Statement of Environmental Effects

Thredboland and Freeriders Beginner Zone

Thredbo Alpine Resort
Kosciuszko National Park, NSW
September 2022

Document Control

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Contents

Figures

Tables

Executive Summary

Summary of the Development Application	
Development Proposal	This Statement of Environmental Effects (SEE) has been prepared to support the Development Application (DA) for the Thredboland and Freeriders Beginner Zone Project (the Development). The DA is for the installation of a snowrunner and Snowsports School (Snowsports) operations building within the Friday Flat Ski Area, Thredbo Alpine Resort, approximately 35 kilometres (km) south-west of Jindabyne, New South Wales (NSW). The Development will provide a dedicated snowrunner and teaching terrain to be utilised by Snowsports for kids lessons and programs (i.e. Thredboland and Freeriders ski and snowboard programs). The Development comprises the following: • installation of snowrunner, gallery roofing and two (2) operators hut, including minor earthworks; • construction of Snowsports operations building; • trenching for electricity and communications cable to service the new snowrunner and Snowsports operations building; • construction of stairway adjacent to the Mountain access road; and • extension of an existing gabion retaining wall with a rock retaining wall.
Site Details	**Lot Description**: Lot 876/DP 1243112
	Total disturbance area: Approximately 320 m^2
	Zoning: Kosciuszko National Park
Applicant	Kosciuszko Thredbo Pty Ltd
Key Planning Considerations	The proposed development is subject to the requirements of the *State Environmental Planning Policy (Precincts – Regional) 2021* (Regional Precincts SEPP). As such, the Department of Planning and Environment (DPE) Minister for Planning is the consent authority for the DA. The Development has been assessed against the relevant requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), *Environmental Planning and Assessment Act 1979* (EP&A Act), *National Parks and Wildlife Act 1974* (NPW Act), *Biodiversity Conservation Act 2016* (BC Act), *Water Management Act 2000* (WM Act) and associated statutory instruments.
Key Environmental Matters	The Development will have minimal impacts on the natural environment given the highly disturbed nature of the site, no removal of native tree or shrubs is required and the minor disturbance footprint. Appropriate environmental controls will be implemented in accordance with the Site Environmental Management Plan (SEMP) during construction. The Development will provide an additional snowrunner and associated building which fits with the current built form within Friday Flat. As such, impacts on the built environment are expected to be negligible. The social and economic impacts of the Development will be positive through the provision of an additional dedicated ski area for beginner skiers and snowboarders which will contribute to an enhanced guest experience. The Development will also generate construction jobs, though the impacts will be nominal.

1 Introduction

This Statement of Environmental Effects (SEE) has been prepared to support the Development Application (DA) for the Thredboland and Freeriders Beginner Zone Project (hereinafter referred to as the Development). The Applicant for the DA is Kosciuszko Thredbo Pty Ltd (KT) (ABN 95 000 139 015).

The Development will provide a dedicated snowrunner and teaching terrain to be utilised by the Snowsports School (Snowsports) for kids lessons and programs (i.e. Thredboland and Freeriders ski and snowboard programs). The Development site is located within the Friday Flat Ski Area (Friday Flat), Thredbo Alpine Resort (Thredbo) within Kosciuszko National Park (KNP), approximately 35 kilometres (km) south-west of Jindabyne, New South Wales (NSW).

The Development will comprise the following:

- installation of snowrunner, gallery roofing and two (2) operators hut, including minor earthworks;
- construction of Snowsports operations building;
- trenching for installation of services, including electricity and communications cable, and sewer and water pipes;
- construction of stairway adjacent to the Mountain access road; and
- extension of an existing gabion retaining wall with a rock retaining wall.

Developments in NSW alpine resort areas are governed by the *State Environmental Planning Policy (Precincts – Regional) 2021* (Regional Precincts SEPP). The Department of Planning and Environment (DPE) Minister for Planning is the consent authority under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This SEE has been prepared in accordance with the relevant statutory requirements.

