

Remarkables Ski Area Expansion Project

Telecommunications Infrastructure Concept Report

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NZSki Limited

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Prepared by:
Stantec New Zealand

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310104671



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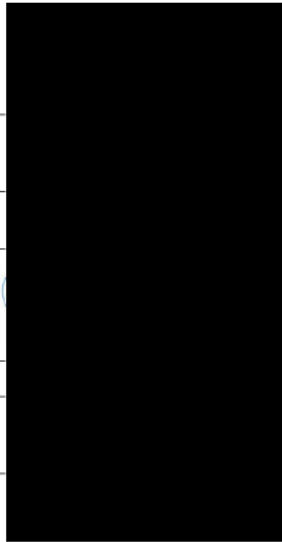


Remarkables Ski Area Expansion Project – Telecommunications Infrastructure

Prepared by:

Reviewed by:

Approved by:



Code of Conduct

The author of this report is Tim White. I am a Senior Principal Electrical Engineer with experience across electrical building services, including specific expertise in Telecommunications systems.

I hold a BSc (Electronics) and am a Chartered Professional Engineer (CPEngNZ). I have 17 years of industry experience.

I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This report has been prepared in compliance with that Code, as if it was expert evidence presented in proceedings before the Environment Court. Unless I state otherwise, this report is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this report.



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Executive Summary

This report assesses the proposed Telecommunications Infrastructure for the proposed expansion of the Remarkables Ski Area into Doolans Creek Catchment.

The approach recommended for primary internal communications connection between the NZSki Base Building, and the Doolans Facilities is for a new buried fibre optic backbone cable connection. The proposed cable route is,

- Doolans section; laid in a trench along the access road between Helicopter Ridge and the Doolans Gondola Return station and facilities area.
- Rastus Burn section; laid in a trench between the Rastus Burn Base Building and Helicopter ridge via the access road and trail to the Curvey Basin lift. At an altitude of approximately 1,840m the cable route would diverge from the Curvey Basin trail and head northward up the existing scree slope to the Gondola Mid Station on Helicopter Ridge.

The primary incoming communications connection into the Rastus Burn Base Building is proposed to be via an upgrade to the existing Point-to-Point Wireless Bridge connection to Coronet Peak. Additional communications infrastructure upgrades may be required at Coronet Peak to handle the increased bandwidth and capacity associated with the Remarkables expansion; however, this is a detailed design consideration and would likely only involve upgrading of internal communications hardware.

Backbone communications connections across the site are proposed to be via fibre optic cable, with back-up and redundancy options as further described in this report. Connectivity to various equipment and plant items across the site is generally proposed to be cabled to the nearest backbone infrastructure point. Communications cabling will be run within shared trenching wherever possible, to minimise direct costs of Telecommunications Infrastructure.

NZSki Radio system coverage will be extended into the Doolans expansion area for staff communications and accident/emergency response. Repeater station equipment required for this radio infrastructure will be inside buildings or other structures and require only a short external whip aerial approximately 2m above the ridge line of the building.

The option to extend mobile carrier coverage into Doolans Basin requires further investigation of likely costs and confirmation of NZSki requirements. It is proposed that this shall be future proofed only within the initial construction stage and may be completed in a future stage of development.

The technical benefits of each option for each infrastructure category are considered against NZSki operational requirements and estimated costs, to be coordinated with the requirements and details of other infrastructure packages and further detailed during subsequent design stages of this project.



Acronyms / Abbreviations

Acronym / Abbreviation	Full Name
CCTV	Closed Circuit Television (Security Camera)
LAN	Local Area Network
Mbps	Megabits per second (measure of communications connection speed)
SCS	Structured Cabling System
UPS	Uninterruptible Power Supply



1 The issue to be addressed

The issue to be addressed within the scope of this report is to determine the communications infrastructure requirements and technology solutions for the proposed upgrade of the Remarkables Ski Field and expansion into Doolans Basin. The communications infrastructure considered within this report is summarised in the table below. Different components/categories of infrastructure have been given abbreviations for ease of reference, e.g. T1/A refers to a potential incoming fibre communications connection to the site.

