

Our ref: 7604-R1-Rev3
28 January 2025



Thredbo Alpine Resort
By email: chris_byrnes@evt.com

Attention: Chris Byrnes

Dear Chris,

Proposed Installation of Snowmaking Unit, Friday Flat, Thredbo NSW Geotechnical Assessment

1. Introduction

1.1 General

This report presents the results of a geotechnical assessment for a Proposed Installation of a new snowmaking unit at Friday Flat, Thredbo NSW (the Site). The assessment was commissioned on 21 August 2024 by Chris Byrnes of EVT / Kosciuszko Thredbo Pty Ltd. The work was carried out in accordance with the proposal by AssetGeoEnviro (Asset) dated 19 August 2024, reference 7604-P1.

Drawings supplied to us for this investigation comprised:

- Site Plan prepared by Kosciuszko Thredbo Pty Ltd, project 'Thredbo Snowmaking Unit', revision H, dated 22 January 2025.
- Snowmaking Trench Cross Section Details prepared by Kosciuszko Thredbo Pty Ltd, project 'Thredbo Snowmaking Unit', revision 2, dated 26 September 2024.
- Buried services – trench GA, prepared by Kosciuszko Thredbo Pty Ltd, project 'Thredbo Snowmaking Unit', dwg no. SM-911, revision 2, dated 22 January 2025.
- Stormwater Trench Section Details prepared by Kosciuszko Thredbo Pty Ltd, project 24015MO, undated.
- Civilcast's Precast Concrete products brochure.
- Product specifications sheet prepared by KTI-Plersch Kältetechnik GmbH, ref 10057536, dwg 00, dated 3 April 2023.

Based on the supplied drawings, we understand that the project involves installation of a snowmaking unit located directly adjacent to the top of Wombats Snow runner in the middle of Friday Flat with associated underground snow feeder pipes and distribution pits for purpose of distributing snow. We also understand that the Denmac Lenko snowmaking unit, weighs approximately 28m190kg and will be supported by a combination of piers and concrete slab on ground. Also, 13 new pits named as P1 to P13 are proposed to be built, in which P.1, P.2, P.5 are proposed to be 1.2 x 1.2 x 1.2m precast concrete pits (product code: PT212 1200), and the remaining P.3, P.4 are proposed to be 1.268 x 0.455 x 0.836m.

Based on the supplied trench detail drawing, it is understood that three 100mm diameter snow distribution pipes to pits 2, 3, and 4 is to be installed in a single trench nominally 450mm wide with minimum 250mm cover, total trench depth nominal 500mm. Similar design applied for 2 pipes trench running distribution pipes from pit 2 to 5.

Comparably, four 100mm diameter snow distribution pipes to pits 1, 5, 6, 7, and 8 is to be installed in a single trench nominally 600mm wide with minimum cover of 250mm and total depth of 500mm.

A stormwater drainage trench is also proposed, 300mm wide by 600mm depth with about 400mm cover, excavation of no more than 1m depth is expected.

Also, based on the contour map and provided information, a retaining wall of up to 1.2m high is proposed for the Northwest quadrant of the installation site. The retaining structure proposed to be concrete sleepers slotted into vertically mounted steel U beam. The beam will be concreted in piers with depth equal to wall height.

Whilst the site lies within an area designated as "G" as defined in the maps accompanying DIPNR's "Geotechnical Policy – Kosciuszko Alpine Resorts", November 2003, considering the minimal extent and relatively shallow depth required for the development, and the relatively low bearing pressure imposed on the ground by the structure, the development is considered 'minimal impact' and a full geotechnical report is not required to accompany the development application as per the requirements of the Geotechnical Policy.

1.2 Scope of Work

The objective of the Geotechnical Assessment is to provide information on the surface conditions and likely subsurface conditions, and to provide a Site Classification to AS2870-2011 'Residential Slabs and Footings' and a Form 4 certification with design recommendations.

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

- Review of available reports and maps held within our files, especially focusing on invasive investigations carried out by Asset in the vicinity of the proposed snow factory (ref: 6262-G1; dated: 2 November 2020, and ref: 6751-G1; dated: 6 February 2022).
- Desktop study, engineering assessment, and reporting including Form 4 for minimal impact certification.

Our report describes the surface and subsurface conditions and provides recommendations on:

- Key geotechnical constraints to the development.
- Subgrade preparation and earthworks.
- Suitable foundation options.
- Settlement.
- Site Classification as per AS2870 'Residential Slabs and Footings' (2011).

