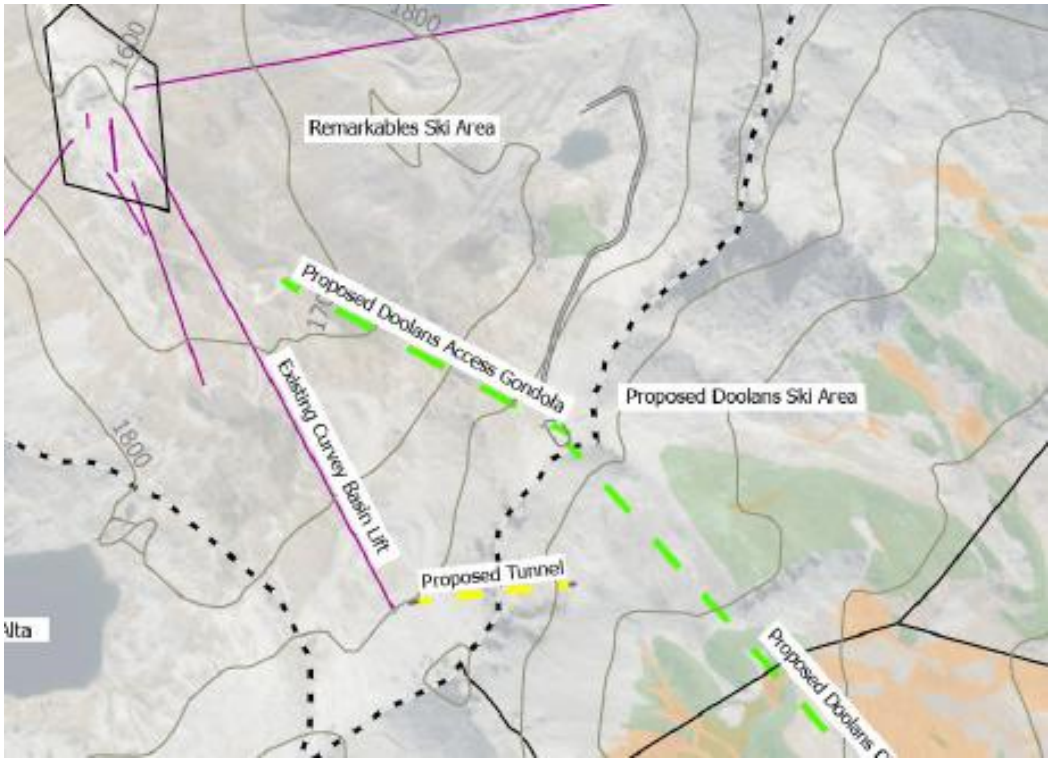


Figure 5.3 – Proposed Option for a Gondola Base Station, at old Sugar drive

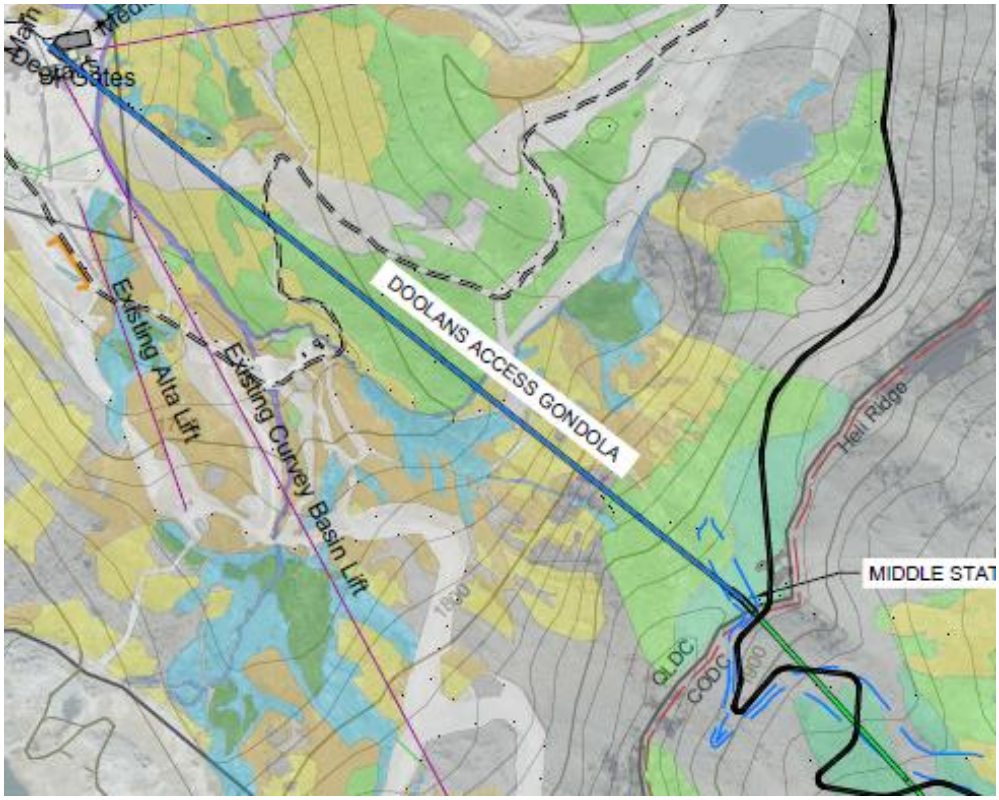


Figure 5.4 – Selected Alignment & Gondola Base Station Location

Ultimately, the location adjacent to the existing building was chosen as it: provides the best accessibility for all visitors, skiers and non-skiers to be able to use the lift and visit the Doolans; it provides immediate skier access from the Base into the Doolans, without having

to ride an intermediate lift first; it does not congest any of the existing chairlifts with 'Doolans access' skier traffic; and it minimises environmental effects as the construction footprint is within an already disturbed area.

5.7 Site Selection – Gondola Cabin Storage

Offline storage for the gondola cabins is required to satisfy structural wind loading, operational resilience and icing risk management requirements. Wind assessments undertaken to the applicable 1/500-year return period event demonstrate that carriers cannot remain on line under ultimate limit state wind conditions without materially increasing structural demand on towers, foundations and rope systems. The system capacity (planned for approximately 2,400 pph) requires storage for approximately 75 carriers.

Cabin storage adjacent to the Rastus Burn station was explored in some detail, as it is an operational recommendation from suppliers to have this storage closer to maintenance facilities and the main base area. However due to restrictions from existing topography, the Rastus Burn creek location, and existing infrastructure, no suitable solution could be found that was constructable and not cost prohibitive. It would require fully enclosed structures of a scale that cannot be accommodated within the constrained base area without disrupting established circulation, transport and lift interfaces. The spatial envelope necessary to achieve this cannot be integrated within the existing Rastus Burn footprint. Relocation of the cabin building and off-line carrier storage to Doolans Basin is therefore functionally necessary rather than discretionary.

Therefore, gondola storage has been proposed adjacent to the Doolans base station.

5.8 Site Selection - Doolans Base Station

The Doolans base station location site selection process was integral to the selection of the overall gondola alignment, and included:

- Locating the Doolans base building on stable gentle terrain, reducing cut volumes and the need for retaining structures.
- Avoiding impacts on wetlands, which also included considering the required 'lead-out' tower locations and alignment from any base station location and being able to locate these to avoid wetland effects.
- Avoiding the need for extensive retaining structures on the edge of the steep slope down to the creek.

Alternative areas within the basin would require materially greater earthworks and increase slope stability exposure. They would also reduce the skier vertical metres and amount of lift-accessed terrain that the expansion currently delivers.

The selected location also enables integration of the off-line carrier parking and cabin building functions within a stable platform area without encroaching into areas identified as being subject to rockfall, debris flow or slope instability constraints.

Consistent with the approach applied to access routes and gondola tower positioning, the Doolans base station site selection followed an effects-led framework.

It avoided where practicable: areas of identified slope instability; rockfall and debris flow hazard zones; and sensitive ecological areas within the basin.

It minimised where avoidance is not practicable: by limiting platform width to that required for operational safety; consolidating built form into a single envelope; integrated external seating within the defined platform; and aligned utilities within coordinated corridors.

The selected Doolans base platform:

- Avoids wetlands and associated effects on their hydrology;
- Occupies comparatively stable terrain;
- Reduces required cut volumes relative to alternative locations;
- Minimises retaining structures; and
- Integrates efficiently with stormwater and wastewater infrastructure.
- Maximises skiable terrain within the Doolans basin

5.9 Alternatives for the Doolans Base Station

Alternative elevations/locations for the Doolans Base Station, were considered, however, with the midstation point fixed on Helicopter Ridge:

- Lower: Terrain topography limits dropping the base station any lower than the natural plateau at approximately 1590-1600m asl. Going lower would create technical challenges with steep take-off angles for the ropeway, difficult tower construction, and more ecological damage from more substantial construction access roads required to enable heavy crane access. It also limits safe and easy access for skiers gathering to load the lift. Snow conditions at lower elevations are also becoming unreliable.
- Higher: Any locations on the alignment further upslope of the chosen base station location prior to the natural bench, would not be able to avoid earthworks for the station foundation footprint adversely impacting the extensive wetland zone.
- East or West: Locations further west or east of the chosen location enter wetland zones and/or increase the alignment length that passes over the wetland zone up to the bench, which then has the impact of the next tower also being required to be constructed in a wetland.
- Further West: A location significantly further west would result in skier traffic, access roads etc needing to be created on skier's right (western side) of the Doolans, closer to Tarn 1 and Tarn 2 and the associated waterway, or more extensive earthworks to adjust the grade on the existing trail, as the current trail would not have the fall grade to enable skiers/snowboards to get to a location further to the west. Both of these were considered to result in a higher environmental impact.Or, if the current trail access was maintained skier access would be reduced because of the increased

elevation limiting return traffic from the eastern direction. They would also not provide a location suitable for learners terrain (which contributes markedly to the project commercial benefits) that would be directly accessible from the gondola Doolans base station without extensive earthworks.

- Further East: A location significantly further east would result in skier traffic not being able to ski the full skier's right (western side) of the Doolans, closer to Tarn 1 and Tarn 2 and have the fall grade to enable a return to the lift station. Both of these were considered to have a higher environmental impact. They would also not provide a location suitable for learners terrain (which contributes markedly to the project commercial benefits) that would be directly accessible from the gondola Doolans base station without extensive earthworks.

5.10 Integration of Doolans Day Lodge and Base Station

The Day Lodge function has now been incorporated within the Gondola Cabin Building rather than delivered as a standalone structure as initially proposed (see Figure below). This integration:

- Avoids duplication of structure and plant;
- Reduces total building footprint;
- Minimises additional earthworks and retaining;
- Concentrates visitor activity within a single platform; and
- Reduces cumulative environmental and visual effects.

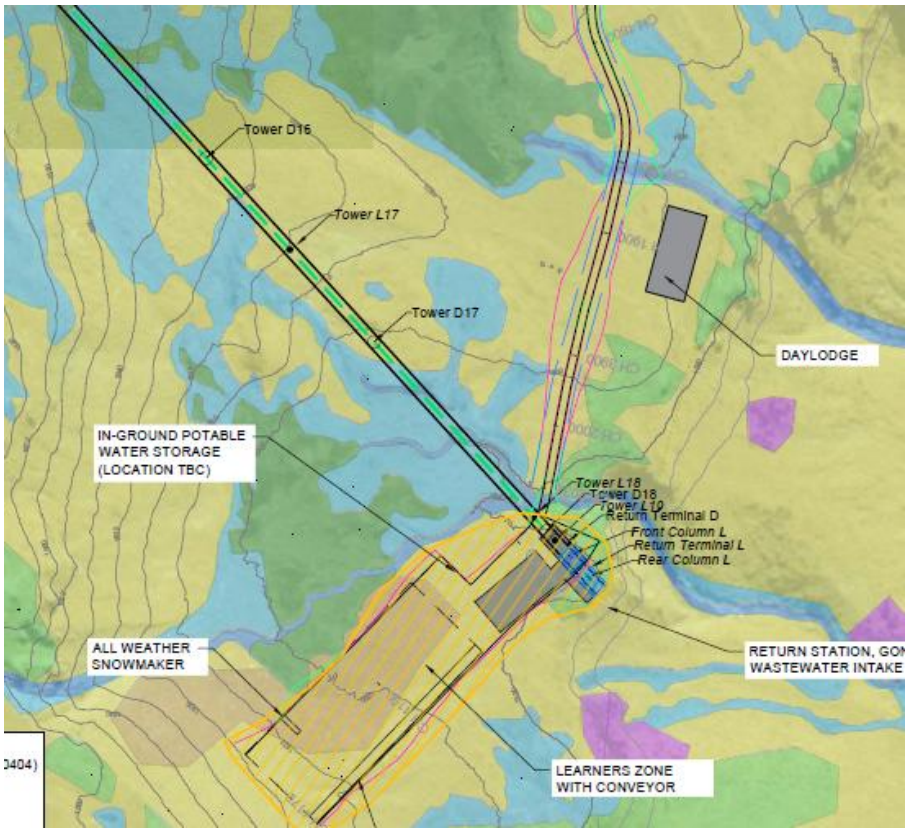


Figure 5.5 – Previous Option for separate Doolans Base Station and Day Lodge buildings, as shown in the Referral Application

The proposed Doolans Base Building now supports:

- Gondola upper terminal and full off-line carrier parking;
- Skier circulation within Doolans Basin;
- Day Lodge (Food & Beverage) operations;
- Essential plant and maintenance; and
- Integrated utilities (water, wastewater, power, communications and stormwater).