Telecommunications Category Reference	Category Description	Sub-category Reference	Sub-category Description
T1	Incoming Communications connection to the site	/A	Incoming Fibre connection
		/B	Point-to-Point Wireless Bridge to Coronet Peak
		/C	Satellite Internet connections
T2	Backbone Communications Infrastructure – main hubs	/A	Main base building (including proposed expansion)
		/B	New Gondola Terminal buildings (Base Station, Midstation and Return Station)
		/C	Doolans Cabin Building
T3	SCS and LAN connectivity within buildings, including Wi-Fi access	/A	NZSki Operations
		/B	UPS Requirements
		/C	Public Use
		/D	CCTV and Webcams
T4	LAN and Controls/Monitoring connectivity to field devices	/A	Snowmaking machines and pumps
		/B	Chairlifts
		/C	CCTV and Webcams
		/D	Wastewater Pump Stations
		/E	Water Intake Plant
		/F	Reservoir Plant
T5	Radio Communications Systems	/A	Existing Ski Area, including possible upgrades
		/B	Doolan's Expansion Ski Area
T6	Mobile Carrier Communications	/A	Existing Ski Area
		/B	Doolan's Expansion Ski Area



2 The concept proposed

The below table provides a summary of the communications infrastructure solutions proposed for each of the identified project elements, using the references from the table in Section 1:

Reference	Summary Description
T1/B	It is proposed to upgrade the existing Wireless bridge connection to Coronet Peak. Options/specifications for upgrading this connection shall be explored further as part of a future detailed design, including possible associated upgrades to incoming communications infrastructure/hardware at the Coronet Peak site.
T1/C	Starlink satellite devices are already used across the site, for back-up connectivity. These are proposed to be retained and new units deployed to expansion areas.
T2/A	The upgraded wireless bridge connection would terminate at the existing main (Rastus Burn) base building which shall remain the primary communications hub for the site. Network switching shall be upgraded if/as required. A new main communications room/cabinet is proposed for the building extension area, with associated internal backbone cabling.
T2/B	The gondola terminal building/s shall have a dedicated fibre backbone connection. Gondola operational communications/monitoring shall be managed by Doppelmayr.
T2/C	The new Doolans base building shall have a fibre backbone connection direct to the main base building. It is proposed to have two fibre routes for back-up/redundancy; one via the new access road and one via the Gondola overhead cable.
T3/A	SCS and LAN connectivity for NZSki operations such as staff general data use and point-of-sale shall be serviced by existing and new/upgraded internal building infrastructure. IT network set-up shall prioritise these operations over public communications use.
T3/B	UPS back-up shall be provided for all telecommunications infrastructure network equipment; further details to be confirmed to NZSki requirements, as part of a future detailed design.
T3/C	SCS and LAN connectivity shall be provided for public use, mainly focussed on high quality and high bandwidth Wi-Fi connectivity within and nearby to buildings.
T3/D	CCTV system/s and webcams within/near buildings shall connect via general data SCS within the respective building.
T4/A	New snow making machines and plant shall have a cabled communications connection to the nearest infrastructure connection point.
T4/B	New chairlifts shall have a cabled communications connection to the nearest infrastructure connection point. Connectivity to existing chairlifts is assumed to be fit for purpose.
T4/C	CCTV system/s and webcams away from buildings, e.g. at track tops, shall have a cabled communications connection to the nearest infrastructure connection point.
T4/D	Wastewater Pump Stations require reliable monitoring for faults/alarms. A small, weatherproof cabinet (or pit) for communications connection (and Low Voltage Power) is proposed adjacent to each pump station.
T4/E	Water Intake Plant requires reliable monitoring for faults/alarms. A small, weatherproof cabinet (or pit) for communications connection (and Low Voltage Power) is proposed within/adjacent to the plant area.
T4/F	Reservoir Plant requires reliable monitoring for faults/alarms. It is proposed that this would be cabled directly to the water intake station.
T5/A	The existing Radio communications system to the existing ski area shall be retained and no upgrades are proposed.
T5/B	Radio communications shall be deployed to the Doolan's expansion ski area. Active equipment shall be housed within buildings or other structures, with a small 2m whip antenna above the ridge line of the building.
T6/A	Mobile communications to the existing ski area shall be retained and no upgrades are proposed.
T6/B	Further investigation and liaison with mobile providers is required to confirm estimated capital costs for extending mobile communications into the Doolan's basin ski area. It is proposed that future-proofing works are completed so that this can be installed at a later stage of development.



3 The design considerations

In developing the proposed solutions, the following options were investigated and design considerations made.