1.1 Purpose

The purpose of this SEE is to:

- describe the proposed development in relation to the existing environment;
- evaluate the proposed development against the relevant statutory planning framework; and
- assess the following key issues in relation to the proposed development –
    - the impacts of the development on the natural, human and built environment and how these impacts have been identified
    - mitigation and management measures that will be taken to protect the environment or to reduce expected environmental harm
    - any specific matters identified by the Secretary of DPE.

2 The Site

2.1 Regional Context

The Development site is located in Thredbo, within the southern part of KNP, approximately 35 km south-west of Jindabyne, NSW, within the Snowy Monaro Regional Local Government Area (LGA) (**Figure 1**). Thredbo is located approximately 500 km from Sydney, and 200 km from Canberra.

2.2 Local Context

The Development site is located within Friday Flat, within the head lease allotment, on land formally described as Lot 876/DP 1243112 (**Figure 2**). Site photos are provided in **Appendix A**.

2.3 History of the Site / Present and Previous Land Uses

Friday Flat was established in the 1980s and has been subject to expansion and various maintenance projects over the past 40+ years, including (but not limited to) the construction of ski lifts and snowrunners, extension to ski area, installation of minor structures (e.g. huts) and snowmaking infrastructure.

During summer operations the site is generally vacant, with the exception of a small area used for storage of materials e.g. chairlift seats. Prior to 2019, during winter operations the site had been used to access the Gunbarrel Chairlift. The site is no longer operationally utilised to access the Gunbarrel Chairlift, with all traffic being directed to the lift access on the eastern side of Gunbarrel bottom station.

The site comprises snowmaking infrastructure and underground services. KT have recently installed additional snowmaking infrastructure within this location, which was subject to DA 22/458 (Friday Flat Fan Gun Project).

The surrounding land uses include (**Figure 3**):

- north: ski run (High Noon spillway / bottom of Easy Does It);
- east: Gunbarrel bottom station;
- south: mountain access road, snowmaking infrastructure, tourist accommodation (River Inn); and
- west: Werners Way / Wombats snowrunner.