The building therefore performs both a transport infrastructure function and a Day Lodge function within a single integrated facility, with activation staged over time. Consolidation of cabin parking and Day Lodge functions materially reduces trenching, duplication of services and cumulative environmental effects.

5.11 Site Selection - Doolans Midstation Location

The Mid Station location is governed by alignment geometry, operational integration, and slope stability. Between Rastus Burn and Doolans Basin, the adopted position:

- Enables the lift to pass through and above existing ski operations without conflict;
- Maintains compliant span geometry and rope clearance;
- Enables skier circulation at load and unload; and
- Avoids areas of greater instability.

A geotechnical desktop review and site walkover identified slope instability either side of the adopted location, including steeper scree slopes and areas of historic movement. The selected position lies within comparatively more stable ground along the ridge.

Any other sites along the ridge would require much more extensive geotechnical engineering and construction works to attempt to stabilise the ground, and therefore the environmental impact would also be far greater.

The Mid Station is located within an exposed alpine environment and is subject to high wind speeds. At concept stage, the Mid Station platform incorporates terrain-based mitigation measures, including:

- Lowering the station into a shallow trench such that roof level sits closer to surrounding ground level; and

- Placement of excavated material as engineered bunding on the prevailing north-western exposure.

This approach both moderates local wind acceleration effects and enables beneficial reuse of excavated material generated by the wider project works. Detailed numerical wind modelling can be undertaken to refine localised wind flow behaviour and inform final structural and operational design parameters.

5.12 Tower Locations

Tower locations were refined through overlay of engineering, hazard, ecological and landscape constraints. Tower siting sought to:

- Avoid identified slope instability and locate foundations within comparatively stable ground;
- Avoid or minimise environment effects on cushion bogs and seepage wetlands; permanent and intermittent watercourses; snowbanks and cushionfield;
- Avoid visually prominent ridgelines where feasible
- Minimise the number of towers while maintaining technically compliant span lengths and clearance envelopes;
- Minimise disturbance to defined foundation platforms;
- Minimise vegetation clearance to the minimum required footprint;
- Undertake minor positional refinements ("micro-siting") to respond to site-specific ecological or geotechnical constraints
- Respond to wind exposure and topographic effects.

The environmental constraints mapping was used by ropeway suppliers to site towers outside of wetland zones and limit disturbance of other vegetation communities as far as they initially saw practicable, when undertaking the initial line engineering work to identify tower spacings, heights, load configurations and locations based on engineering design standards.

This was then further refined by 'micro-siting' as some initial locations were challenged and adjusted to further avoid or reduce effects. For example, changes were to the configuration of the lead-out towers at the Doolans base station compared to what was initially proposed by suppliers, so that all towers avoided the wetland zones.

Provision of construction access to towers was also a key consideration during the design process, especially on the lower half of the alignment within the Doolans, Proposed tower locations after preliminary line engineering were then further refined so that temporary construction access roads could avoid wetlands.

6 Site Selection - Ski Trail and Access Road Design

6.1 General Ski Run Design Considerations

The optimum ski run width is dependent on topographic conditions and the ski run difficulty. Specific geological or ecological conditions potentially limit the width of ski runs. Preferably from an operational and user perspective, the width of ski runs is 50 metres or more. Ski paths width should be at the very minimum 6m to allow a safe skiing pathway and to enable a groomer to maintain the trail. Generally, a small number of wide ski runs is to be preferred over a higher number of narrow ones for a better skier experience.

Ski runs are to be designed in fall-line as much as possible. Ski runs that are designed to be continuously in fall-line support the natural flow of skiers of all ability levels and provide the best recreational skiing experience with the least amount of environmental impact during construction due to minimum required earthworks.

Ski run design also depends on environmental constraints, natural hazards, prevailing weather conditions, and constructability, such as impact of ground conditions and feasible construction access. The ski runs proposed or the Doolans have been designed in accordance with this best practice as far as practicable.

The figure below is an Inclination map from the ILF masterplan. Areas that are white are too steep to form repeatable ski runs in the fall line, with green, blue and red suitable for skiing.

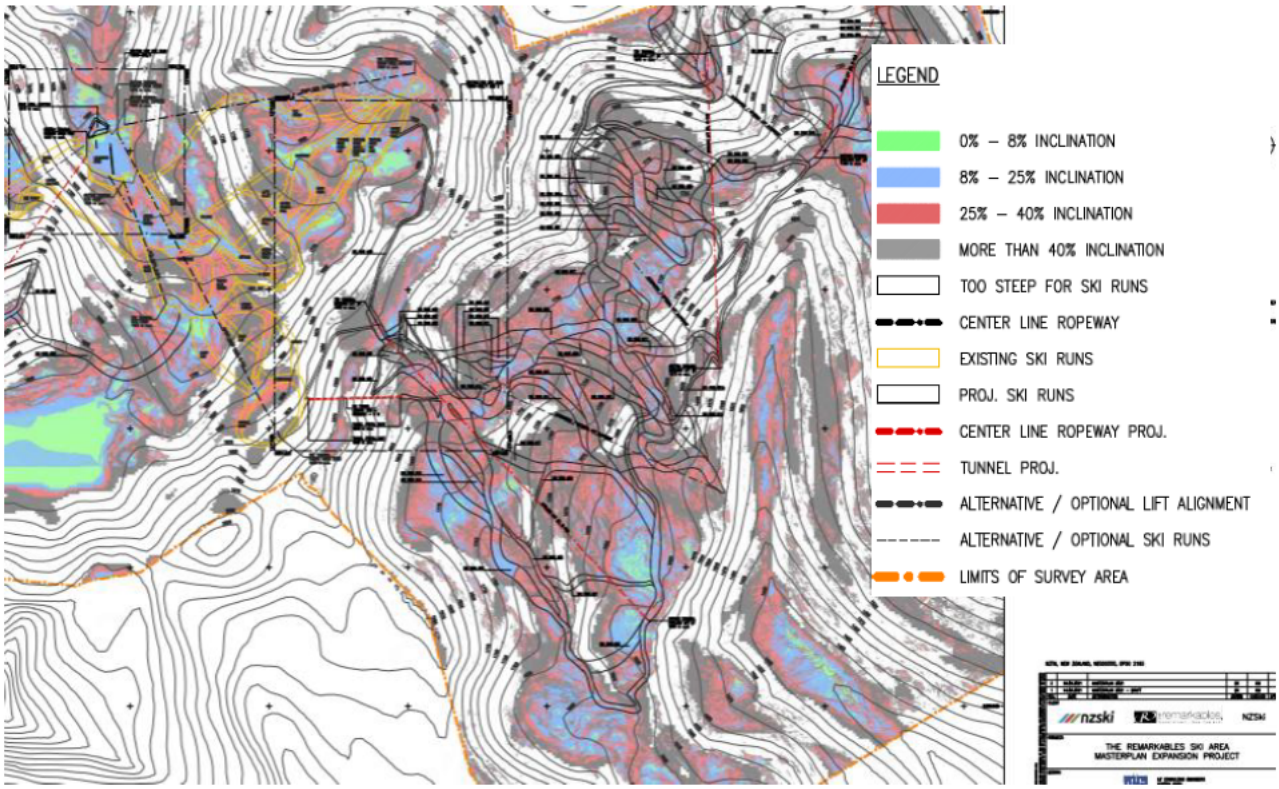


Figure 6.1 First Draft Masterplan

6.2 General Access Road Design Considerations

Access roads within the Doolans Basin Expansion are enabling infrastructure required to support:

- Construction of gondola stations, towers, utilities, reservoirs, snow making facilities, and associated earthworks;
- Long-term maintenance and inspection access;
- Emergency response and operational resilience; and
- Winter ski operations, including groomer and patrol access where relevant.

In an alpine environment characterised by steep terrain, variable ground conditions, and ecologically sensitive areas, access cannot be treated as temporary or secondary infrastructure. It must be:

- Reliable across seasons;
- Constructible within constrained terrain; and
- Integrated with utilities and operational needs.

NZSki made the decision to integrate the main access road with the ski trail design wherever practicable, to minimise environmental effects of the Project.

6.3 Design of Ski Trails and Access Roads

This process included:

- Site investigations, desktop terrain and constraint mapping;
- Ski area design masterplanning
- Road engineering design
- Ecology workshops and optioneering sessions;
- Initial visual impact assessment advice;
- Earthworks workshops focused on constructability;
- Geotechnical desktop review and site walkovers;
- Further engineering design
- Overlay comparisons of alternative alignments; and
- Iterative refinement to reduce environmental and engineering risk.

The intent of this process was to ensure that access routes were technically feasible, responsive to ecological, visual and landscape constraints, and adaptable as site understanding improved. Access routes presented in the Fast-track design drawings represent the outcome of this iterative refinement. No fundamental engineering or ecological constraint has been identified that would preclude delivery of the proposed access network.

Avoid where practicable

During alignment selection, priority has been given to avoiding disturbance to:

- Cushion bogs, seepage wetlands, and riparian wetlands;
- Permanent or intermittent watercourses;
- High-value snowbank habitats of limited extent;
- High-value dracophyllum areas;
- Known locations of rare or threatened species; and
- Terrain where disturbance would present elevated instability or debris flow risk.

These areas are treated as high-constraint areas during alignment refinement.

Minimise where avoidance is not practicable

Where avoidance is not practicable due to terrain, gradient, safety, or operational requirements, alignments have been refined to reduce interaction with:

- Intact cushionfield and high alpine cushionfield communities;
- Undisturbed tussock grassland; and
- Visually prominent landforms and sensitive ridgelines.

Where disturbance cannot be avoided, design measures focus on reducing the extent and intensity of effects. These measures include:

- Using downslope build-out with retaining solutions in preference to deep cut slopes where appropriate;
- Keeping formation and earthworks widths as narrow as practicable while maintaining safe and functional access; and
- Locating roads and utility infrastructure within a single shared corridor to avoid creating multiple parallel disturbance areas.

Manage residual effects through design and methodology

In constrained locations, effects are addressed through:

- Locating wetland and waterway crossings at the narrowest feasible points;
- Maintaining natural flow paths and hydrological connectivity where practicable;
- Drainage, erosion and sediment control design; and
- Construction sequencing to reduce duration and extent of exposed ground.
- Temporary access routes, laydown areas, and surplus disturbed areas will be reinstated following construction, informed by ecological advice and detailed construction methodology.

6.4 Roading Design Parameters Applied at Concept Level

At concept stage, access roads have generally been designed to:

- Maintain gradients typically within approximately 15–20% max grades, recognising alpine constraints;

- Achieve formation widths generally in the order of 4–6 metres, subject to local conditions;
- Limit cut heights where practicable;
- Utilise downslope retaining in constrained locations where required; and
- Co-locate utilities within access corridors to reduce cumulative disturbance.

These parameters reflect a balanced response to constructability, operational requirements, and environmental constraints. Final geometry, earthworks quantities, and retaining solutions will be confirmed through detailed design.

6.5 Site Selection for Trails - Masterplan Environmental Constraints and Ongoing Refinement

The ski area designers were provided with the initial environmental constraints map that mapped vegetation types.

Whilst considering all the general ski trail design principles when preparing the masterplan of the interconnected ski lift and ski trail network, they were also briefed to prioritise avoiding wetlands and waterways wherever practicable, and then to minimise impact on cushionfields and then other vegetation. Where wetlands could not be avoided, they needed to be highlighted and explained with the masterplan report.

Subsequently, as part of the ongoing option selection and design refinement, NZSki have adjusted the main trail and access road and have further minimised impact on wetlands and cushionfields wherever practicable. This design refinement has also considered updated information from ongoing ecological assessments as further detail has been made available.