T1/B - Wireless Bridge

In discussions with NZSki IT, it is understood that the existing wireless bridge incoming communications connection, via Coronet Peak, generally works well and is reliable even under severe weather conditions. The existing connection is rated up to 500Mbps which is more than sufficient for general operations of the current facility however is expected to not be sufficient for the expansion of the site and increasing demand of public/customer use.

As a new fibre connection is not considered viable, it is proposed to enhance the existing wireless bridge connection via upgraded hardware. Possible options/specifications have been investigated to confirm viability; however, these would be reviewed closer to the time of installation to take advantage of further technology improvements.

Higher bandwidth options, such as the 'Ubiquiti UISP airFiber 60 XR 60GHz Long Distance PTP Bridge' (pictured below) are rated for up to 5.4Gbps (5,400 Mbps), i.e. more than 10x the bandwidth of the existing connection. This is expected to be more than sufficient for the expansion project 'if completed today' and it is anticipated that any incremental increase in demand at the time of construction could be compensated by equivalent improvements in available technology.



Figure 1. Option for upgraded Wireless bridge - Ubiquiti UISP airFiber 60 XR 60GHz Long Distance PTP Bridge



Remarkables Ski Area Expansion Project - Telecommunications Infrastructure

3 The design considerations



Figure 2. Existing hardware - Remarkables telecommunications link (wireless bridge) connection to Coronet Peak

An upgrade to wireless bridge hardware is significantly more cost-effective than a buried fibre connection for the Remarkables site; in the order of \$15,000, depending on the exact product and installation complexity.

The wireless bridge connection option does put a heavy dependency on the Coronet Peak communications infrastructure; with the wireless bridge proposed to be upgraded and remain the primary connection to the Remarkables site, then it should also be considered whether concurrent upgrades to the Coronet Peak site may be wise, or necessary.

Requirements to upgrade incoming communications infrastructure at the Coronet Peak site shall be investigated further as part of a future detailed design stage, to allow for planned future demand combined across both sites.

T1/C - Satellite Internet

In discussions with NZSki IT staff, it is understood that multiple SpaceX Satellite Internet units are in use across this and several other Trojan Holdings sites, and operate reliably as a redundancy back-up. It is proposed to retain these existing connections and also to deploy new units for the Doolan's expansion area as a further back-up.



Remarkables Ski Area Expansion Project - Telecommunications Infrastructure

3 The design considerations

T2/A,B,C - Backbone Communications Infrastructure

The existing (Rastus Burn) main building will remain as the primary point of connection for incoming communications infrastructure, with internal backbone cabling within the building, including a proposed new communications room(s)/cabinet(s) within the building extension area. The number and location of communications rooms/cabinets within the extension area shall be coordinated within the building services design for the main building expansion project, as part of a future detailed design.

Backbone fibre optic cabling is proposed to connect to the Gondola terminal building and also across to the Doolan's Basin. It is proposed to run two diverse routes between the existing Base Building and the Doolan's Base Building being:

1. Via the overhead cable installed as part of the gondola construction; this can be accommodated as part of the gondola contract for minimal additional cost.
2. Run underground within shared services trench; connectivity is required to wastewater pump stations and other plant distributed along the route and trenching will be necessary for other services as well, and so it is proposed that the primary fibre backbone is run within underground ducts for the full length between the two buildings. Utilising this trenching route facilitates the connection requirements of other services infrastructure/plant at the same time as providing resilience and redundancy to the fibre backbone connection with a completely diverse/physically separate cabling route to the proposed overhead line.

The proposed underground cable route is described below and shown on the appended site layout sketch plans,

- a) Doolans section; laid in a trench along the access road between Helicopter Ridge and the Doolans Gondola Return station and facilities area.
- b) Rastus Burn section; laid in a trench between the Rastus Burn Base Building and Helicopter ridge via the access road and trail to the Curvey Basin lift. At an altitude of approximately 1,840m the cable route would diverge from the Curvey Basin trail and head northward up the existing scree slope to the Gondola Mid Station on Helicopter Ridge.

T3/A,B,C - SCS and LAN connectivity within buildings

Connectivity within the existing Base Building, proposed extension and new Doolan's Base Building is proposed to be deployed via a traditional SCS which connects into the main backbone infrastructure. Delivery of extensive, reliable and high bandwidth WiFi will be a key focus of the internal building infrastructure design.