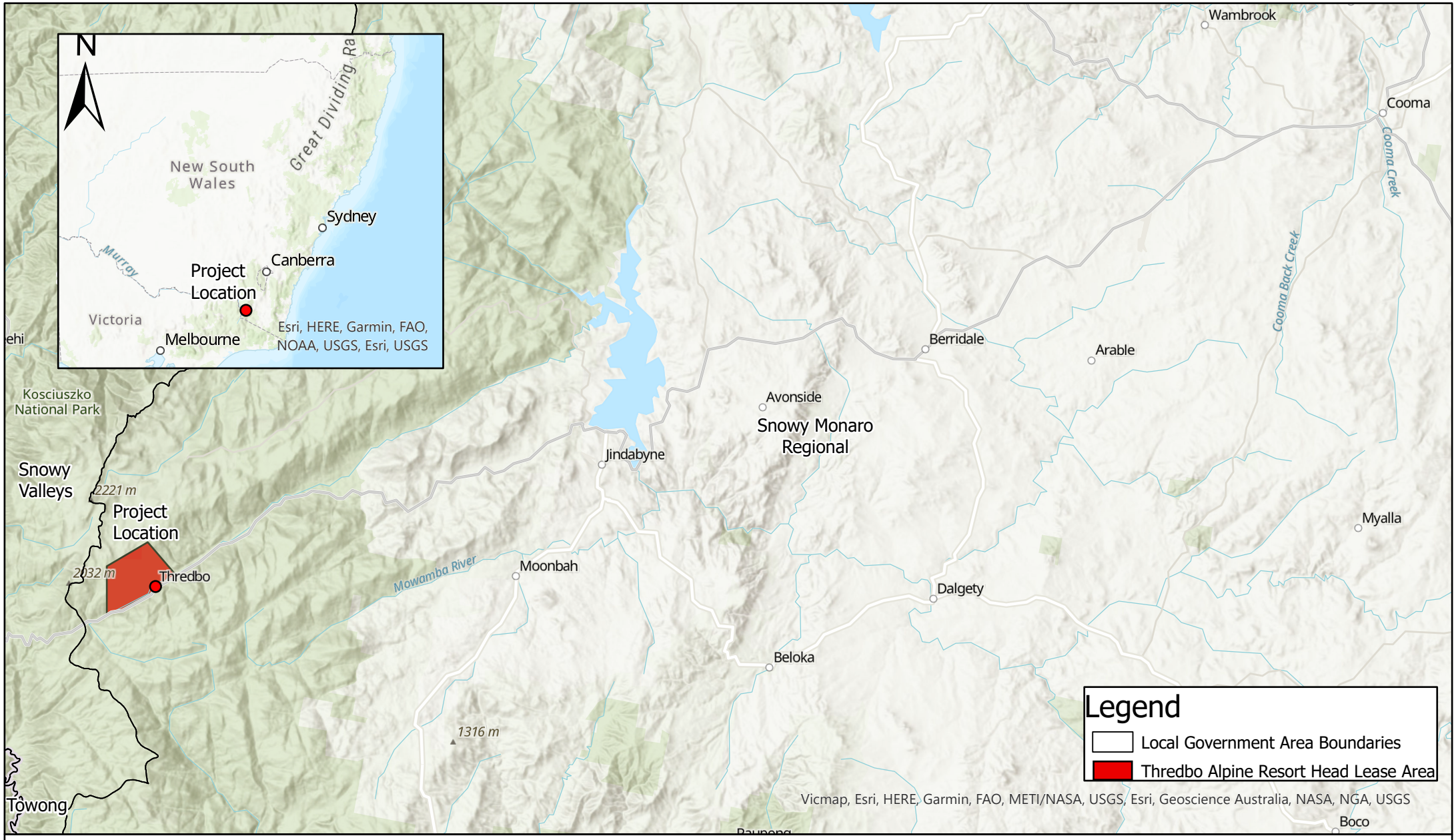
The site is zoned as C1 – National Parks and Nature Reserves (formerly E1) (NSW Government 2022a).

2.4 Site Description and Suitability

The Development site is located within a heavily disturbed environment, predominately comprising an existing ski run and the summer Mountain access road (**Figure 4**). There are no records of contamination within or adjacent to the site.

The site is considered suitable for the proposed Development given the following:

- the site is heavily disturbed;
- the site is not operationally utilised during winter;
- the site does not contain any conservation significant flora or fauna species;
- no native tree or shrub clearing is required (only minor grass clearing);
- the site comprises a gentle slope which is appropriate for beginners;
- the site is located away from the busier central section of the Friday Flat base area; and
- the site is located close to the Thredboland building where kids commence their lessons.