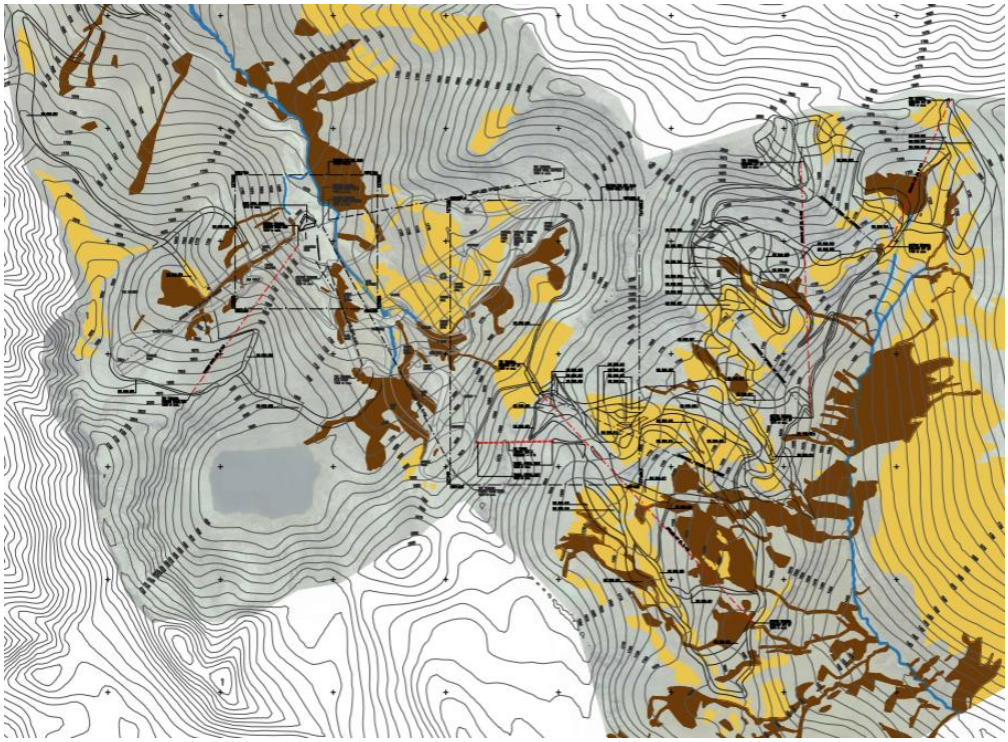
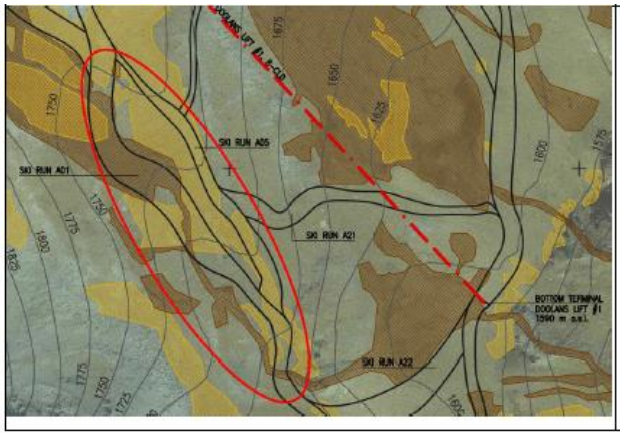


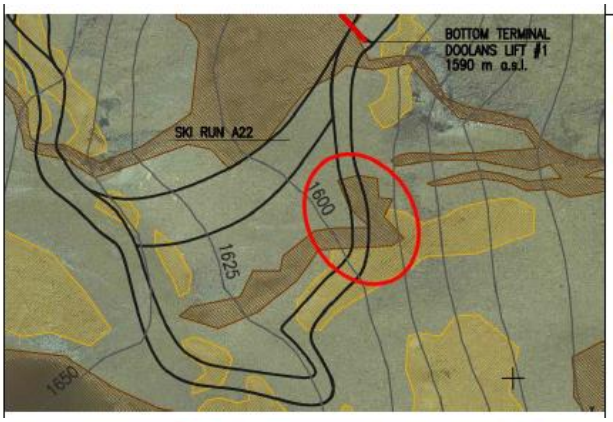
Figure 6.2– Masterplan First Draft, with Ecology Mapping of Wetlands (Brown), Cushionfields (Yellow) and Waterways (Blue).

The following are examples of what was provided with the ILF masterplan, as they worked with the provided ecological constraints to propose from a ski trail perspective, what could be avoided, and what was essential where further work to minimise effects would be required.

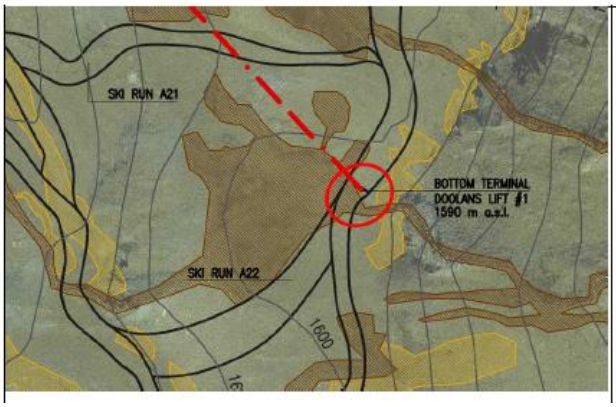


Vast extend of ecologically sensitive areas within the gully in the mid-section of ski run A01. This section will be challenging to be prepared for skiing using snow only. Earthworks would affect cushionfield areas as well as wetlands.

Ski run A05 does not appear to be feasible due to required earthworks within cushionfield areas. However, this ski run is not crucial to the functioning of the network.



In the lower section of ski run A01 a short traversing section is necessary, which would potentially require earthworks that would affect wetlands as well as cushionfields.



The bottom terminal of Doolans Lift #1 is surrounded by ecologically sensitive areas. It has to be proven in detail if the terminal can be fitted into that spot while meeting the required distances.

Moving the terminal further in northern direction is unfavorable since the skiers arriving from ski runs A01 and A22 would have to walk up to such a terminal location.

Figure 6.3 Examples of areas highlighted in Draft Masterplan(of proposed draft trails vs ecological constraints)

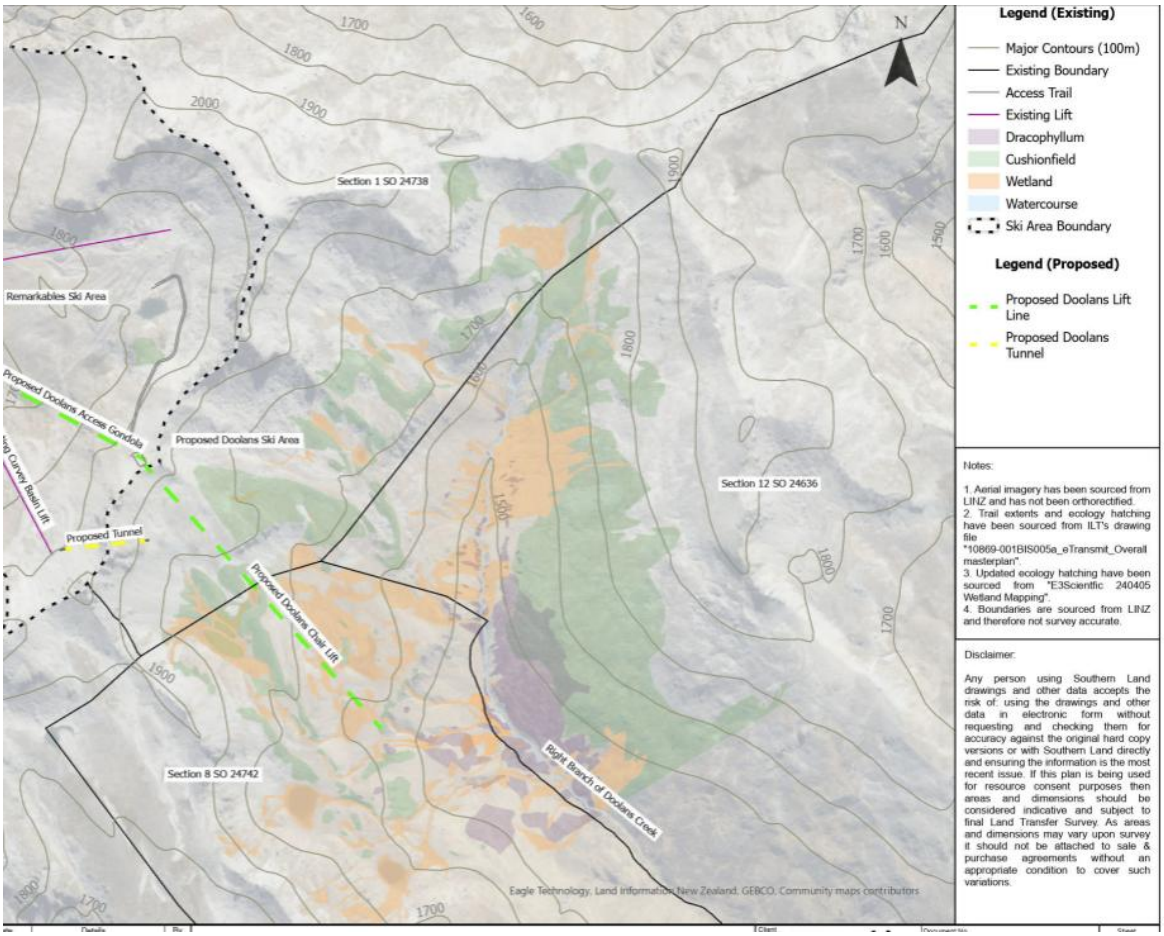


Figure 6.4 Ecological Constraints updated to show Dracophyllum, Cushionfield, Wetland and Watercourses as masterplan was further refined.

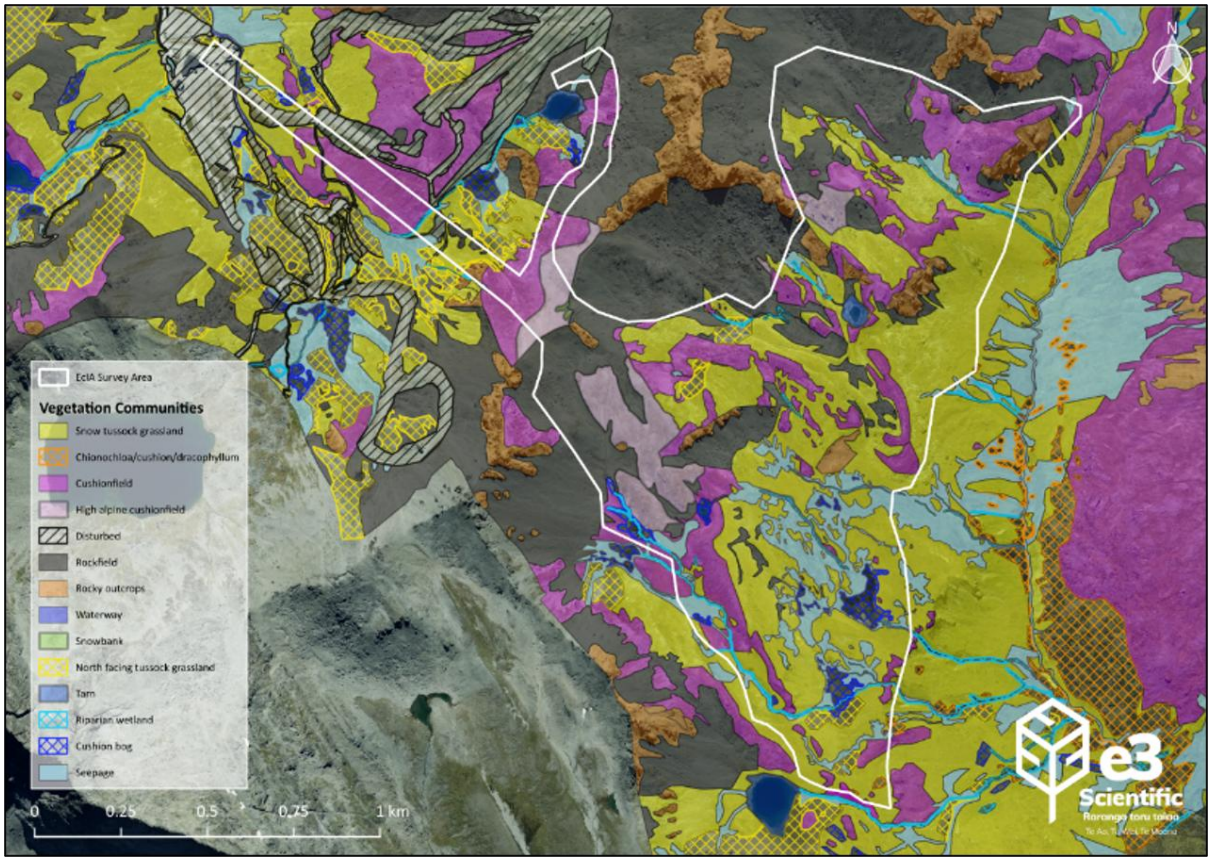


Figure 6.5 Further Refined Vegetation Communities used for the updated lift and ski trail earthworks design submitted with Substantive Application

6.6 Ski Trail & Access Road Site Selection Ecological Workshop

A workshop was held with the civil designers, e3s and NZSki reps in September 2025 to review and refine the ski trail layouts to further minimise effects. Some example action notes from this meeting are included below, to demonstrate the ongoing refinement of the design prior to lodgement of the application.