2. Site Description

The proposed installation site is located directly adjacent to the top of Wombats Snowrunner in the middle of Friday Flats. The Site is located on a very gently undulating terrain and generally slopes down to the

south at less than about 3° to 5° towards Friday Drive. The Site is bounded to the east by Gunbarrel Express Bottom Station and elsewhere by grass land.

Topographically, the Site is situated at the toe of a gentle slope of about 10° to 12° up to the northwest before again increasing to about 22° to 26°. Heavy populated buried services are located to the north- east of the Site.

The 1:250,000 Tallangatta Geological Map indicates the site is underlain by Silurian aged intrusive granite.

3. Subsurface Conditions

The geotechnical investigation previously conducted by Asset located closest to the proposed installation site is job number 6262 completed in 2020. The invasive investigation included excavation of test pits at eight locations using a Kubota U17-3 excavator. The test pits were terminated at depths ranging from 1 m to 1.5 m. Specifically, results from test pits numbered 4, 5, and 6 are used for the geological assessment due to their proximity to the proposed snowmaking installation site. Test pits 4 and 5 located at about 30 metres to the East of the installation site and test pit 6 located at about 50 metres to the West of the installation site.

Also, results from 4 hand-augered boreholes from job number 6751 (dated 29 Nov 2021) have been assessed. The invasive investigation at this job included drilling of hand auger boreholes and conducting Dynamic Cone Penetrometer (DCP) soundings at four locations. The boreholes were auger drilled to depths of 0.2m to 0.72 below ground level (bgl) and were discontinued at the recorded depths due to reaching refusal on inferred weathered granite and or very stiff to hard clayey fill soil. The DCP soundings were terminated at depths of 0.2m to 1.3m at 'solid' refusal on inferred Granite bedrock or boulder.

A marked-up plan showing these test locations in relation to the proposed installation site is attached.

3.1 Subsurface Conditions

A generalised geotechnical model for the Site has been developed is shown in Table 1 based on log results from test pits 4,5 and 6 from job number 6262. For a detailed description of the subsurface conditions, refer the attached engineering logs and explanatory notes.

Table 1 – Generalised Site Geotechnical Model

Unit	Origin	Description	Depth to Top of Unit ¹ (m)	Unit Thickness ¹ (m)
1	Topsoil	SILT, medium plasticity, dark grey, grass roots	Ground surface	0.2
2	Fill	GRAVEL, fine to medium grained, over geofabric	Ground surface	0.1
2a	Fill	Mixture of Clayey SAND and Cobbles and small boulders to 300mm size, tree roots. TP6 only	0.1	1.2
3	Colluvium	CLAY, medium plasticity, dark brown to orange-brown, some cobbles to 200mm	0.1	1.4
4	Residual	Clayey SAND, medium to coarse grained, light grey/brown. COMPLETELY WEATHERED GRANITE	1.2	Not proven beyond a depth of 1.4

Notes:

1. The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the Site.

3.2 Groundwater

Groundwater was not observed in the test pits during excavation to depths of 1.4m to 1.6m bgl. It is noted that the groundwater observation may have been made before water levels had stabilised. No long-term groundwater monitoring was carried out.

4. Discussions & Recommendations

The excavation for the proposed work is expected to range from 0.6m to 1m depth for the strip footing and Snow Distribution Pipe layout, and up to about 1.2m for the retaining wall at the high end of the snowmaking slab and is anticipated to be almost entirely within soils of variable nature including fill and possibly completely weathered granite and cobbles. Rock excavation is not anticipated to be required but possibly some boulders may be encountered. Filling is generally not expected except for trench backfill and minor filling of up to about 0.5m thickness on the low end of the snowmaking slab.

The proposed works will have 'minimal geotechnical impact' on the site, based on the generally relatively shallow depths of excavation required, the relatively low bearing pressure beneath the footings, and the lack of obvious signs of hillside instability observed or expected. A completed Form 4 – Minimal Impact Certification – is attached to this report. Recommendations for the development are provided in the following sections.

4.1 Subgrade Preparation

The following general recommendations are provided for subgrade preparation for earthworks, proposed strip footings, and minor structures:

- Strip existing topsoil.
- Excavate to a suitable subgrade (firm or better clays / medium dense or better sandy soils).

Any waste soils being removed from the Site must be classified in accordance with current regulatory authority requirements to enable appropriate disposal to an appropriately licensed landfill facility.

4.2 Filling

Where filling (anticipated to be minor, less than say 0.5m depth) is required, place in horizontal layers over prepared subgrade and compact as per Table 2.