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3 1.5 0 3 6 9 12

Kilometers

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 55

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THREDBO

FIGURE 1: REGIONAL SITE CONTEXT

Revision: A

Date: 7/06/2022

Produced By: KO

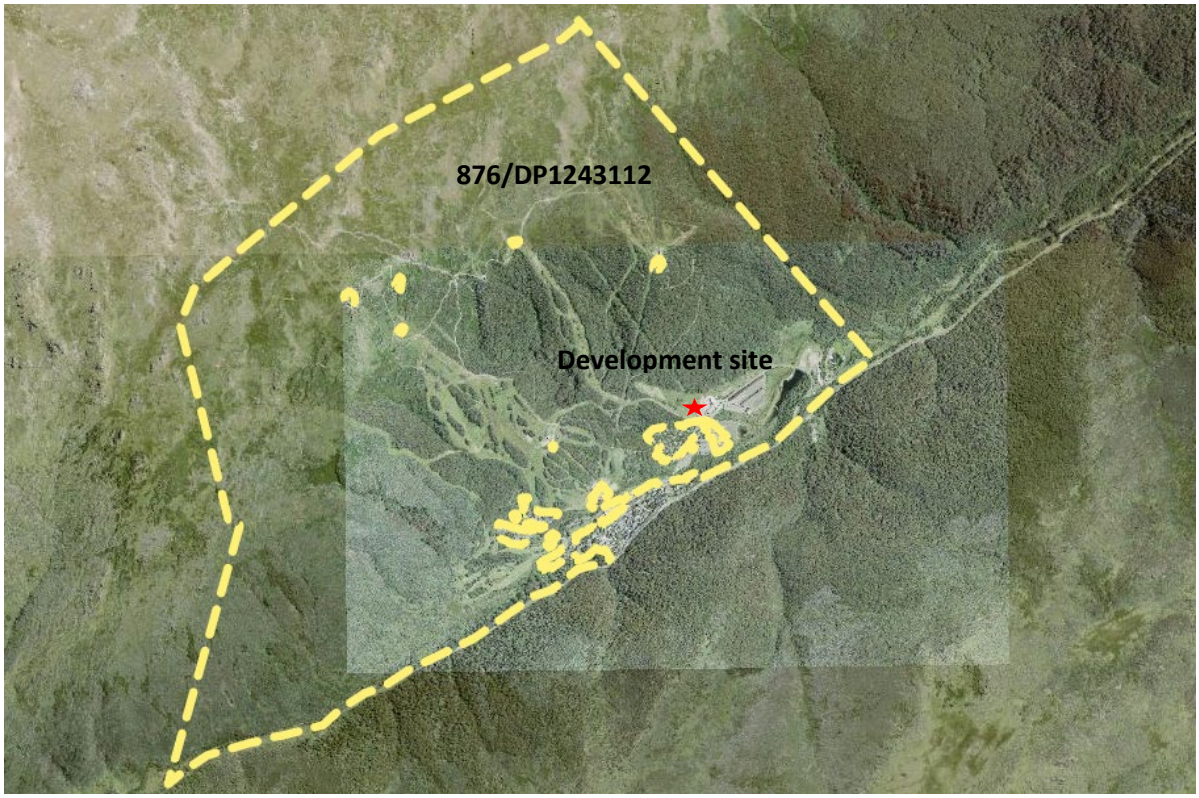


Figure 2: Local Site Context (Source: NSW Government 2022a)