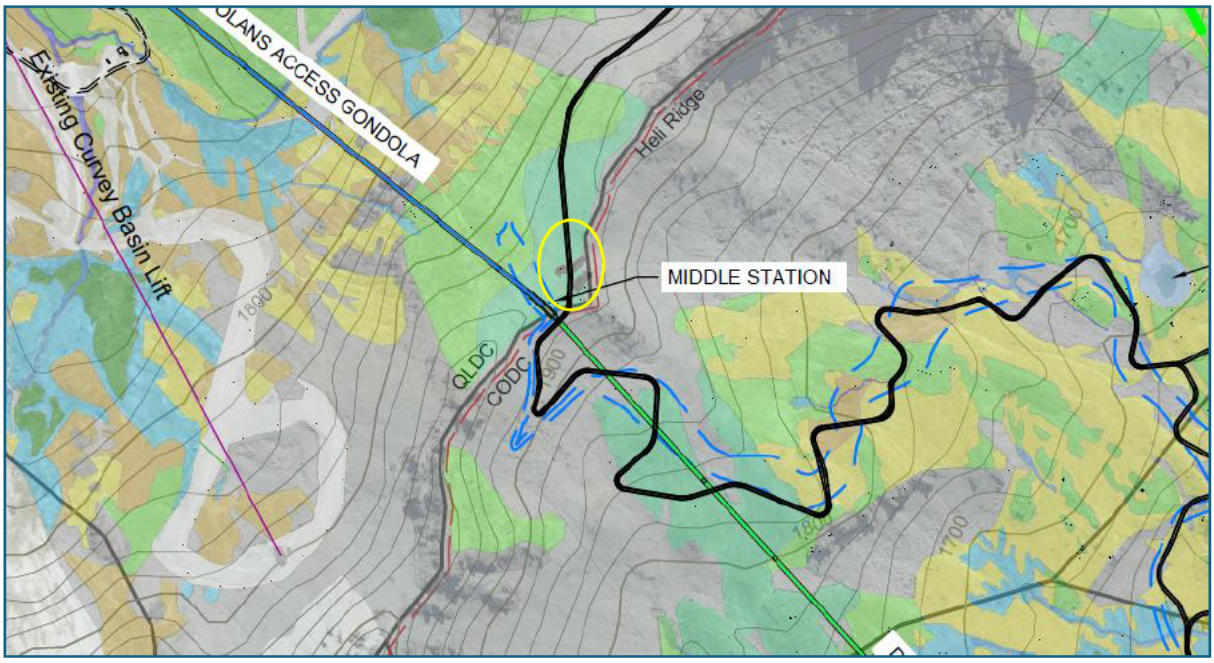


Figure 6.6 : Rev D Plans March 2025 - Shows Heli Ridge skier trail and access road / midstation earthworks going through grey snowbank area of ecological significance. The trail and access road have been repositioned to now avoid this area.

Area 3 – Chainage 1000 to 1100:

> [redacted]oted access road is running through two 'snowbank' habitats and would result in their partial/complete loss. Snowbanks have relatively low ecological value but there is a limited extent of snowbank habitat across the wider site increasing the value of the habitat. The partial or complete loss of snowbank habitat should be avoided.

> **Action:** [redacted]nvestigate realignment options for the access road to avoid the snowbanks and report back.

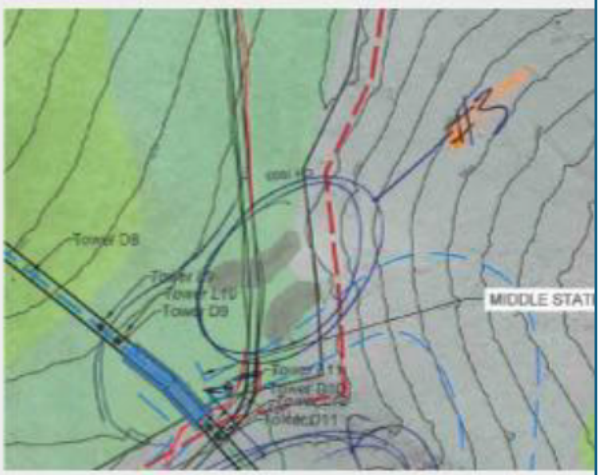


Figure 6.7 Action Note from Sept 2025 workshop identifying the 'snowbank' issue

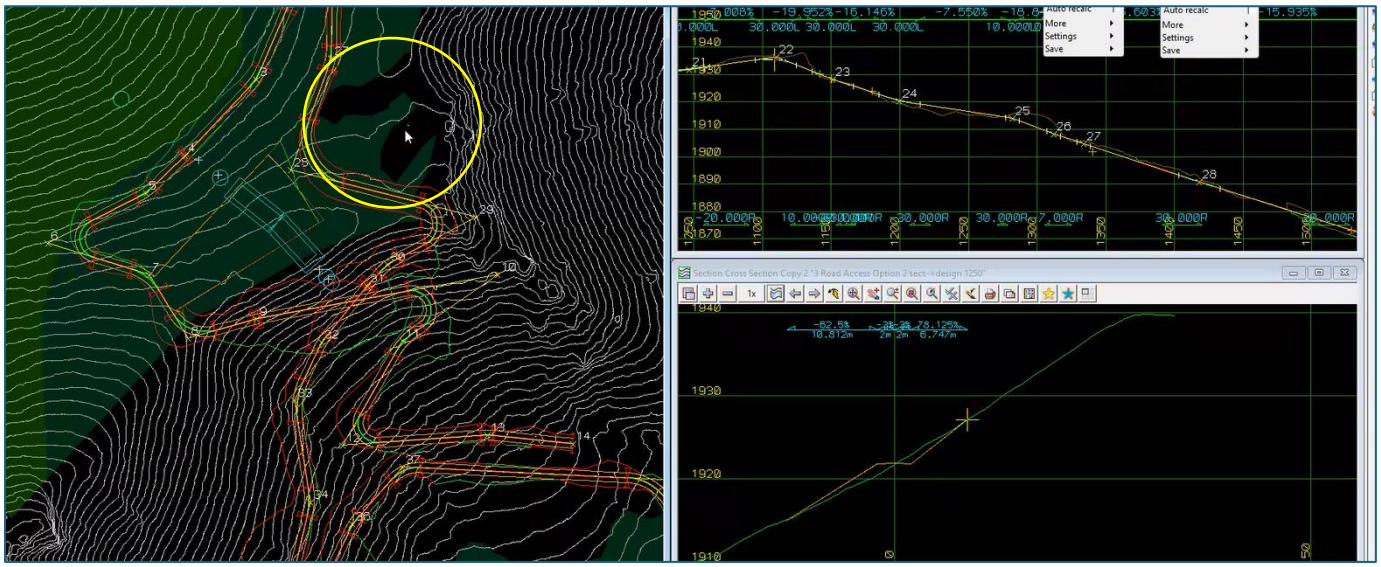


Figure 6.8: Example of Engineering in Progress to avoid Snowbanks (Black areas inside yellow circle)

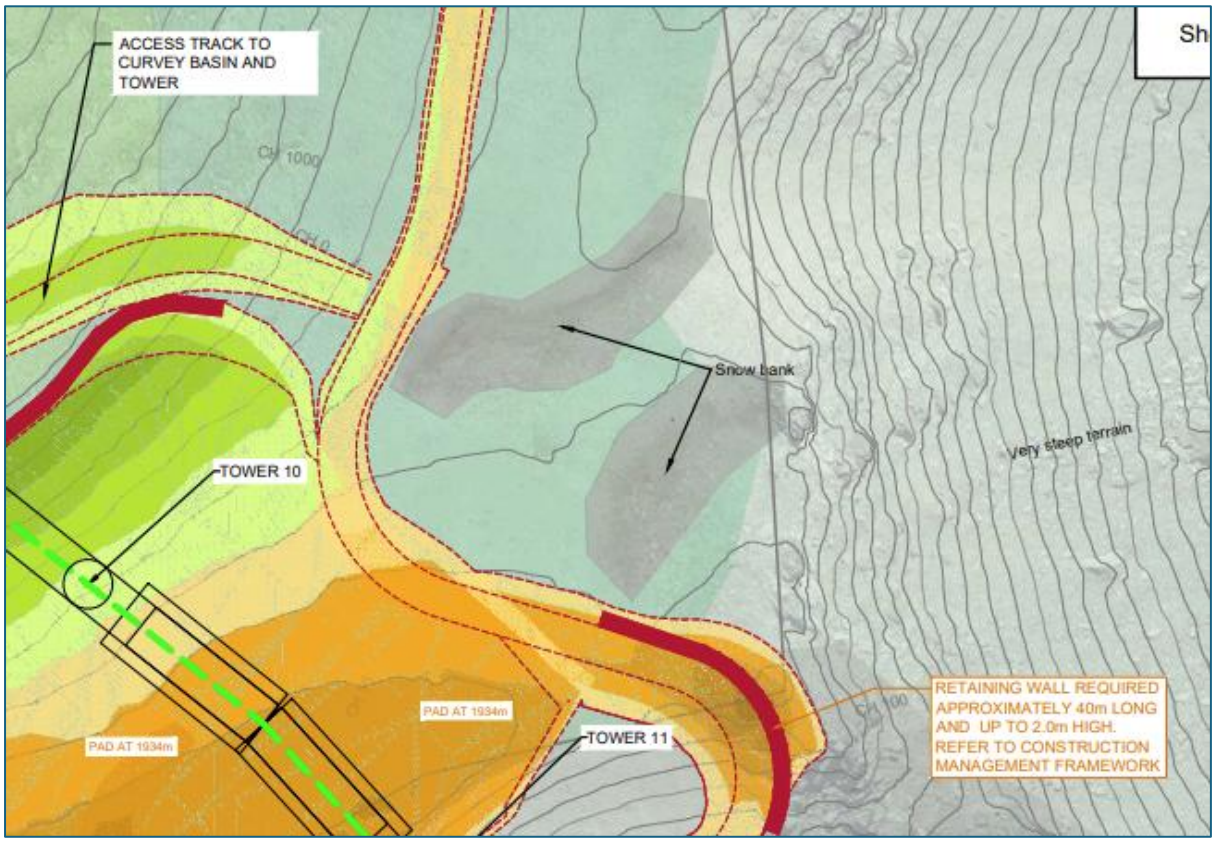


Figure 6.9 : Current Design submitted with Substantive Application 2026 avoiding identified snowbank.

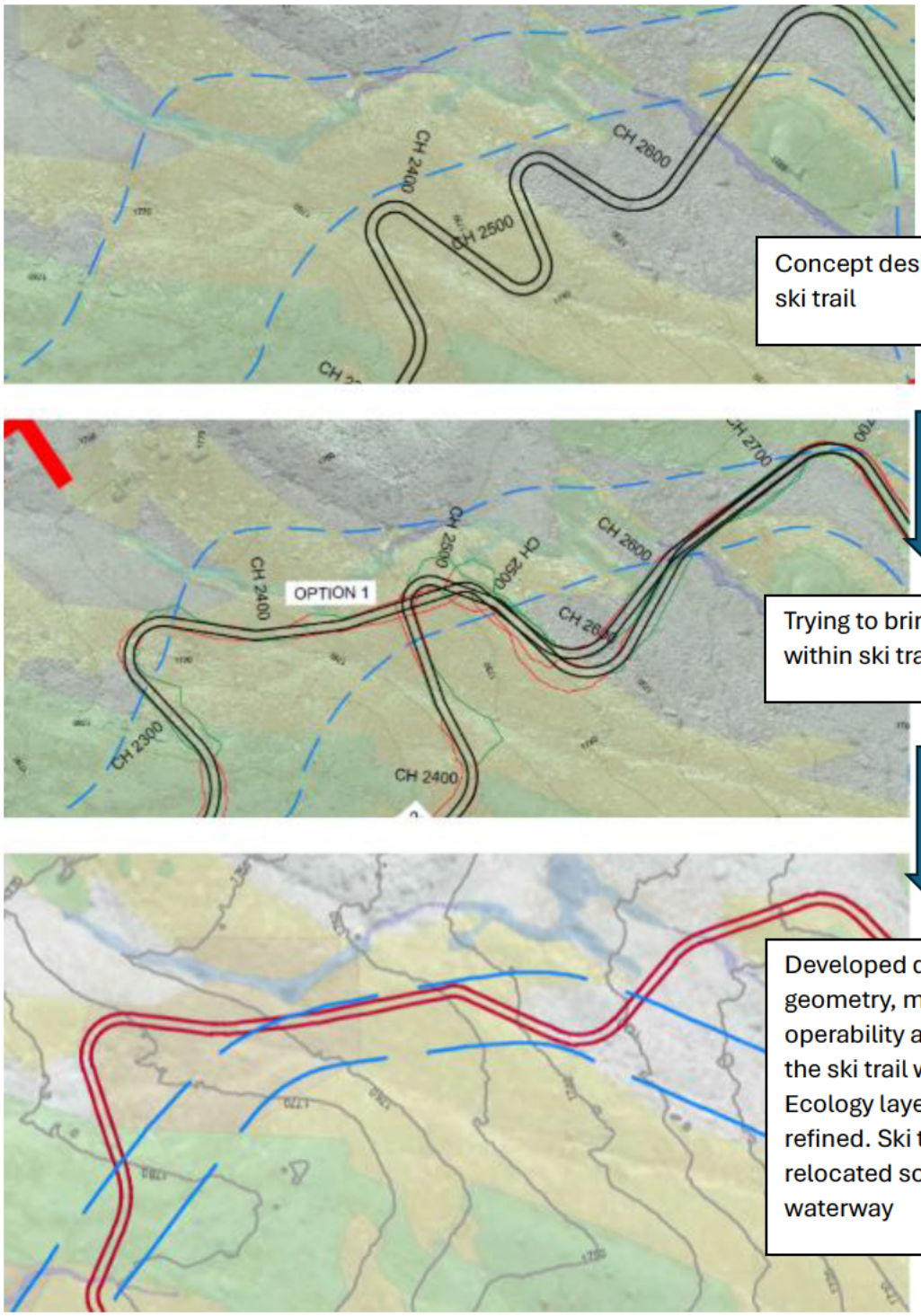


Figure 6.10 Example of Access Road and Ski Trail Refinement, from initial concept through to submitted design. Ski trail now minimises impact on waterway as it was shifted further southwest. Colours indicate ecology layers provided by e3s.