Table 2 – Compaction Specifications

Parameter	Cohesive Fill	Non-Cohesive Fill
Fill layer thickness (loose measurement):		
• Within 1.5m of the rear of retaining walls	0.2m	0.2m
• Elsewhere	0.3m	0.3m
Density:		
• Beneath Pavements	≥ 95% Std	≥ 70% ID
• Beneath Structures	≥ 98% Std	≥ 80% ID
• Upper 150mm of subgrade	≥ 100% Std	≥ 80% ID
Moisture content during compaction	± 2% of optimum	Moist but not wet

Any soils to be imported onto the Site for backfilling and reinstatement of excavated areas should be free of contamination and deleterious material and should include appropriate validation documentation in

accordance with current regulatory authority requirements which confirms its suitability for the proposed land use.

4.3 Batter Slopes

Excavations are anticipated to be minor, less than about 1m depth. Temporary batter slopes may be cut vertically up to 1m depth. Recommended maximum slopes for temporary batters greater than 1m and up to 2m depth, should they be required, are presented in Table 3.

Table 3 – Recommended Maximum Dry Batter Slopes (>1m to 2m depth)

Unit	Maximum Batter Slope (H : V)
	Temporary
Residual Clay & colluvium & fill	1 : 1
Completely decomposed Granite	0.75 : 1
Highly weathered Granite	0.5 : 1

4.4 Site Classification

Due to the presence of fill, the Site is classified as a Class P (Problem) Site in accordance with AS 2870–2011 “Residential Slabs and Footings”. This requires that footings be designed from first principles rather than relying on standard footings in AS2870-2011.

4.5 Footings

Based on the draft structure drawing, and information provided in the product specifications sheet, the average bearing pressure beneath the footings is expected to be insignificant. An allowable bearing pressure of 100kPa may be adopted for the firm or better clays / medium dense or better sands below the strip footings. Footing excavations should be inspected to verify that suitable founding material has been reached.

5. 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 previous limited investigations. To confirm the assessed soil and rock properties in this report, further site-specific investigation and / or construction inspections would be required.

This report may have included geotechnical recommendations for design and construction of temporary works (e.g., temporary batter slopes or temporary shoring of excavations). Such temporary works are expected to perform adequately for a relatively short period only, which could range from a few days (for temporary batter slopes) up to six months (for temporary shoring). This period depends on a range of factors including but not limited to: site geology; groundwater conditions; weather conditions; design criteria; and level of care taken during construction. If there are factors which prevent temporary works from being completed and/or which require temporary works to function for periods longer than originally designed, further advice must be sought from the Geotechnical Engineer and Structural Engineer.

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: Figure 1 – Previous Test Locations
Important Information about your Geotechnical Report
Soil and Rock Explanation Sheets
Form 4

Document Control

Distribution Register

Copy	Media	Recipient	Location
1	Secure PDF	Chris Byrnes	Thredbo Alpine Resort
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Document Status

Rev	Revision Details	Date	Author	Reviewer	Approver
0	Initial issue	12 September 2024	TK	MAB	MAB
1	Minor adjustment	26 September 2024	TK	MAB	MAB
2	Revised trench design	13 November 2024	TK	MAB	MAB
3	Revised plans	28 January 2025	MAB		MAB

