

Our ref: 7087-G2 Rev 1
8 March 2023

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Vail Resorts
PO Box 42
Perisher Valley NSW 2624

By email: andrew.kennedy@vailresorts.com.au

Attention: Andrew Kennedy

Dear Andrew,

Tom Thumb Learning Area, Front Valley, Perisher Ski Resort Geotechnical Assessment

1. INTRODUCTION

1.1 General

This report presents the results of a geotechnical assessment for the proposed redevelopment of the Tom Thumb Learning Area at Front Valley, Perisher Ski Resort (the Site). The assessment was commissioned on 10 November 2022 by Andrew Kennedy of Vail Resorts. The work was carried out in accordance with the email proposal by AssetGeoEnviro (Asset) dated 10 November 2022, reference 7087-P1.

Documents supplied to us for this assessment comprised:

- Civil Plans (prepared by: CLM Civil Engineering; drawing: V276-2; sheets 1 to 9; revision: D; dated 8 March 2023) – CLM '23.
- Statement of Environmental Effects (prepared by: Dabyne Planning; project: 43-22; dated: January 2023) – Dabyne Jan '23.
- Structural Plans for Walkway (prepared by: Camstruct Consulting Pty Ltd; project: 22086; drawings: S01 to S06; revision: A; dated: 17 February 2023) – Camstruct Feb '23.

Based on the supplied documents, we understand that the project involves:

- Removing Tom Thumb J-bar lift.
- Cut and fill earthworks to remove an existing aerial jump and fill in the adjacent downslope area to provide a more even grade. The cut and fill will include removal of two prominent rock outcrops, cutting of up to 4.5m, and filling of up to 3.5m.
- Reconfiguring existing skier conveyors to increase from three to four.
- Other associated works including minor changes to the snowmaking system, modification to the entry stairway and signage, and installation of a snow fence.

The Site lies within the G-line as defined in DIPNR's "Geotechnical Policy – Kosciuszko Alpine Resorts", November 2003. However, given that earthworks will largely re-instate the natural surface levels that existing at the aerial jump site and immediately area downslope, and no significant structures are proposed, the development would fall under Minimal Impact criteria.

1.2 Scope of Work

The main objectives were to assess the surface and likely subsurface conditions and to provide comments and recommendations relating to Site Classification to AS2870–2011 "Residential Slabs and Footings", allowable bearing capacity, and earthworks.

The following scope of work was carried out to achieve the project objectives:

- A review of existing regional maps and reports relevant to the Site held within our files.
- Visual observations of surface features.
- Engineering assessment and reporting.

This report must be read in conjunction with the attached "Important Information about your Geotechnical Report" in Appendix A. Attention is drawn to the limitations inherent in site investigations and the importance of verifying the subsurface conditions inferred herein.

2. SITE DESCRIPTION

The Site is located within the Front Valley area of the Perisher Ski Resort. The site locality, context, and surrounding developments are shown in Figures 6 to 9 in Dabyne '23 and Sheet 3 in CLM '23.

Topographically, the Site is located in moderately to steeply sloping terrain. In the site vicinity, the slopes are estimated to be about 10° over the lower part increasing to about 15° over the upper part. The existing aerial jump, located within the upper part, appears to have been formed by cutting up to about 3.5m depth from downslope and filling up to about 4.5m thick, as indicated by the existing site contours shown in Sheet 2 of CLM '23 and Earthworks Longitudinal Section shown in Sheet 6 of CLM '23. The fill batter slope appears to have been formed at about 26° (2H : 1V).

Selected photos of the site are attached.

The 1:250,000 Tallangatta Geological Map indicates the Site is underlain by Lower Devonian aged intrusive granites, micro-diorites and tonalites. This is locally weathered to produce core-stones and tor outcrops. These can be of significant size.

Granite rocks can be seen outcropping in the site vicinity as two tor outcrops to be removed as part of the development, and numerous shallow outcrop just under the grass cover across the middle and upper slopes of the site. Numerous granite boulders were observed at the toe of the aerial jump.

Surface flows are expected to follow the ground surface contours with likely risk of ponding in the depression formed at the toe of the aerial jump formed by the original earthworks.

3. DISCUSSIONS & RECOMMENDATIONS

Removal of the J-bar, moving of ski conveyors, removal of trees and tor outcrops, and associated minor works as described above is not considered to present a significant geotechnical constraint (e.g., disturbance, significant load bearing).