Discussion Notes: Ecology Workshop on Doolans Access Road, Infrastructure and Ski Run alignments

Area 1 - Chainage 0 to 400:

- Access road utilises a natural bench to skirt below the steep rockfield to the south.
- Marginal intrusion into cushionfield to the south is necessary to avoid rockfield and achieve accessible gradients.
- **Action:** [redacted] refine engineering road design to minimize intrusion into cushionfield/cut and fill. Final alignment to be confirmed on site.

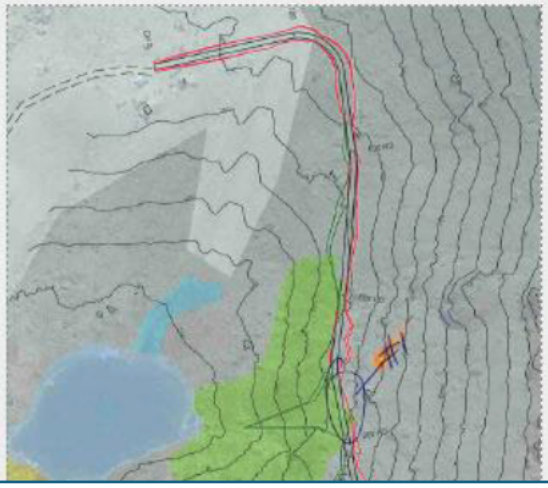


Figure 6.11 Action Item Example from Workshop

Areas 11 - 15 / 5 Water/Wetland Crossings - Chainage 3400 to 4100:

Areas 11 (13m crossing), 12 (20m crossing), 13 (4m crossing), 14 (14m crossing) & 15 (8m crossing – creek with riparian edges)

- Ski run has been narrowed as it reaches this point to avoid as much wetland as possible.
- Access road and ski run have been located to cross wetlands at narrowest points possible to minimize intrusion into wetlands. [redacted] confirmed this is ecologically optimal.
- Blair identified a challenge to construct ski run into bottom of gondola due to lack of elevation over the distance to the gondola. Preferable change would be for the ski run to maintain higher elevation from approx. chainage 4200 to provide enough elevation.
- Snowmaking zone necessary to ensure ski run to gondola is always achieved.
- This change may necessitate installation of snowmaking machines within wetland areas (TBC) however the existing lower alignment would likely require a greater number/extent of snowmaking machines and pipes to support shallower run into gondola. Therefore, the change could reduce overall disturbance.
- **Action:** [redacted] explore option to keep access road low (with earthworks) and construct ski run higher with snow only, avoiding additional earthworks in the wetland.

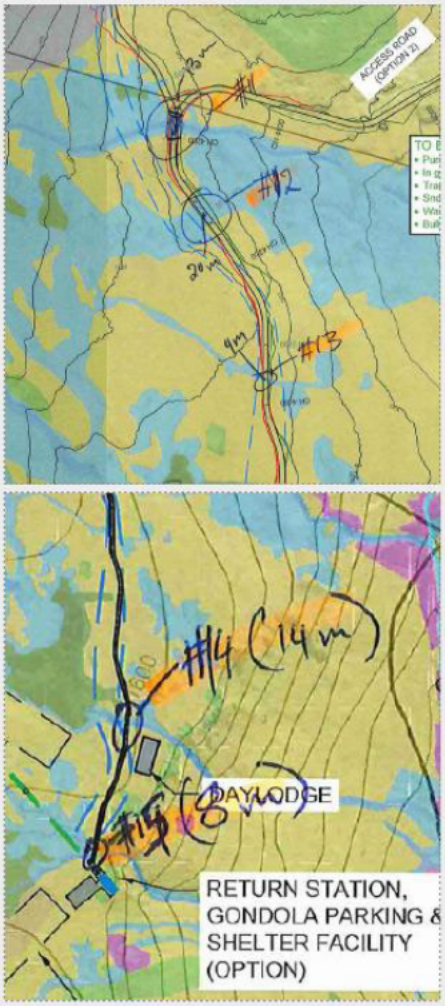


Figure 6.12 Action Item Example from Workshop

Area 8 / Third Waterway – Chainage 2500 to 3100:

- Access road and associated earthworks currently intruding into first part of watercourse.
- **Action:** [redacted]djust ski run alignment to avoid earthworks within the watercourse.
- Option identified to relocate ski run to drop directly down ridge from 2600 to 2900 rather than following road access to the east past reservoir, reducing extent of earthworks over cushionfield area.
- **Action:** [redacted]review alignment.
- [redacted]confirmed these changes would achieve the best possible alignment from an ecological perspective through that area.
- Access road goes over subsurface waterway. Construction to use rocks rather than dig into it.

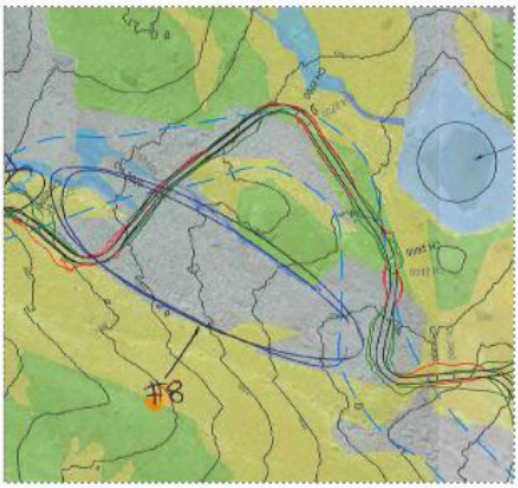


Figure 6.13 Action Item Example from Workshop

6.7 Minimising Effects: Only One Skier Trail Now Proposed

The initial ILF masterplan shows an extensive trail network. See Figure below, with new trails in blue and red.

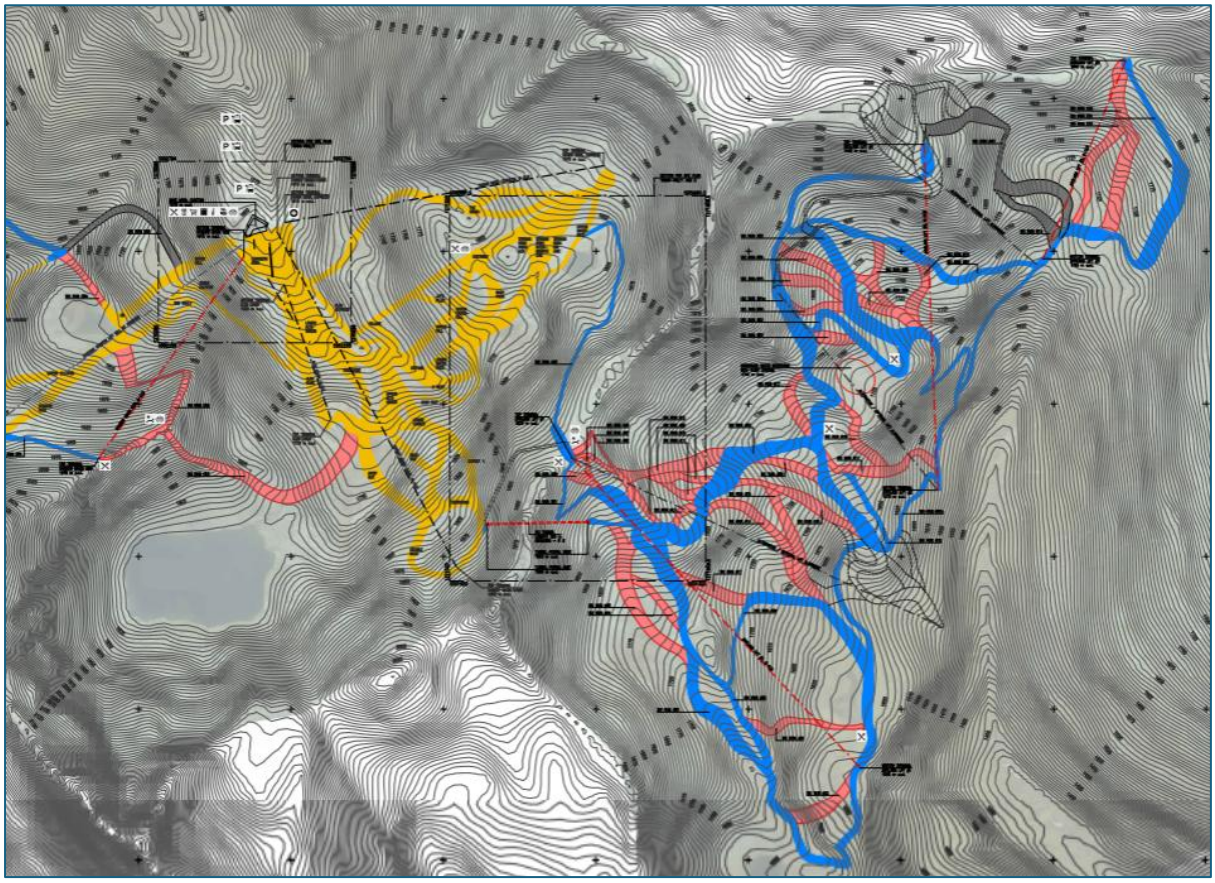


Figure 6.14 Initial Ski Area Masterplan, with extensive trail network and alternative lift alignments to provide lift access to three separate terrain pods within the Doolans.

However, to minimise the earthworks footprint and associated environmental effects**, NZSki have only proposed the minimum works: one single intermediate ski trail from the midstation to the base station, integrated with the access road wherever practicable.** This is a significant decision; as it will impact the skier experience compared to a fully constructed ski trail network with cleared vegetation and supporting snowmaking.

The skier trail stays above approximately. 1600m asl (in line with natural topography changes), and the proposed main trail is of a length and vertical that will enhance the skier experience to a value that is commensurate of the infrastructure investment required to access the Doolans Basin.

As snow allows, grooming machines will smooth the snow around the other parts of the Basin to provide additional skier runs, but no additional earthworked runs with cleared vegetation will be constructed. This means that for additional trails, where vegetation has not been cleared, a higher level of snowfall is required to extend the trail network than would be if extensive earthworks are undertaken.

