

Our ref: 7237-G1 Rev1  
11 June 2025



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Vail Resorts  
PO Box 42  
Perisher Valley NSW 2624

**Attention: Sophie Ballinger**

Dear Sophie,

## **Ski Slope above Guthega Nordic Centre, Guthega NSW Geotechnical Assessment**

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### **1 Introduction**

#### **1.1 General**

This report presents the results of a geotechnical assessment for the proposed redevelopment of the Ski Slope above Guthega Nordic Centre at Guthega NSW (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 21 April 2023, reference 70237-P1.

Civil Engineering Plans were recently provided to us for this report update. The plans are by CLM Civil, reference V-317, 8 sheets, revision A, dated 17 April 2024. Based on these plans, we understand that the project involves widening of a ski slope above the Guthega Nordic Centre to minimum 6m width to permit access for Caterpillar snowplough equipment. Some flattening of the track gradient is also proposed, up to a maximum of about 1.5m depth, and a rock retaining wall will also be required.

The Site lies within the G-line as defined in DIPNR's "Geotechnical Policy – Kosciuszko Alpine Resorts", November 2003. However, given that the proposed earthworks will likely be relatively minor and based on expected weathered granite at relatively shallow depth, 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, earthworks, and retaining.

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 at the rear of the Guthega Nordic Centre in Guthega, as shown in Plate 1.



**Plate 1 – Site Locality**

Topographically, the Site is in moderately to steeply sloping terrain. In the site vicinity, the slopes are estimated to be about 23° to 32° above the existing track, and up to 32° below the track down to the rear of the Guthega Visitors Centre.

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.

Granite rocks can be seen outcropping in the site vicinity and numerous granite boulders were observed within the slope above the track. It is expected that variably weathered granite is located at relatively shallow depth below the ground surface.

No seepage was observed during the walkover observations.

### 3 Discussions & Recommendations

Widening and lowering the existing track will require cutting of up to about 1.2m depth into the existing slope above the track. It will not be feasible to batter this slope due to the existing slope angle. It will therefore be necessary to construct a retaining wall to support the uphill slope where the cut exposes soil and extremely / highly weathered granite. If less weathered granite is exposed, no retaining would be required (subject to inspection by a geotechnical engineer).

The slope below the track would not require modification as part of the development.

Alternatives for a retaining wall (if required) include:

- Boulder retaining wall using granite boulders won from site and nearby.
- Gabion wall.
- Mortared stone (gravity) wall.

The wall design details will depend on the actual depth of cut and the material exposed in the cut, which will require detailed survey and further investigation. For preliminary design purposes, a boulder retaining wall height of 1.5m would require a base width of about 1.5m and a top width of 0.5m with subsoil drainage behind that is piped to a suitable discharge point.

In view of the landslide risk setting, a general site classification for the retaining wall would be Class P (Problem site). However, founding within extremely weathered or better granite bedrock would justify a less severe classification, Class A. It is expected that an allowable bearing pressure of 200kPa would be achievable at the retaining wall foundation level, but inspection of footing excavations by a Geotechnical Engineer is required to verify the founding conditions.

### 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**



**Mark Bartel**

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

Encl: Site Photos  
Important Information about your Geotechnical Report  
Soil and Rock Explanation Sheets  
Form 4 – Minimal Impact Certification

## Document Control

### Distribution Register

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

### Document Status

Rev	Revision Details	Date	Author	Reviewer	Approver
0	Initial issue	8 September 2023	MAB		MAB
1	Reference plans	11 June 2025	MAB		MAB



ISO 9001:2015  
ISO 14001:2015  
ISO 45001:2018 AS/NZS 4801:2001

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## Site Photos



**Photo 1**

General view of slope at rear of Guthega Nordic Centre.





**Photo 2**

General view looking along track to be widened, Guthega Nordic Centre downslope.





**Photo 3**

Continuation of Photo 2, note boulders exposed in slope above track.





**Photo 4**

Continuation of Photo 3, note exposed boulders above track.





**Photo 5**

View of slope between track and Guthega Nordic Centre.