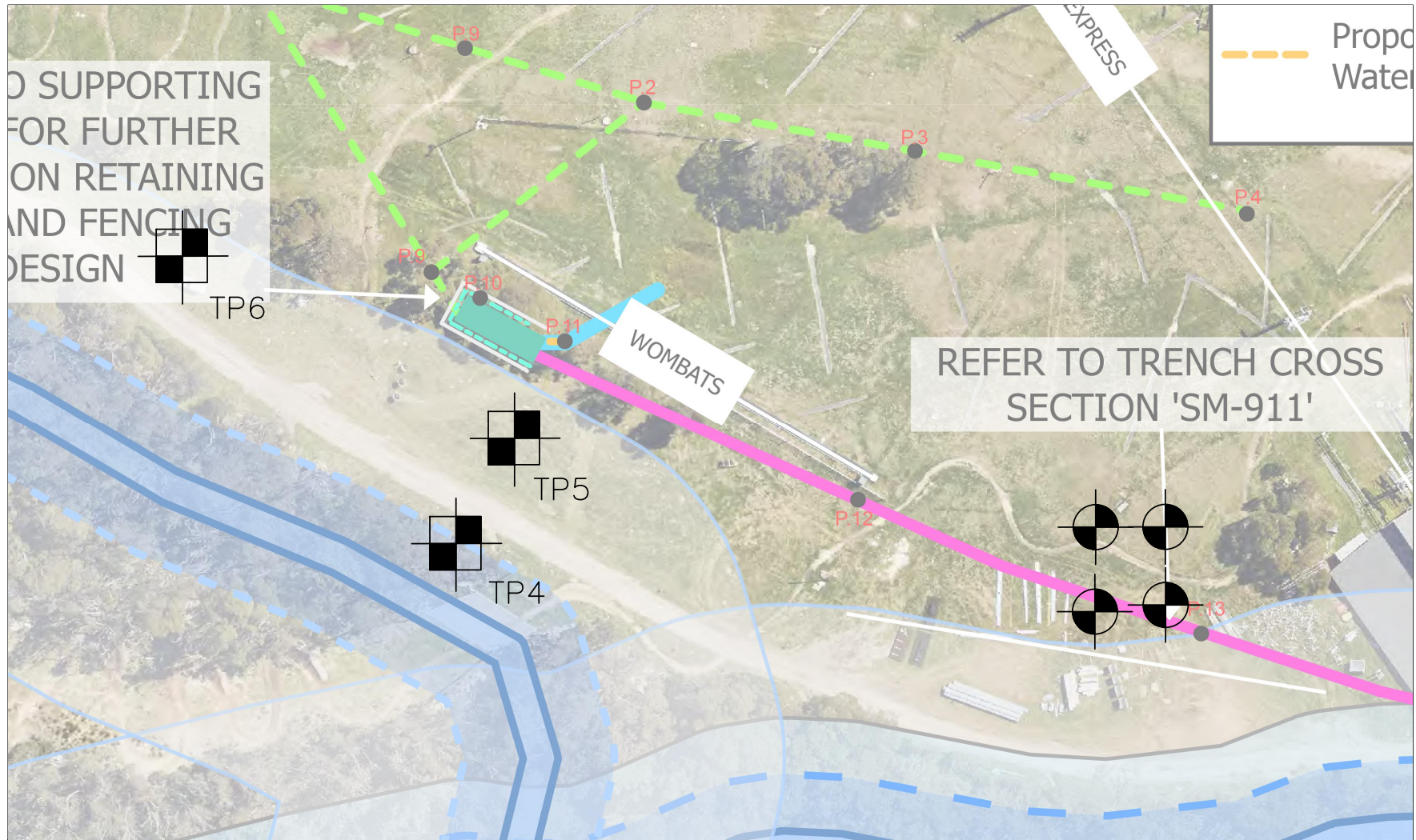


ISO 9001:2015
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APPROXIMATE ONLY.
 SOURCE: •Site Plan prepared by Kosciuszko Thredbo Pty Ltd;
 project: Thredbo Snowmaking Unit ; revision:
 F: dated: 25 October 2024.
 THIS DRAWING IS USED TO ILLUSTRATE TEST LOCATIONS ONLY,
 AND MUST NOT BE USED FOR ANY OTHER PURPOSE.

LEGEND 6751-Boreholes 6262-Test pits

0 1:2,000 A4 100m



issue	date	description
E	28.1.25	Revised Plans
D	12.11.24	Revised Plans
C	8.11.24	Revised Trench Design
B	26.09.24	Minor Adjustment



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Proposed Snowmaking Unit Installation,
 Thredbo Friday Flats
 For
 Thredbo Alpine Resort

Previous Test Locations

drawn: TK/MAB

date: 28.1.2025

checked: MAB

scale: 1:3000 A4

job no.:

7604

fig:

1

issue:

E

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 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 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	veneer
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) [$>>$ 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		$0.002 - 0.075$
Clay		< 0.075

MATERIAL DELINEATION

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

MINOR COMPONENTS

Term	Proportion by Mass:
	<u>coarse grained</u> <u>fine grained</u>
Trace	$\leq 5\%$ $\leq 5\%$
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.
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.

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)
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	>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 in situ 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.

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)

Site Plan by Kosciuszko Thredbo Pty Ltd, Thredbo Snowmaking Unit, revision H, dated 22 January 2025.
Snowmaking trench Cross Section Details prepared by Kosciuszko Thredbo Pty Ltd, project ‘Thredbo Snowmaking Unit’, revision 2, dated 26 September 2024.
Product Specifications Sheet by KTI-Plersch Kältetechnik GmbH, ref 10057536, dwg 00, dated 3 April 2023.
Civilcast Precast Concrete Products Brochure
Buried services – trench GA, prepared by Kosciuszko Thredbo Pty Ltd, project ‘Thredbo Snowmaking Unit’, dwg no. SM 911, revision 2, dated 22 January 2025.
Stormwater Trench Section Details prepared by Kosciuszko Thredbo Pty Ltd, project 24015MO, undated.

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

- ☒ I have attached design recommendations to be incorporated in the structural design in accordance with this site classification.

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

28 January 2025

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