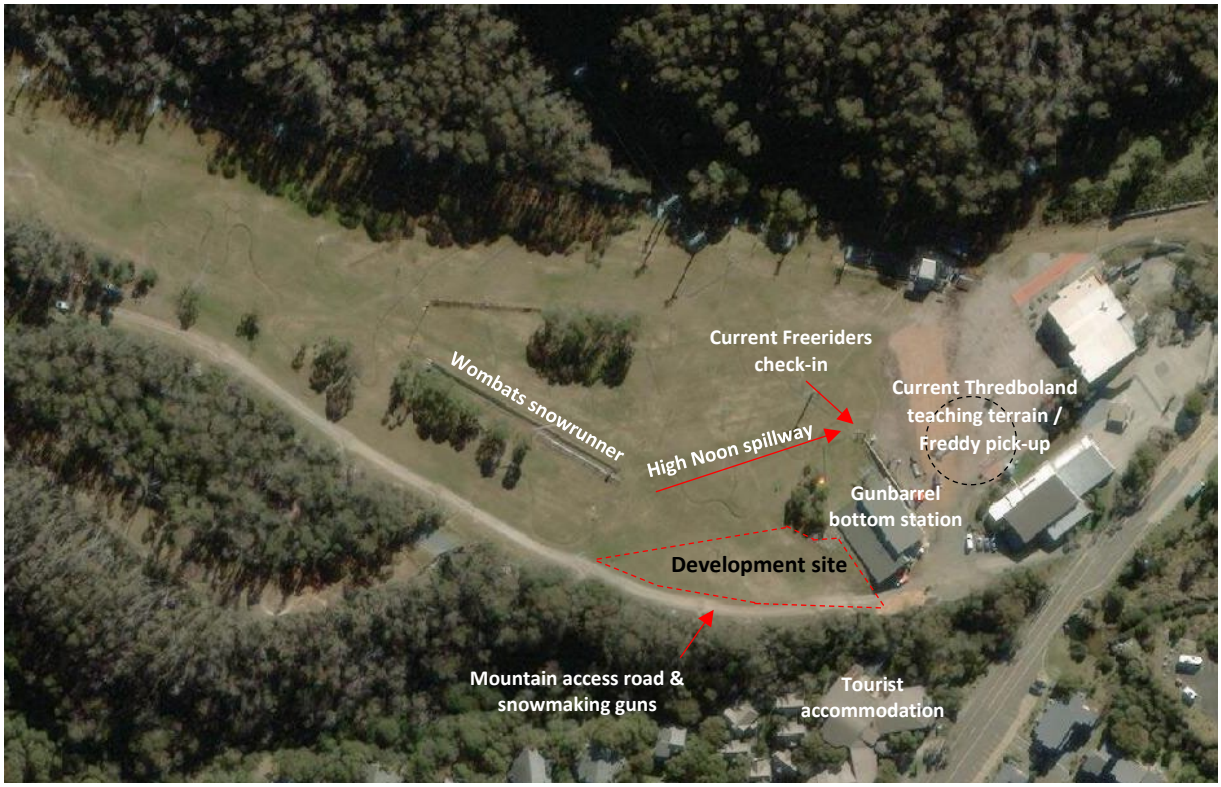
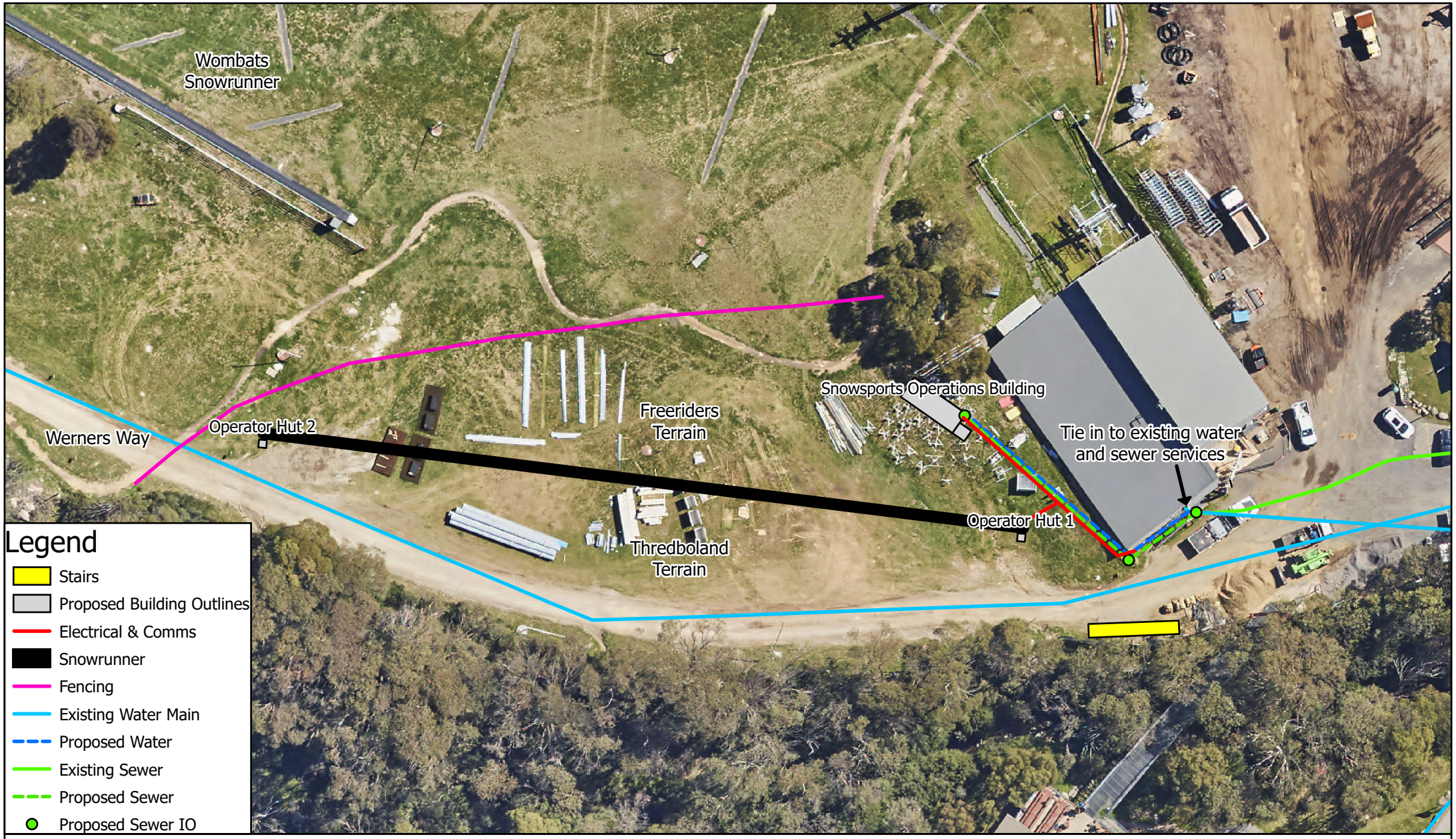