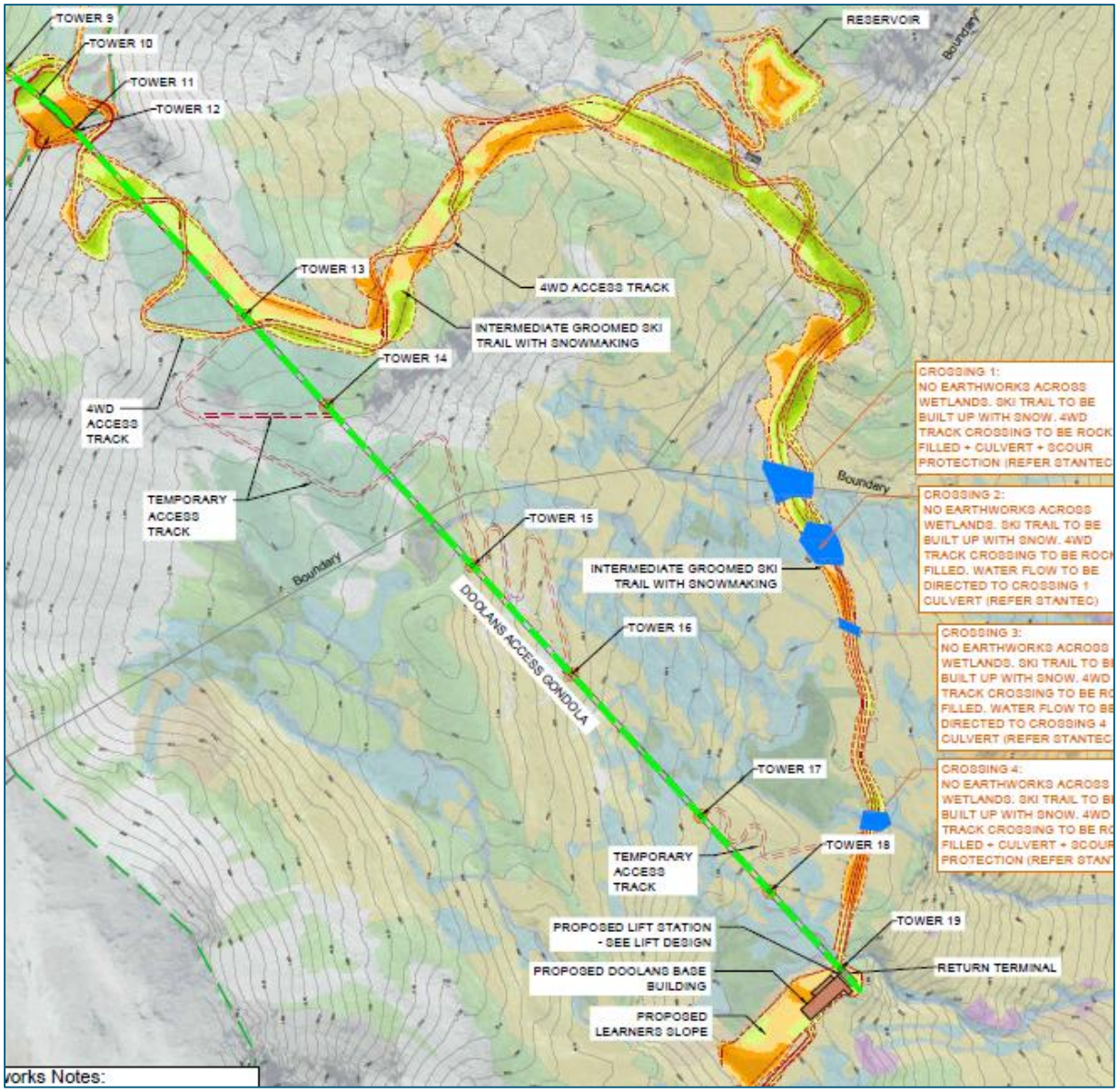


Figure 6.15 Current Trail Earthworks Design, Excerpt from Sheet E502 – Doolans Access, Roads, Trails & Utilities. Note only one co-located trail.

6.8 Adaptive Implementation Within the Assessed Envelope

The ski trail and access alignments presented at concept stage establish a robust baseline for the environmental effects assessment. As detailed design progresses, optimisation of geometry, earthworks extents, retaining solutions, and construction methodology will occur. This may include micro-siting — minor positional adjustments within the assessed corridor to respond to local ground conditions, avoid specific ecological features, or improve constructability and safety. Refinement is a normal component of detailed design. Where it results in changes to the scale or distribution of effects relative to the concept baseline, these will be addressed through the project's governance framework, including adjustment of mitigation where required. This ensures a controlled and transparent response to site-specific conditions while maintaining alignment with the environmental assessments.

6.9 Site Selection - Doolans Learners Area

The functional need for the learners area is to provide expanded beginner terrain for the ski area, in relatively flat terrain and that is accessible and adjacent to base amenities.

There are no other learners terrain options available within the existing ski area or the expanded Doolans Basin that would support the same level of connectivity, ease of access, and low volume of earthworks whilst also avoiding impact on wetlands.

One alternative option was explored and discussed in the ecology workshop, see below

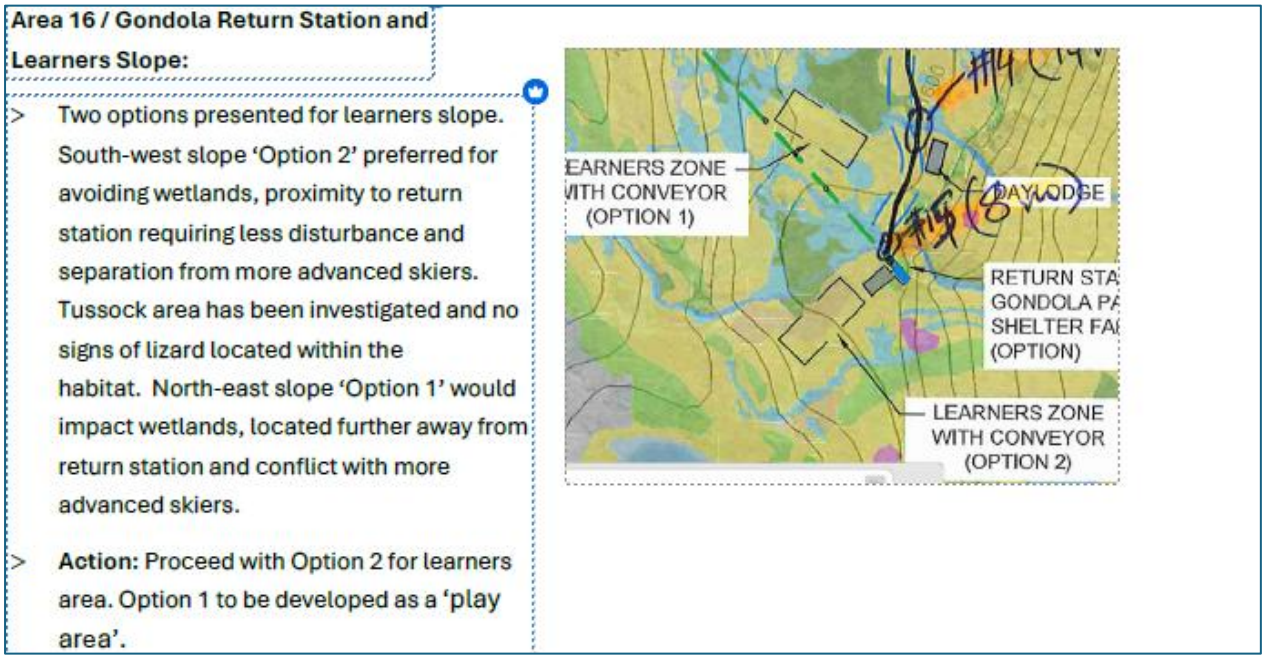


Figure 6.16 Excerpt from ecology workshop, considering two learners options

The learners site was selected because it:

- Can be immediately accessed from the Doolans gondola base station;
- Has a low angle terrain grade; and
- Avoids wetland effects, compared to other areas around the base area.

A surface lift (conveyor) is proposed as it is the safest and best solution for beginner skiers, as opposed to a chairlift or surface poma lift, that requires skill to load and unload and often results in skier incidents.

6.10 Site Selection - Skier and Trail Access from RastusBurn to Midstation (Helicopter Ridge)

The trail from Sugar Bowl to Helicopter Ridge follows similar site selection principles to the Doolans ski trail and access road design.

The proposed road is part of an interconnected network and joins the existing summer maintenance road at the top of the Sugar Bowl chairlift.

The functional need is to provide construction and maintenance access from Sugar Bowl to the midstation and into Doolans Basin for heavy construction vehicles (e.g. a crane to construct the Doolans gondola base station), as well as integration with skier circulation across the upper mountain.

Of particular importance, as this is the main construction access into the Doolans, was maintaining of a grade suitable for heavy vehicles, whilst balanced with ideally enabling skier access from the ridge down into Sugar bowl without prolonged flat sections where skiers would lose momentum.

Environmental constraints included cushionfields, wetlands, landscape and natural hazard considerations. All options considered aimed to avoid earthworks through the tarn and wetland zone adjacent to the existing terrain park.

Alternative options were assessed as part of a multi-criteria assessment. Three principal options were assessed against:

- Operational suitability;
- Constructability and technical complexity;
- Environmental effects;
- Affordability; and
- Programme flexibility.

Option 1 - ILF return trail, a lower elevation alignment was discounted due to its inability to meet full operational and construction access requirements.

Option 2 – Mid return trail, provided dual use 4WD access and ski return functionality. This option achieved the most balanced performance against operational, environmental, constructability and affordability criteria and was endorsed as the preferred alignment.

Option 3 – a higher elevation alignment, requiring large earthworks and material import (approx. 40,000m3). It was ruled out due to cost risks and construction complexity.