As per Camstruct Feb '23, the walkway extension involves constructing short pier footings nominally 450mm diameter by 500mm deep to be founded on material with an allowable bearing pressure of 150 kPa and Class A site classification as per AS2870-2011 'Residential Slabs and Footings'. In view of the landslide risk setting and widespread site disturbance over many decades, a general site classification for the area would be Class P. Founding below disturbed ground and on to suitable natural soils or bedrock would justify a less severe classification, Class A where on bedrock or natural sandy soils (medium dense or better). It is expected that an allowable bearing pressure of 150kPa would be achievable at practical excavation depths (say less than about 1m depth), but inspection of footing excavations by a Geotechnical Engineer is required to verify the founding conditions.

Cutting of the aerial jump and filling the depression at the base will result in approximate reinstatement of original ground surface levels in that part of the site and this is also not considered to present a significant geotechnical constraint, provided that the following recommendations are adhered to:

- Area to be filled must first be stripped of topsoil and loose / softened soil down to medium dense or better sandy soils or stiff or better clayey soils, or weathered granite.
- Water seepage into the area to be filled should be controlled by installation of temporary diversion drains, to ensure the area remains dry.
- Subgrade preparation should comprise constructing horizontal benches of width compatible with the compaction and earthmoving plant. Proof rolling to be carried out using minimum 8 tonne roller, and areas showing heave should be over-excavated minimum 0.3m depth and replaced with suitable fill.

- Suitable fill to be compacted in layers not exceeding 250mm loose thickness to a dry density ratio (AS1289.5.4.1–2007) not less than 95% Standard. Suitable fill could comprise selected material from the aerial jump and ideally would comprise well graded soils with a maximum particle size of 150mm and free of deleterious or organic matter. Predominantly sandy soils or cohesive soils could also be considered as suitable fill. Larger rocks and boulders should be removed.
- Filling should be over-placed (i.e., extend beyond the design batter slope), compacted, and then trimmed to the design batter such that the exposed surface comprises compacted material.

4. LIMITATIONS

In addition to the limitations inherent in site investigations (refer to the attached Information Sheets), it must be pointed out that the recommendations in this report are based on assessed subsurface conditions from limited observations. To confirm the assessed soil and rock properties in this report, further investigation would be required.

Asset accepts no liability where our recommendations are not followed or are only partially followed. The document “Important Information about your Geotechnical Report” in Appendix A provides additional information about the uses and limitations of this report.



Please do not hesitate to contact the undersigned if you have any questions regarding this report or if you require further assistance.

For and on behalf of

AssetGeoEnviro

A handwritten signature in blue ink that reads 'Mark Bartel'.

Mark Bartel

BE, MEngSc, GMQ, CPEng, RPEQ/NER(Civil), DEP/PRE (NSW)
Managing Director | Senior Principal Geotechnical Engineer

Encl: Form 4 – Minimal Impact Certification

Important Information about your Geotechnical Report

Soil and Rock Explanation Sheets

Site Photos

DOCUMENT CONTROL

Distribution Register

Copy	Media	Recipient	Location
1	Secure PDF	Andrew Kennedy	Vail Resorts
2	Secure PDF	Mark Bartel	Asset Geotechnical Engineering

DOCUMENT STATUS

Rev	Revision Details	Author	Reviewer		Approved for Issue		
			Name	Initials	Name	Initials	Date
0	Initial issue	M. Bartel			M. Bartel	MAB	7 March 2023
1	Review comments	M. Bartel			M. Bartel	MAB	8 March 2023



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Form 4 – Minimal Impact Certification

DA Number: _____

This form may be used where minor construction works which present minimal or no geotechnical impact on the site or related land are proposed to be erected within the “G” line area of the geotechnical maps.

A geotechnical engineer or engineering geologist must inspect the site and/or review the proposed development documentation to determine if the proposed development requires a geotechnical report to be prepared to accompany the development application. Where the geotechnical engineer determines that such a report is not required then they must complete this form and attach design recommendations where required. A copy of Form 4 with design recommendation, if required, must be submitted with the development application.

Please contact the Alpine Resorts Team in Jindabyne for further information - phone 02 6456 1733.

To complete this form, please place a cross in the appropriate boxes ☐ and complete all sections.