Provision should be made within architectural space planning for new communications rooms where required (as nominally indicated on the site plan sketch). Suggested allowance is for approximately 10sqm per main communications room (allowing up to 2 No. Cabinets per room), but this can be refined in coordination with the detailed building design in due course.



Remarkables Ski Area Expansion Project - Telecommunications Infrastructure

3 The design considerations

The scope/extent of this package of works within the context of the infrastructure planning project is to be discussed and agreed with NZSki as part of future design stages.



Figure 3. *Building Communications Cabinet (approx. dimensions: 700mm wide x 850mm deep x 2100mm high) - Typical for reference, to be installed within dedicated room*

T4/A,B,C,D,E,F - LAN and Controls to Field Devices

Various field equipment and plant items for other infrastructure packages, as listed/described above, require communications connectivity for controls and/or monitoring. These connections are generally proposed to be via cabling to the nearest backbone infrastructure connection point. In many cases this will be a fibre optic cable connection due to length, which does also mean that a small network switch and field cabinet or other enclosure would be required at the plant/equipment location. These enclosures would be proposed as weatherproof including anti-condensate/anti-freezing internal heaters. Low Voltage power would generally be required to the plant/equipment requiring a communications connection in any case, and so a small power supply should be readily available at each plant location. Plant with multiple units in close proximity (e.g. snow making machines) could potentially have one cabinet between several units. Buried pit options may also be viable in some cases.



Figure 4. *Field Communications Cabinet (approx. dimensions: 600mm wide x 600mm deep x 400mm high) - Typical for reference, to be installed nearby to plant*

Final cable routes will be determined once design is finalised for other infrastructure packages, which will define plant locations. Cable routes will utilise shared trenching routes and possibly in some cases overhead lines via chairlifts, as much as possible to reduce communications infrastructure costs.



Remarkables Ski Area Expansion Project - Telecommunications Infrastructure

4 Benefits, risks and cost of options

T5/A - Radio Communications System to existing Ski Area

The existing radio communications system includes two elevated repeaters located “above Shadow Basin near the ridgeline and at Bishops Camp.” as per the supplied 2021 Infrastructure Report.

No changes to repeater locations of the existing system are proposed; upgrades to hardware/equipment at existing locations may be considered, subject to further discussion with NZSki.

T5/B - Radio Communications System to Doolan’s Basin

The Radio Communications system will be expanded to the Doolan’s Basin Ski Area; detailed requirements, number and location of repeaters are to be confirmed within the subsequent design stages. It is anticipated that at least two additional repeaters shall be installed and that these shall be integrated within/onto new buildings and/or other structures. It is anticipated that repeaters will be incorporated into the Gondola Return Station Carrier Stacking/Café Building and into the Gondola Mid Station Structure. Active equipment would generally be concealed, with a small whip antenna proposed at each location, approximately 2m above the building ridge line.

T6/A,B - Mobile Communications

The existing mobile carrier communications tower is located at the base of the Curvey Basin chairlift. It is anticipated that this shall remain as it is without requiring extension/upgrade.

The option to establish two additional mobile communications towers within the Doolan’s Ski Area will be considered and further investigated particularly with regards to capital cost. It is anticipated that one tower will be placed adjacent to the Gondola Return Station and another tower on Helicopter Ridge adjacent to the Gondola Mid Station. Input will be required from mobile carriers to confirm detailed requirements and likely implementation costs.

It is proposed that the initial construction shall allow for futureproofing only, for the installation of a mobile tower as part of a later development stage. This would include spatial allocation for a future tower and ensuring ease of future services connections via underground ducts or similar.

4 Benefits, risks and cost of options

4.1 Incoming Communications

4.1.1 Wireless Bridge Connection

The primary benefits of the wireless bridge option for incoming communications connection are both low cost and ease of installation. The primary risk of this option is interruption to service which could be caused by physical damage at either end of the bridge causing misalignment and therefore loss of signal.



Remarkables Ski Area Expansion Project - Telecommunications Infrastructure

4 Benefits, risks and cost of options

To operate well, the antenna pair needs to be precisely aimed (which is completed during installation/commissioning) with nothing blocking line-of-sight and a robust mounting to ensure maintained alignment. The risk of physical damage/misalignment can be mitigated by selecting a location which is away from activities that might cause accidental or inadvertent damage.