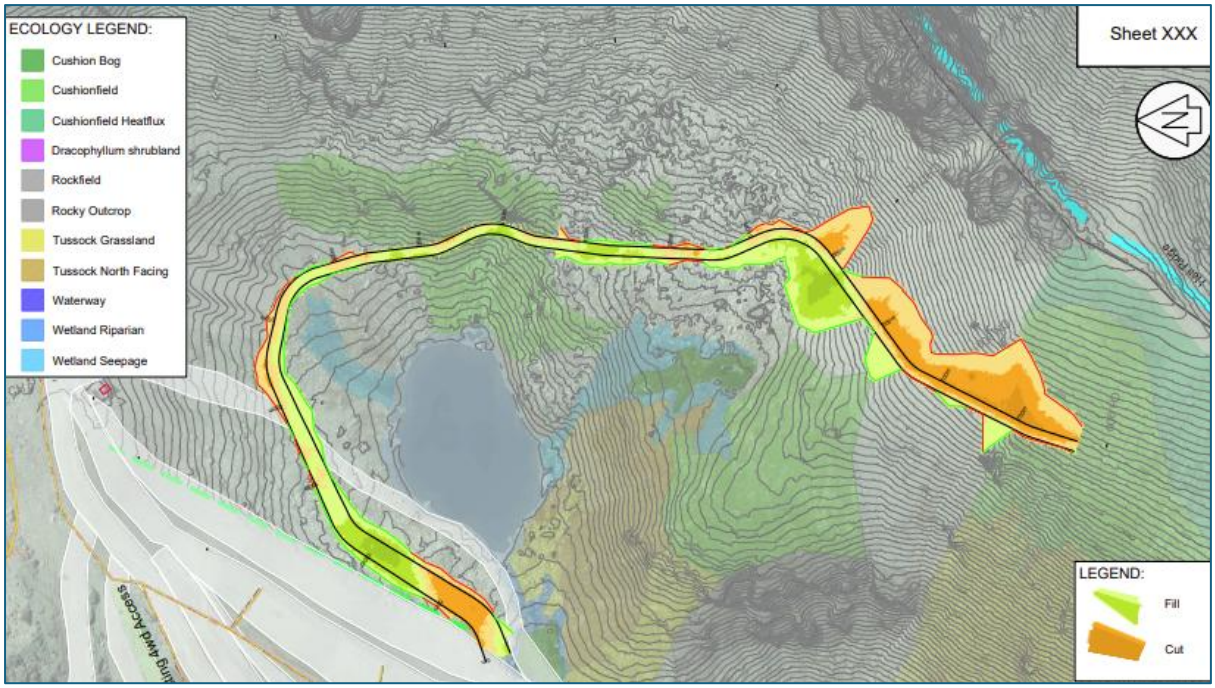


Figure 6.17 Option 1

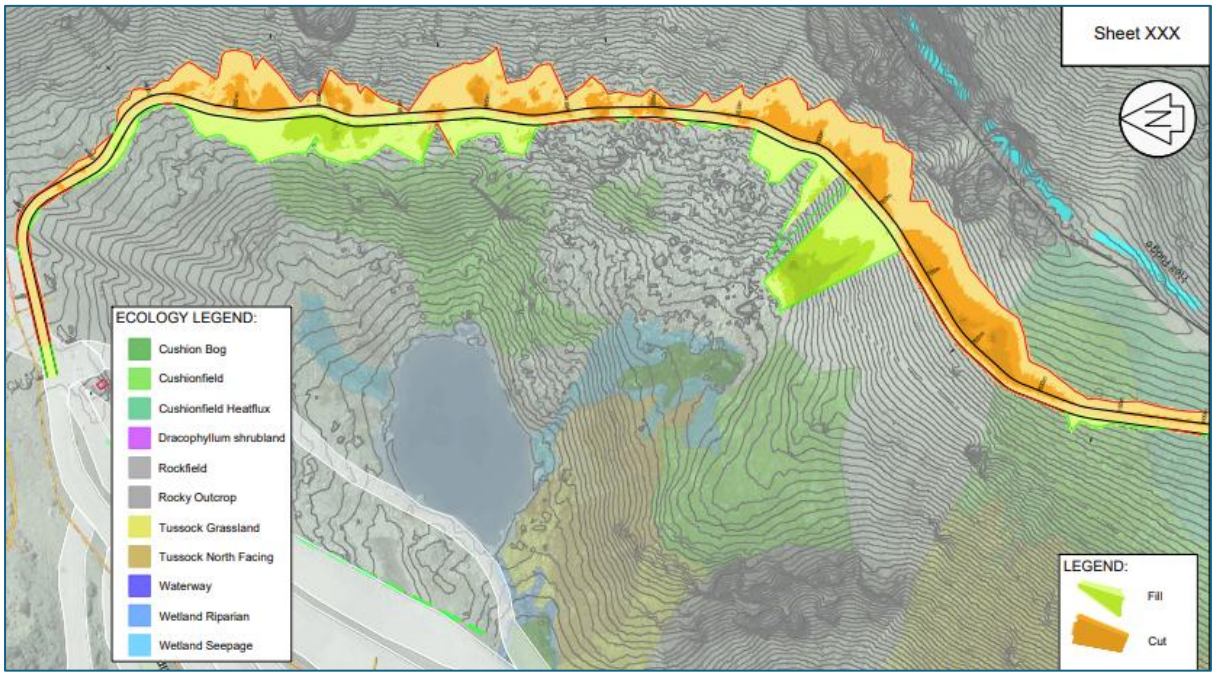


Figure 6.18 Option 2

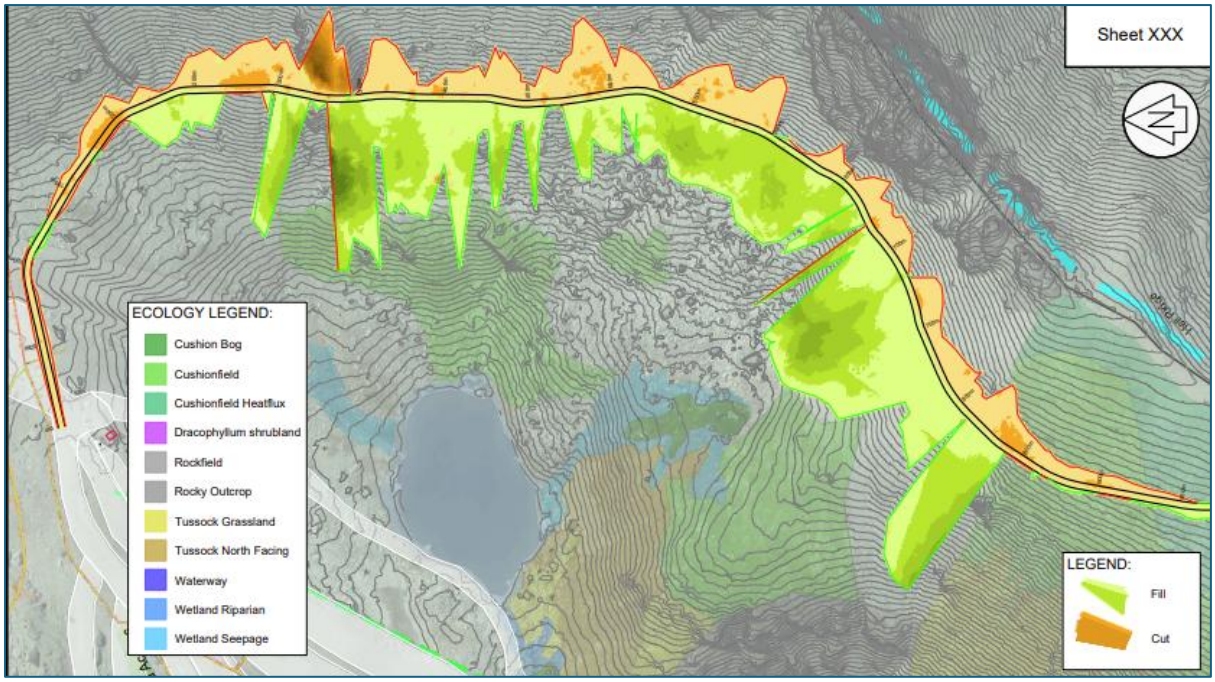


Figure 6.19 Option 3

Design Development of Option 2 was undertaken to confirm technical feasibility as it remains a challenging road. Review of geotechnical information, earthworks, ecology, utility corridor integration and construction sequencing was undertaken. Specific constraints were identified including localised instability, rock outcrops influencing alignment choices, sections which are less than optimal in grade for returning skiers, and a vertical alignment that would require wastewater to pump uphill, resulting in additional pump stations and increased costs.

Retaining walls have been proposed to limit cut/fill extents and associated environmental effects. As part of this, the trail width was constrained to the minimum feasible width. Geotechnical considerations will be an integral part of the detailed design process.

Assessment of alternative options demonstrates that there is no other feasible access route that can meet the functional and location requirements. Note that the Curvey extension is discussed further below.

6.11 Site Selection – Supporting Services into Doolans

A key element of the access philosophy is the integration of utilities within access corridors. Where practicable:

- Wastewater, water supply, power, communications, and snowmaking infrastructure are co-located within access routes;
- Disturbance is concentrated within a single shared corridor rather than dispersed;
- Long-term maintenance access is facilitated; and
- Cumulative environmental effects are reduced.

This integration has materially influenced alignment selection across the project. Initially, all services were proposed to be co-located in the access from Sugar to Helicopter ridge.

Further design development of Option 2 showed:

- The Mid Station corridor must accommodate installation of critical infrastructure services (wastewater, water, power, communications, snowmaking);
- Service installation within Option 2 will temporarily constrain access for bulk earthworks and ski trail formation in Doolans Basin;
- Passing bays and service laydown areas on Option 2 Helicopter ridge alignment are very difficult to achieve due to constructability, cost and environmental constraints
- Reliance on a single access corridor would limit concurrent work fronts during the first construction season;
- Alpine weather windows materially constrain available construction periods; and
- To maintain delivery certainty and enable concurrent services installation and Doolans earthworks, two access routes are required during initial construction staging.

Therefore a secondary access was sought that could help to mitigate both the construction sequencing risk, as well as avoid the additional wastewater pumping requirements the Option 2 alignment introduced.

In response to the construction sequencing constraints identified in Section 5, an alternative alignment, referred to as Curvey, was established in response to the staging requirements, slope stability considerations, and infrastructure integration.

Although not part of the original multi-criteria assessment, Curvey offers several material advantages:

- Shorter overall alignment length;
- More favourable longitudinal grades for skier return;
- Reduced service run lengths for wastewater, water, power, communications, and snowmaking;
- Lower overall infrastructure installation cost;

- Reduced interaction with steeper and less stable scree slopes relative to the earlier geometry; and
- Laying services up this alternative trench enables the access road from Sugar Bowl to helicopter road to remain open for supply of ropeway, building and services equipment and personnel access during the services construction.

Retention of both Option 2 (Mid Return Trail) and Curvey alignments provides long-term operational flexibility, construction resilience, and improved safety outcomes.

The services route up from Curvey Basin to Helicopter Ridge is functionally required to ensure the Project remains constructable within a commercially sustainable timeframe, as it reduces the capital cost of the services infrastructure. It also reduces construction and geotechnical risks associated with services installation.

The route has been selected because it primarily travels through existing disturbed terrain within the Rastus Burn. Then the route from Curvey to Helicopter ridge provides the most direct constructable route at a suitable grade that travels above the rockfall hazard from the Gallipoli Chutes. Retaining walls limit the extent of cut and fill required.

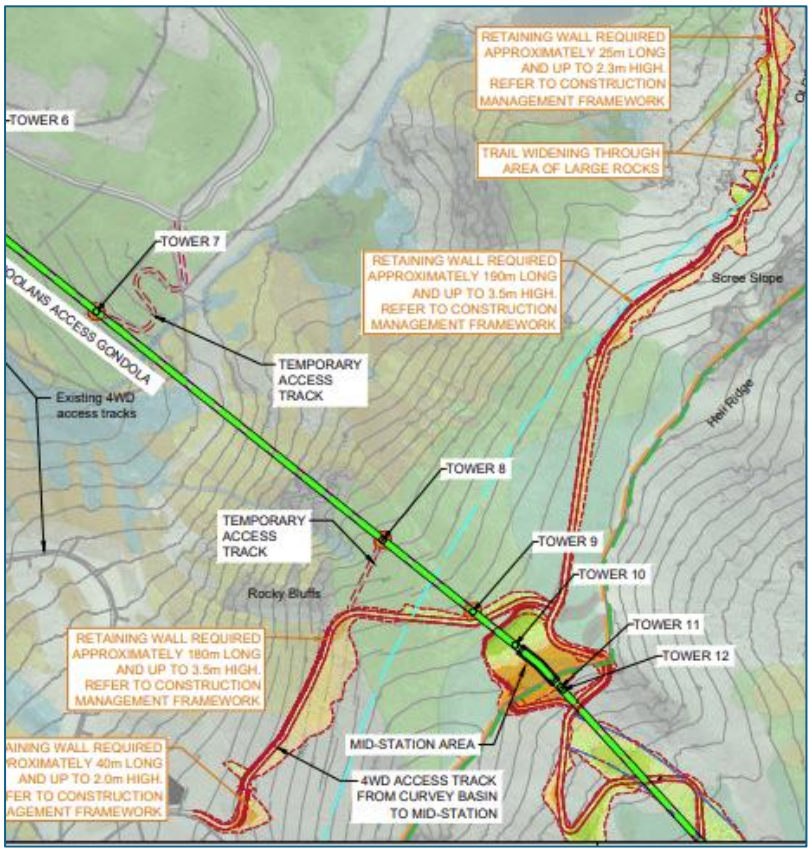


Figure 6.20 – Snapshot from Sheet E402 showing Curvey and Option 2 Alignments from the midstation into the Rastus Burn.

7.0 Site Selection - Water Take, Storage and Access

7.1 Water Take and Storage Options Assessment

Water take options for snowmaking, potable water and firefighting supply have been assessed.

Three main options were initially considered:

- Take water from Lake Alta and/or Rastus Burn.
- Groundwater.
- Take Water from Doolans Creek.

The main water take alternatives considered, with corresponding reservoir storage requirements are outlined in the Table below:

Water Take Option	Required Take for Snowmaking	Reservoir Storage	Assessment	Further Consideration
Water Take in Doolans Creek	104 L/s	Nil	Flow within Doolans Creek insufficient for 104 L/s take	No
		Yes	Take from Doolans Creek can be reduced to less than 50% of MALF to enable balance between sustainable take and rapid refill	Yes
Increase Take from Rastas Burn Catchment		Lake Alta	• Catchment overallocated • Catchment less than half that of Doolans Creek above DC3 hence lower MALF • Water level within Lake Alta cannot be maintained above required consented level and meet snowmaking needs of Remarkables and Doolans Expansion. • Transferring water between Kawarau River and Nevis River catchments culturally inappropriate	No
Groundwater		Required	Resource unknown but likely low yielding within the schist bedrock – low likelihood of adequate supply Sustainable take unlikely due to need to maintain baseflows to seepage wetlands - high likelihood of significant adverse effects on wetlands and tarns due to groundwater drawdown	No

Taking of additional flow from Lake Alta or the Rastus Burn was not considered viable due to the current water take in that catchment being overallocated. NZSki currently has to carefully manage its water usage within the Rastus Burn, therefore a redistribution or reallocation of water from its existing operations is not feasible.

NZSki is also cognisant that transfer of water from one catchment to another is generally less favourable from a cultural perspective (acknowledging that the ultimate receiving environment for water from the Rastus Burn and Doolans is the Kawarau Catchment).

Groundwater conditions beneath the site have not been investigated, however it is expected that any resource would be low yielding within the schist bedrock, and important for maintaining baseflows to the seepage wetlands. Given the difficulty of access to drill investigation wells, the low likelihood of success, and high likelihood of significant adverse effects on wetlands and tarns due to groundwater drawdown, groundwater supply was not considered further.

In addition to the table above, a water take from the largest nearby Tarn 1 was considered but discounted early, due to the high ecological values of the tarn (e3s, 2026b), and the tributaries and wetlands sustained by the tarn, it was not considered further.

Therefore, a water take from Doolans creek was further progressed as the only viable solution, and a water take location further assessed. A corresponding reservoir is required. The site selection considerations for a water take from Doolans creek included:

- Flow at the take location to be greater than 20 l/s, so that reservoir storage requirements could be maintained within a 20,000m3 volume;
- Suitable access for maintenance and inspection year-round;
- Sufficient space to install an intake weir and pumping;
- A location not prone to excessive snow buildup during winter;
- Minimisation of avalanche risk;
- Minimise crossing of wetlands; and
- Minimise disturbance to vegetation, including Dracophyllum.

The selected water take site in the Doolans creek was considered the best location of the water intake flow, could be accessed by a road with a practical gradient that minimised disturbance to wetland vegetation, had a wide bed to allow the below ground low-head pump chamber plus weir to be fitted and had an adjacent terrace located beyond potential flooding for the high-head pump, as well as being not an impractical distance from the Doolans base area. The area is also located out of potential avalanche terrain.

The main pump station building will be located on a terrace above and next to the riverbed. This location protects the station from flooding and avalanches.

Alternative sites were investigated for the proposed water take within Doolans Creek, however there was insufficient flow higher in the catchment, above the selected site, to provide an adequate sustainable take. There is also difficult construction and maintenance access and exposure to avalanche risk. Anything further downstream increased infrastructure requirements and environmental disturbances due to increased retaining earthworks, with no corresponding gain in system operability.

7.2 Water Storage Option Selection

With the only feasible option being a water take from Doolans Creek, accompanying water storage is also required, to buffer the snowmaking needs of the site. Snow production requires a high rate of take which could not be supported solely by taking the available flow directly from Doolans Creek.