Figure 3: Surrounding Land Uses (Source: SixMaps, NSW Government 2022a)



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7.53.75 0 7.5 15 22.5 30 Meters

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 55

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THREDBO

SITE LAYOUT

Project: Thredboland and Freeriders
Beginner Zone

Revision: F

Date: 06/09/2022

Produced By: KOS

3 Development Proposal Overview

3.1 Purpose of the Development

The purpose of the Development is to:

- provide a safer experience for kids by creating a dedicated snowrunner and teaching terrain close to Thredboland that can be utilised by Snowsports for kids lessons and programs (i.e. Thredboland and Freeriders ski and snowboard programs);
- provide a lift access to Wombats snowrunner instead of utilising Freddy transportation (snowmobile with trailer); and
- reduce congestion and safety hazards associated with the current Freerider check-in location.

3.2 Project Need

The current check-in for Freeriders (kids 7-14 years) is located directly underneath the Gunbarrel Chairlift (north of Gunbarrel bottom station / nearby Tower 2) (refer **Figure 5**) which results in congestion between guest meeting for lessons, and general skier/boarder traffic within the Friday Flat precinct.

From the check-in location, kids are transported by Freddy (snowmobile with trailer) to beginner ski areas (e.g. Wombats snowrunner) to undertake their lessons. Freddy presents potential safety concerns for other skiers/boarders within the Friday Flat area on busy days. Additionally, Freddy is not the most environmentally conscious mode of transport as the snowmobile can use up to 40-50 litres of fuel per week. As such, KT plan to phase out the use of Freddy, and this Project is the first step in creating a safe, dedicated teaching area for Thredboland and Freerider ski and snowboard programs without the need for Freddy.

The current Thredboland (kids 3-6 years) teaching terrain area is located directly outside of the Thredboland building, adjacent to the Gunbarrel Chairlift / lift line (refer **Figure 5**). This area is heavily trafficked during winter, with Friday Flat being one of the major base areas within the resort.

The Development will provide an additional check-in area located west of Gunbarrel bottom station. The check-in will be accessible via Thredboland and on-snow travel which is a predominately a flat – gentle grade.

It is anticipated the new check-in location and teaching terrain will increase the safety of both the public and Snowsports guests by –

- reducing congestion around the High Noon spillway and egress to the Gunbarrel lift line;
- removing the need for kids (and guardians/parents etc.) to navigate across snow from Thredboland, through the main Gunbarrel lift line / High Noon spillway to the current Freeriders check-in;
- removing the risks associated with the current Freeriders check-in location directly under the Gunbarrel chairflift e.g. traffic congestion reducing the requirement for Freddy (snowmobile) to transport kids to teaching terrain such as Wombats snowrunner.