The other key risk and consideration for this connection option is the possibility of inadequate performance for NZSki operations in terms of bandwidth. With the wireless bridge proposed to remain the primary communications connection to the site, it is proposed to upgrade the existing installation as part of the Doolans expansion project. Currently available products offer up to approximately 10x the bandwidth capacity of the existing connection and further technology upgrades are likely to be available in future if/as required and so with appropriate periodic investment, the risk of limited bandwidth should be sufficiently mitigated.

The technology is designed to operate reliably even under severe weather conditions and in conversations with NZSki IT, it is understood that the current wireless bridge has provided reliable continuity of connection to date. A new, upgraded installation should provide even greater reliability.

A second wireless bridge may be considered to provide redundancy and lower the risk of outage to the site. If included, it would be recommended to install the second bridge at a different location on the site and with the pair at Coronet Peak to also be in a different location, to reduce the risk of a single incident (at either The Remarkables or Coronet Peak site) taking out both connections.

As this connection only provides a point-to-point link to Coronet Peak, it is also completely reliant on the quality and bandwidth capacity of the communications infrastructure on that site. It is highly recommended that an assessment/audit of anticipated future capacity is undertaken, considering combined requirements across both sites. The outcome of this assessment may be that communications infrastructure at Coronet Peak is recommended to be upgraded, due to increased demand resulting from the Remarkables Doolans expansion.

4.1.2 Cost Consideration

The cost of an upgraded wireless bridge is in order of \$15,000 dependent on final installation details and not including cabling if the antenna location is remote from the building. A secondary wireless bridge for redundancy would simply double installation costs, approximately.

The cost of possible required/recommended upgrades to the Coronet Peak incoming communications infrastructure should also be considered and shall be investigated further within a future design stage.

4.2 Backbone and LAN Infrastructure

Options assessment is not generally applicable to backbone and LAN infrastructure components. Cabled connections are proposed to utilise shared reticulation routes to reduce direct costs of Telecommunications Infrastructure.

It should be noted that fibre communications connections require active equipment at each end and therefore require power at the connection location, however mains power will generally be required for the plant being connected in any case and so should be readily available in parallel with other services infrastructure.



4.3 Radio and Mobile Communications

The primary risk associated with radio and mobile communications systems is inadequate coverage and/or performance. Operational requirements and analysis of suitable transmitter/repeater locations shall be assessed further during subsequent design stages in order to mitigate this risk.

5 Nominal layout of the proposed design

Refer to the appended sketch layouts which provide indicative locations across the site for the Telecommunications Infrastructure items covered within this report.

Note that information for other services is also shown on these plans, for reference/coordination. Telecommunications descriptions and notes are in black text boxes, with coloured borders relating to the different infrastructure categories.

6 Standards and Statutory requirements

All Telecommunications infrastructure shall comply with applicable standards and statutory requirements, as well as best trade practice. Of particular note, is the permitted radio communications spectrum licenses which are already in place. Any upgrades/expansion of the Radio Communications System shall operate under the same spectrum licenses.

All Telecommunications infrastructure should comply with all applicable New Zealand legislation, regulatory codes, and applicable international standards and is to be designed, supplied, installed, tested, and commissioned in accordance with these requirements.

Relevant standards are listed below but in general the installation is to comply with New Zealand Building Code (NZBC), all applicable AS/NZS standards and with best trade practice to ensure reliability and longevity in a harsh alpine environment.

Listed standards for reference:

- AS/NZS 3000: Australian/New Zealand Wiring Rules
- AS/NZS 3084: Telecommunications Installations – Telecommunications Pathways and Spaces for Commercial Buildings
- AS/NZS 3085.1: Telecommunications Installations – Basic Requirements
- ISO/IEC 11801
- AS/NZS 11801.1: Information Technology - Generic Cabling for Customer Premises General Requirements
- NZ TCF Premises Wiring Cable Installers Guidelines for Telecommunication Services
- AS/CA S009 Installation Requirements for Customer Cabling (Wiring Rules)
- New Zealand Radio communications Act 1989 and Radio Spectrum Management (RSM) Regulations)



Remarkables Ski Area Expansion Project - Telecommunications Infrastructure

7 Further Design Development

- AS/NZS 1768: Lightning Protection
- National Environmental Standard of Telecommunication Facilities (NES-TF) 2016

International standards to also be considered, as applicable:

- BICSI TDMM 15th Edition – Pathways, Spaces, Bonding & Cabling
- TIA/EIA Standards: 568.2-D, 569-E, 606-C, 758-B, 607-D
- Outside plant (OSP) TIA-758-B (Fibre and copper outside plant installation in alpine terrain.)