Considerations for reservoir selection included:

- The minimum reservoir size for system operability is approximately 19,000m3 or larger, which holds enough water for one snowmaking campaign to provide 0.5m of snow on the intermediate trail.
- Minimisation of physical infrastructure, with reservoir located as close as practicable to main ski trail and access road, as this improves operability, maximises reliability, and reduces costs.
- Environmental constraints, including avoiding or minimising impact on wetlands and naturally uncommon vegetation by locating close to existing infrastructure, and

choosing sites utilising natural depressions or tarns so that earthworks volumes and associated construction effects are reduced where practicable.

- Slope gradient, avoiding areas of steep slopes
- Natural hazards, minimising rockfall and avalanche risks.
- Elevation, to maintain a practicable pumping capacity and associated power requirements as well as 10m required head to snowmaking pumps.

An evaluation of the various water storage options is presented below.

Table 7-1 Reservoir Options Assessment

Reservoir Option	Assessment	Further Consideration
Tarn 3	• Within footprint of area proposed for development • Flat requires less groundworks. • No effect on landscape due to existing tarn • Outside of area of wetlands or threatened plants • No downstream wetlands within 100 m. • No terrestrial ecological values associated with the tarn extent • Uncommon ecosystem type	Yes
Partial Tarn 3 footprint	• Reduction in reservoir size would result in the need for a greater rate of take from Doolans Creek which would not be sustainable. • Given there is no littoral wetland habitat for Tarn 3, it is unclear how there would be benefit to reducing the reservoir size.	No
Alternative Depression ~ 200 m north	• Outside of the area proposed to be developed. • Requires more pumpworks. • Greater length of pipe and trenching. • Extremely high abundance of Naturally Uncommon plant species, otherwise sparsely recorded within the wider Doolans landscape	No
Tarn 1 & 2	• Surrounded by very high value littoral wetland zones that would be impacted by taking from the tarn • Assessed to have higher ecological value than Tarn 3 • Would require pipeworks and take infrastructure within tarn margins	No
Engineered Tanks	• An impractical number of tanks would be required to enable the rate of take required. • High cost • High impact on landscape • Still requires sufficient groundworks and engineering to establish flat land for tanks with consideration of dynamic liquid mass, intense hydrostatic forces, environmental load factors like high-velocity wind shears and seismic acceleration.	No

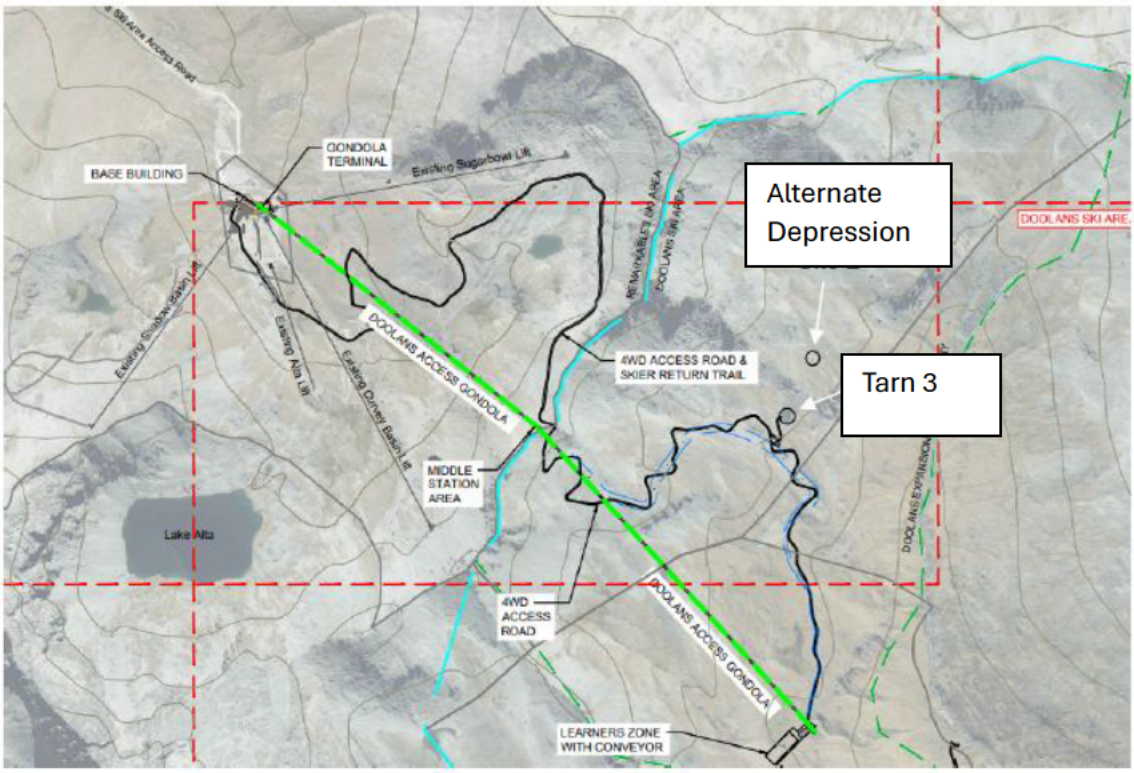


Figure 7.1 Reservoir options, locations shown as circles

The alternative depression site was initially proposed as part of a further expansion footprint, adjacent to an additional chairlift line access road and associated trails. Since this was removed from the scope of the Project, this option was assessed as not viable to because, in comparison to the selected site it:

- Increased environmental effects from extension of the construction envelope from an additional access road and trenching, resulting in loss of naturally uncommon plant species;
- Required higher capital and operational outlay, due to additional pipe lengths as it is further from the main service trench, and extra pumping requirements as it is at a higher elevation above the creek;
- Increased rockfall risk; and
- Has increased operability challenges with maintaining safe access along a secondary road year round.

No other sites were identified in close proximity to the proposed ski trail/access road, at a suitable elevation, with relatively flat topography and free of environmental constraints. The reservoir must also be in an area that would not add an operational hazard to skiers on main trails.

The selected site avoids wetland effects and threatened plants. It has reduced earthworks, reduced vegetation clearance and reduced infrastructure footprint. It provides connectivity to supporting infrastructure, maintenance access, reliability and long term functionality.

Tarn 3 differs from the other tarns as its water storage is more seasonal – filled after snow melt and slowly declining during the summer season, indicating that it does not receive consistent groundwater fed baseflows. Unlike the other Tarns, Tarn 3 does not have wetlands directly downstream; the closest downgradient wetlands are 260 m to the east. Seepage wetlands downstream of Tarn 3 occur at the break in slope above Doolans Creek and are not in obvious connection to the tarn.

7.3 Access Track to Water Take

The access track to the water take was carefully considered and optioneered before arriving at the submitted design. More direct, steeper routes were considered, which would have resulted in less areas of disturbance and potentially less stream crossings. However, those routes would have been very difficult to construct and operationally hard/impossible to utilise. Vehicular access to the intake is required for maintenance and inspections so the access grade needed to allow for this rather than a steeper direct route. Co-locating the combined trench and access track means less disturbance than 2 differing routes. The final proposed route best balances constructability, operational usability and avoided or minimised disturbance of high value ecological areas.

For crossings of wetlands/waterways, 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 feasible option given the location, topography and geology of the site and the weight the

bridges would need to be engineered to support. Crossings have still been designed to maintain hydrological connectivity.

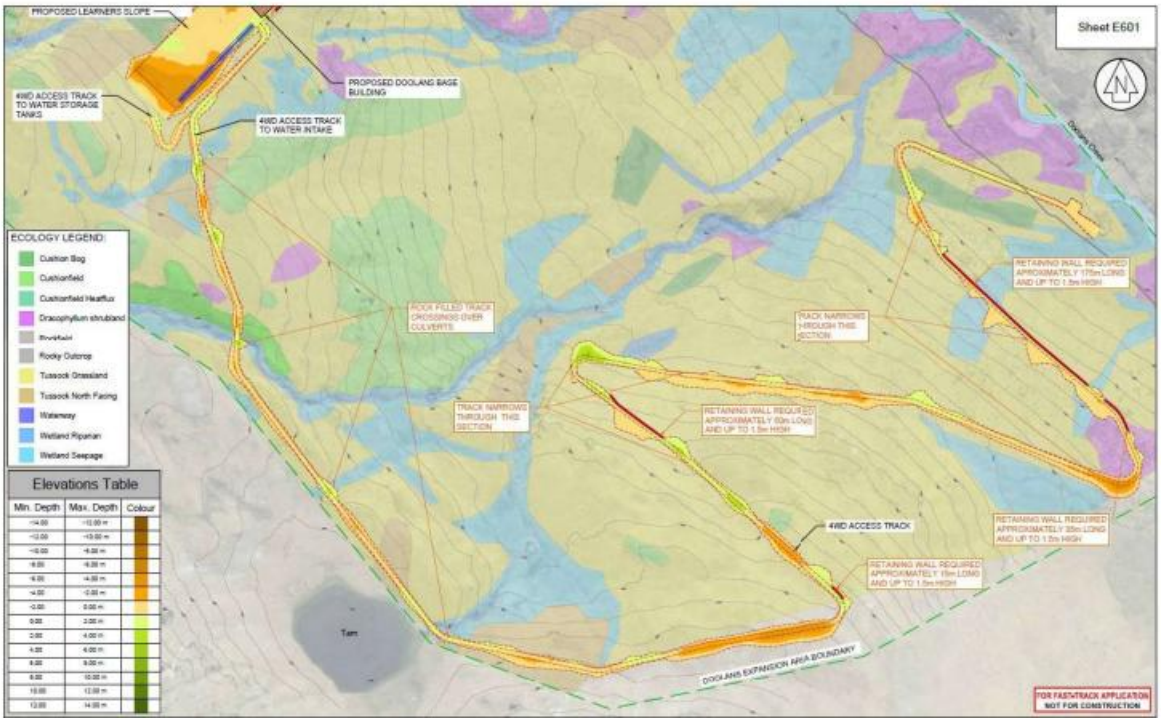


Figure 7.2 Preliminary Route of Water Take Access Track – Ecology layers shown, Dracophyllum in purple, Wetlands in green, waterways blue, tussock yellow.

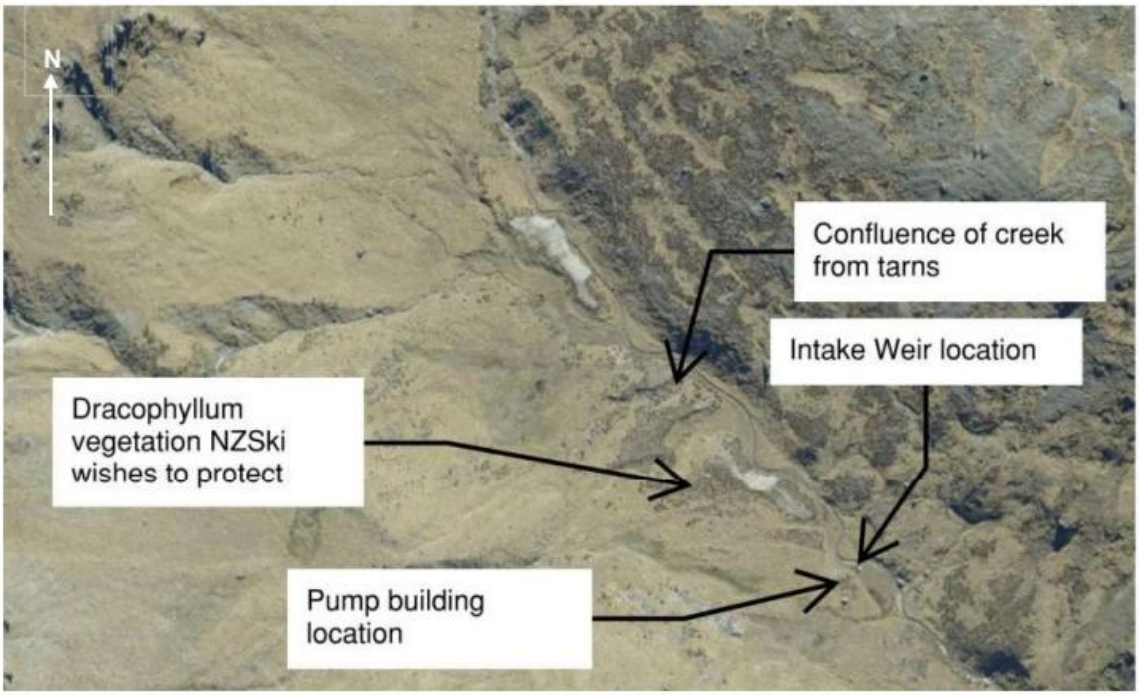


Figure 7.3 Location of Proposed Intake within Doolans Creek

Conclusion

The selected site layout represents the most suitable location and layout following consideration of environmental, engineering, operational and hazard-related constraints.

The site layout avoids the majority of identified ecological and water environment sensitivities, minimises earthworks and infrastructure extent, and provides the most practicable and efficient infrastructure solution for the Doolans Expansion Project.

Accordingly, it is considered the most appropriate location for the proposed infrastructure.