1. Declaration made by geotechnical engineer or engineering geologist in relation to a nil or minimal geotechnical impact assessment and site classification

I,
Mr ☒ Ms ☐ Mrs ☐ Dr ☐ Other

First Name	Family Name
Mark	Bartel

OF

Company/organisation

Asset Geotechnical Engineering Pty Ltd (trading as AssetGeoEnviro)
--

certify that I am a geotechnical engineer /engineering geologist as defined by the “Policy” and I have inspected the site and reviewed the proposed development known as

Tom Thumb Learning Area, Front Valley, Perisher Ski Resort
--

As a result of my site inspection and review of the following documentation

(List of documentation reviewed)

Civil Plans (CLM Civil Engineering; drawing: V276-2; sheets 1 to 9: revision: D; dated 8 March 2023)
Statement of Environmental Effects (Dabyne Planning; project: 43-22; dated: January 2023)
Structural Plans for Walkway (Camstruct Consulting Pty Ltd: ref: 22086; dwgs: S01-S06; rev: A; dated: 17/2/2023)

I have determined that;

- ☒ the current load-bearing capacity of the existing building will not be exceeded or adversely impacted by the proposed development, and
- ☒ the proposed works are of such a minor nature that the requirement for geotechnical advice in the form of a geotechnical report, prepared in accordance with the "Policy", is considered unnecessary for the adequate and safe design of the structural elements to be incorporated into the new works, and
- ☒ in accordance with AS 2870.1 Residential Slabs and Footings, the site is to be classified as a type
(insert classification type)

Class P (disturbed area, landslide risk setting), Class A where founded as per report 7087-G2 Rev 1

civil and
- ☒ I have attached design recommendations to be incorporated in the structural design in accordance with this site classification. [Refer report 7087-G2 Rev 1](#)

I am aware that this declaration shall be used by the Department as an essential component in granting development consent for a structure to be erected within the "G" line area (as identified on the geotechnical maps) of Kosciuszko Alpine Resorts without requiring the submission of a geotechnical report in support of the development application.

2. Signatures

Signature

Mark Bartel

Chartered professional status

CPEng 35641 NER (Civil)

Name

Mark Bartel

Date

8 March 2023

3. Contact details

Alpine Resorts Team

Shop 5A, 19 Snowy River Avenue

P O Box 36, JINDABYNE NSW 2627

Telephone: 02 6456 1733

Facsimile: 02 6456 1736

Email: alpineresorts@planning.nsw.gov.au

SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client and Asset Geotechnical Engineering Pty Ltd ("Asset"), for the specific site investigated. The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

The report should not be used if there have been changes to the project, without first consulting with Asset to assess if the report's recommendations are still valid. Asset does not accept responsibility for problems that occur due to project changes if they are not consulted.

RELIANCE ON DATA

Asset has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps, and plans. Asset has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, Asset will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented, or otherwise not fully disclosed to Asset.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g., a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation program undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation program and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behavior regarding the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

Therefore, the recommendations in the report can only be regarded as preliminary. Asset should be retained during the project implementation to assess if the report's recommendations are valid and whether changes should be considered as the project proceeds.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations,

may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. Asset should be kept appraised of any such events and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that Asset be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience, and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. Asset assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of Asset or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

DATA MUST NOT BE SEPARATED FROM THE REPORT

The report as a whole presents the site assessment and must not be copied in part or altered in any way.

Logs, figures, drawings, test results etc. included in our reports are developed by professionals based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These data should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

PARTIAL USE OF REPORT

Where the recommendations of the report are only partially followed, there may be significant implications for the project and could lead to problems. Consult Asset if you are not intending to follow all the report recommendations, to assess what the implications could be. Asset does not accept responsibility for problems that develop where the report recommendations have only been partially followed if they have not been consulted.

OTHER LIMITATIONS

Asset will not be liable to update or revise the report to consider any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.

Log Abbreviations & Notes

METHOD

borehole logs

AS	auger screw *
AD	auger drill *
RR	roller / tricone
W	washbore
CT	cable tool
HA	hand auger
D	diatube
B	blade / blank bit
V	V-bit
T	TC-bit

* bit shown by suffix e.g. ADV

excavation logs

NE	natural excavation
HE	hand excavation
BH	backhoe bucket
EX	excavator bucket
DZ	dozer blade
R	ripper tooth

coring

NMLC, NQ, PQ, HQ

SUPPORT

borehole logs

N	nil
M	mud
C	casing
NQ	NQ rods

excavation logs

N	nil
S	shoring
B	benched

CORE-LIFT

|| casing installed

⊢ barrel withdrawn

NOTES, SAMPLES, TESTS

D	disturbed
B	bulk disturbed
U50	thin-walled sample, 50mm diameter
HP	hand penetrometer (kPa)
SV	shear vane test (kPa)
DCP	dynamic cone penetrometer (blows per 100mm penetration)
SPT	standard penetration test
N*	SPT value (blows per 300mm)
	* denotes sample taken
Nc	SPT with solid cone
R	refusal of DCP or SPT