7 Further Design Development

This report describes the design concepts and options (where applicable) for Telecommunications Infrastructure. Further details which shall be included in subsequent design package(s) are summarised as follows for each Telecommunications Infrastructure category.

Some design details rely on NZSki decisions and design details for other infrastructure packages, e.g. monitoring requirements for wastewater plant.

T1 - Incoming Communications

The Preliminary Design would proceed to further investigate and detailed the proposed upgrade to the wireless bridge connection, including the following details:

- Number and indicative location(s) of wireless bridge connection equipment at both Remarkables and Coronet Peak
- Description of works required to connect wireless bridge units into site infrastructure
- Indicative specifications for upgraded equipment
- Preliminary assessment of upgrades which may be required at Coronet Peak site
- Sketch plans and schematic diagrams for the above

We would also seek to quantify the number of Starlink units which may be deployed for back-up connectivity and show indicative locations for these.

T2 - Backbone Communications Infrastructure

The preliminary design would confirm the quantity and indicative locations for communications cabinets and backbone connection points across the site, including coordination with the proposed base build expansion design.

We would include proposed specifications for backbone cabling infrastructure within the preliminary design.



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7 Further Design Development

T3 - SCS and LAN connectivity within buildings

Depending on required/agreed scope, preliminary design may include high level performance specifications, confirmation of spatial allowances for telecommunications equipment, bandwidth requirements and indicative outlet quantities for SCS and LAN connectivity throughout buildings.

T4 - LAN and Controls to Field Devices

Preliminary design for this component of telecommunications infrastructure would require client decisions and further details regarding each of the systems which require field connectivity for monitoring etc.

The completed preliminary design would ideally include indicative quantities and locations for all field equipment requiring connectivity.

T5 - Radio Communications Systems

The preliminary design would determine and document proposed locations for new radio communications equipment, repeaters etc. to the Doolans expansion area based on operational feedback from NZSki and indicative signal coverage modelling, if/as required.

T6 - Mobile Communications

The existing mobile carrier communications tower located at the base of the Curvey basin chairlift is assumed to remain with no works required under this project.

If NZSki wish to establish full mobile coverage into the Doolan's basin expansion area, the preliminary design would document infrastructure requirements to facilitate this; however, we would be reliant on design guidance from the mobile carriers for this component of the project.



Appendices



Appendix A Telecommunications Infrastructure – Site Layout Sketches





TELECOMMUNICATIONS
INFRASTRUCTURE -
Site Layout Doolans
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TELECOMMUNICATIONS
INFRASTRUCTURE NOTES:

Communications connections to Snow guns/sprits for new trails to match existing. Ship above showing existing detail with shared services trench for water, power and communications to each location. New connections to be documented once locations confirmed in coordination with Snow making system design.

Provide Communications connections for controls/monitoring of diart and equipment for wastewater pump stations, water supply plant and other infrastructure services. Exact locations and installation details to be confirmed within future detailed design stage.

- ECOLOGY LEGEND:**
- Cushion Bog
 - Cushionfield
 - Cushionfield Heathflux
 - Diacopyllum shrubland
 - Rockfield
 - Rocky Outcrop
 - Tussock Grassland
 - Tussock North Facing
 - Waterway
 - Wetland Riparian
 - Wetland Seepage

PROPOSED UTILITIES LEGEND:

- Water Supply (Potable)
- Water Supply Rising Main
- Underground Power
- Telecommunications
- Wastewater Main
- Snowmaking Main

DRAWING REFERENCING NOTES:

- SERVICES - Refer Stantec
- STORMWATER - Refer Stantec
- BUILDINGS - Refer Wyatt Gray
- LIFTS - Refer TBC



DEVELOPMENT CONSULTANTS

21 Devonian Blvd., Victoria, BC V8P 1A7, Canada
Tel: (250) 383-3333 Fax: (250) 383-3334
www.southernland.co.uk

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Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

Stantec New Zealand

Unit D1-03, 19 Grant Road

Frankton

Queenstown 9300

NEW ZEALAND

Mail to: PO Box 13052, Christchurch 8140

stantec.com





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