## Scope of Services

The geotechnical report ("the report") was prepared in accordance with the contractual scope of services between the Client and AssetGeoEnviro ("Asset") for the specific site investigated. The scope of work may have been limited by factors like time, budget, access, or site disturbance.

Consult Asset before using the report if the project has changed. Asset won't be responsible for problems caused by project changes if not consulted.

## Reliance on Data

Asset prepared the report using data provided by the Client and other individuals and organizations, including surveys, analyses, designs, maps, and plans. Asset has not verified the accuracy or completeness of the data except as stated in the report. Asset won't be liable for incorrect conclusions based on incorrect data, information, or conditions if they're concealed, withheld, misrepresented, or not fully disclosed.

## Geotechnical Engineering

Geotechnical engineering heavily relies on judgment and opinion, making it less precise than other engineering disciplines. Reports are tailored to specific clients, projects, and needs, and may not be suitable for other clients or purposes. The report should only be used for its intended purpose unless additional geotechnical advice is obtained. If further geotechnical advice isn't obtained, the report can't be used if the proposed development's nature or details change.

## 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 apprised 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 organization 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 organization 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 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.

## Report Recommendations not Followed

Where the report's recommendations are not followed, there may be significant implications for the project (e.g., commercial, property, personal, or life loss). Consult Asset if you don't intend to follow all the report recommendations. Asset won't accept responsibility if all the report recommendations aren't followed.

## 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 Sandy
	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	veneer
SM	seam	co	coating

### shape

pl	planar	po	polished
cu	curved	sl	slickensided
un	undulating	sm	smooth
st	stepped	ro	rough
ir	irregular	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 molded. 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 <sub>p</sub> ) or liquid limit (W <sub>L</sub> ) [ $\gg$ much greater than, $\gg$ greater than, $\lt$ less than, $\lt\lt$ much less than].	

#### CONSISTENCY OF FINE-GRAINED SOILS

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

#### RELATIVE DENSITY OF COARSE-GRAINED SOILS

Term	Density Index (%)	Term	Density Index (%)
Very Loose	$\lt 15$	Dense	$65 - 85$
Loose	$15 - 35$	Very Dense	$\gt 85$
Medium Dense	$35 - 65$		

#### PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		$\gt 200$
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		$0.002 - 0.075$
Clay		$\lt 0.075$

#### MATERIAL DELINEATION

Sand or gravel	$\gt 65\%$ above 0.075mm
Clay or silt	$\gt 35\%$ below 0.075mm

#### MINOR COMPONENTS

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

#### 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.
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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 ( $\gt 2\text{mm}$ ) fragments.
Sandstone	... sand sized ( $0.06$ to $2\text{mm}$ ) grains.
Siltstone	... silt sized ( $\lt 0.06\text{mm}$ ) 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	$\lt 6$	Medium bedded	$200 - 600$
Laminated	$6 - 20$	Thickly bedded	$600 - 2,000$
Very thinly bedded	$20 - 60$	Very thickly bedded	$\gt 2,000$
Thinly bedded	$60 - 200$		

#### STRENGTH (NOTE: Is50 = Point Load Strength Index)

Term	Is50 (MPa)	Term	Is50 (MPa)
Very Low	$0.03 - 0.1$	High	$1.0 - 3.0$
Low	$0.1 - 0.3$	Very High	$3.0 - 10.0$
Medium	$0.3 - 1.0$	Extremely High	$\gt 10.0$

#### 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 $\lt 1\text{mm}$ ). Feels like fine to coarse sandpaper.
Very Rough	Many large surface irregularities, amplitude generally $\gt 1\text{mm}$ . 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 = $1\text{mm}$ thick. Thicker soil material described as seam.



## 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

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

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

(List of documentation reviewed)

Civil Plans (by CLM Civil, project V-317, 8 sheets, revision A, 17/4/24)

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 (landslide risk setting), Class A if founding on rock
- ☒ I have attached design recommendations to be incorporated in the ~~structural~~ <sup>civil</sup> design in accordance with this site classification. Refer report 7237-G1 Rev1

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

11 June 2025

## 3. Contact details

### Alpine Resorts Team

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