USCS SYMBOLS

GW	Gravel and gravel-sand mixtures, little or no fines.
GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels
GM	Gravel-silt mixtures and gravel-sand-silt mixtures.
GC	Gravel-clay mixtures and gravel-sand-clay mixtures.
SW	Sand and gravel-sand mixtures, little or no fines.
SP	Sand and gravel sand mixtures, little or no fines.
SM	Sand-silt mixtures.
SC	Sand-clay mixtures.
ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity.
CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays.
OL	Organic silts
MH	Inorganic silts
CH	Inorganic clays of high plasticity.
OH	Organic clays of medium to high plasticity, organic silt
PT	Peat, highly organic soils.

MOISTURE CONDITION

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

CONSISTENCY

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable

DENSITY INDEX

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Graphic Log

Soil

	Fill
	Peat, Topsoil
	Clay
	Silty Clay
	Gravelly Clay
	Sandy Clay
	Silt
	Sandy Silt
	Clayey Silt
	Gravelly Silt
	Gravel
	Sandy Gravel
	Clayey Gravel
	Silty Gravel
	Sand
	Gravelly Sand
	Silty Sand
	Clayey Sand

Rock

	Sandstone
	Shale
	Clayey Shale
	Siltstone
	Conglomerate
	Claystone
	Dolerite, Basalt
	Granite
	Limestone
	Tuff
	Porphyry
	Pegmatite
	Gneiss, Schist
	Quartzite
	Coal

Other

	Asphalt
	Concrete
	Brick

Water

	Level
	Inflow
	Outflow (complete)
	Outflow (partial)

Boundaries

	Known
	Probable
	Possible

WEATHERING

XW	extremely weathered
HW	highly weathered
MW	moderately weathered
SW	slightly weathered
FR	fresh

STRENGTH

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

RQD (%)

$$= \frac{\text{sum of intact core pieces} > 2 \times \text{diameter}}{\text{total length of core run drilled}} \times 100$$

DEFECTS:

type		coating	
JT	joint	cl	clean
PT	parting	st	stained
SZ	shear zone	ve	vener
SM	seam	co	coating

shape

pl	planar
cu	curved
un	undulating
st	stepped
ir	irregular

roughness

po	polished
sl	slickensided
sm	smooth
ro	rough
vr	very rough

inclination

measured above axis and perpendicular to core

AS1726-2017

Soils and rock are described in the following terms, which are broadly in accordance with AS1726-2017.

Soil

MOISTURE CONDITION

Term	Description
Dry	Looks and feels dry. Fine grained and cemented soils are hard, friable or powdery. Uncemented coarse grained soils run freely through hand.
Moist	Soil feels cool and darkened in colour. Fine grained soils can be moulded. Coarse soils tend to cohere.
Wet	As for moist, but with free water forming on hand.
Moisture content of cohesive soils may also be described in relation to plastic limit (W _p) or liquid limit (W _L) [\gg much greater than, $>$ greater than, $<$ less than, $<<$ much less than].	

CONSISTENCY OF FINE-GRAINED SOILS

Term	Su (kPa)	Term	Su (kPa)
Very soft	< 12	Very Stiff	$> 100 - \leq 200$
Soft	$> 12 - \leq 25$	Hard	> 200
Firm	$> 25 - \leq 50$	Friable	-
Stiff	$> 50 - \leq 100$		

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Term	Density Index (%)	Term	Density Index (%)
Very Loose	< 15	Dense	$65 - 85$
Loose	$15 - 35$	Very Dense	> 85
Medium Dense	$35 - 65$		

PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		> 200
Cobbles		$63 - 200$
Gravel	coarse	$19 - 63$
	medium	$6.7 - 19$
	fine	$2.36 - 6.7$
Sand	coarse	$0.6 - 2.36$
	medium	$0.21 - 0.6$
	fine	$0.075 - 0.21$
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Mass:	
	<u>coarse grained</u>	<u>fine grained</u>
Trace	$\leq 15\%$	$\leq 5\%$
With	$> 15\% - \leq 30\%$	$> 5\% - \leq 12\%$

SOIL ZONING

Layers	Continuous across exposures or sample.
Lenses	Discontinuous, lenticular shaped zones.
Pockets	Irregular shape zones of different material.

SOIL CEMENTING

Weakly	Easily broken up by hand pressure in water or air.
Moderately	Effort is required to break up by hand in water or in air.

USCS SYMBOLS

Symbol	Description
GW	Gravel and gravel-sand mixtures, little or no fines.
GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels.
GM	Gravel-silt mixtures and gravel-sand-silt mixtures.
GC	Gravel-clay mixtures and gravel-sand-clay mixtures.
SW	Sand and gravel-sand mixtures, little or no fines.
SP	Sand and gravel-sand mixtures, little or no fines.
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SC	Sand-clay mixtures.
ML	Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity.
CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays.
OL	Organic silts
MH	Inorganic silts
CH	Inorganic clays of high plasticity.
OH	Organic clays of medium to high plasticity, organic silt
PT	Peat, highly organic soils.

Rock

SEDIMENTARY ROCK TYPE DEFINITIONS

Rock Type	Definition (more than 50% of rock consists of)
Conglomerate	... gravel sized ($> 2\text{mm}$) fragments.
Sandstone	... sand sized (0.06 to 2mm) grains.
Siltstone	... silt sized ($< 0.06\text{mm}$) particles, rock is not laminated.
Claystone	... clay, rock is not laminated.
Shale	... silt or clay sized particles, rock is laminated.

LAYERING

Term	Description
Massive	No layering apparent.
Poorly Developed	Layering just visible. Little effect on properties.
Well Developed	Layering distinct. Rock breaks more easily parallel to layering.

STRUCTURE

Term	Spacing (mm)	Term	Spacing
Thinly laminated	< 6	Medium bedded	$200 - 600$
Laminated	$6 - 20$	Thickly bedded	$600 - 2,000$
Very thinly bedded	$20 - 60$	Very thickly bedded	$> 2,000$
Thinly bedded	$60 - 200$		

STRENGTH (NOTE: Is50 = Point Load Strength Index)

Term	Is50 (MPa)	Term	Is50 (MPa)
Extremely Low	< 0.03	High	$1.0 - 3.0$
Very low	$0.03 - 0.1$	Very High	$3.0 - 10.0$
Low	$0.1 - 0.3$	Extremely High	> 10.0
Medium	$0.3 - 1.0$		

WEATHERING

Term	Description
Residual Soil	Material is weathered to an extent that it has soil properties. Rock structures are no longer visible, but the soil has not been significantly transported.
Extremely	Material is weathered to the extent that it has soil properties. Mass structures, material texture & fabric of original rock is still visible.
Highly	Rock strength is significantly changed by weathering; rock is discolored, usually by iron staining or bleaching. Some primary minerals have weathered to clay minerals.
Moderately	Rock strength shows little or no change of strength from fresh rock; rock may be discolored.
Slightly	Rock is partially discolored but shows little or no change of strength from fresh rock.
Fresh	Rock shows no signs of decomposition or staining.

DEFECT DESCRIPTION

Type	
Joint	A surface or crack across which the rock has little or no tensile strength. May be open or closed.
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering/bedding. May be open or closed.
Sheared Zone	Zone of rock substance with roughly parallel, near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects.
Seam	Seam with deposited soil (infill), extremely weathered insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed).

Shape

Planar	Consistent orientation.
Curved	Gradual change in orientation.
Undulating	Wavy surface.
Stepped	One or more well defined steps.
Irregular	Many sharp changes in orientation.

Roughness

Polished	Shiny smooth surface.
Slickensided	Grooved or striated surface, usually polished.
Smooth	Smooth to touch. Few or no surface irregularities.
Rough	Many small surface irregularities (amplitude generally $< 1\text{mm}$). Feels like fine to coarse sandpaper.
Very Rough	Many large surface irregularities, amplitude generally $> 1\text{mm}$. Feels like very coarse sandpaper.

Coating

Clean	No visible coating or discolouring.
Stained	No visible coating but surfaces are discolored.
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	Visible coating = 1mm thick. Thicker soil material described as seam.

SITE PHOTOS



Photo 1

General view of site looking upslope, ski conveyor shown in foreground, aerial jump shown in background.



Photo 2

General view looking downhill showing two rock outcrop areas to be removed.



Photo 3

Continuation of Photo 2 shown ski conveyors in background, upper rock area to be removed to the left, and toe of aerial jump to the right.



Photo 4

Continuation of Photo 3 showing side view of aerial jump