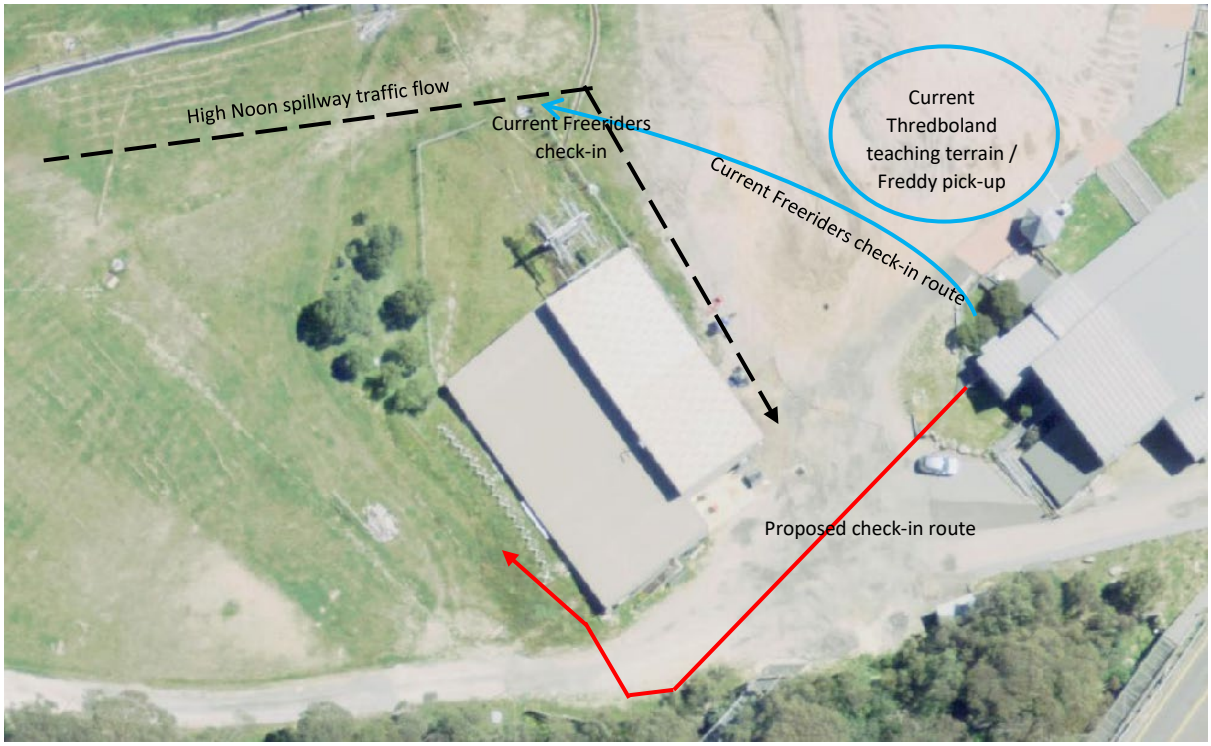


Figure 5: Existing VS Proposed Check-In Route

3.3 Development Description

3.3.1 Dedicated Teaching Terrain

It is proposed Thredboland guests (3-6 years old) will utilised the terrain on the skiers right of the snowrunner and Freeriders guests (7-14 years old) will utilise the terrain on the skiers left of the snowrunner (refer **Figure 4**).

3.3.2 Snowrunner with Gallery Roofing and Operators Huts

A snowrunner with gallery roofing (**Figure 6**) will be installed within the site. The snowrunner is approximately 98.25 m in length with a 0.6 m wide belt. The snowrunner requires minimal ground preparation as demonstrated in **Figure 7**. The snowrunner has adjustable legs placed upon supports every 2 m as shown on the design drawings in **Appendix B**.

Two (2) operator huts (top and bottom of snowrunner) (**Figure 8**) will also be installed. The huts are approximately 1100 mm x 1100 mm x 2850 mm high. The hut footings (short concrete piers) require minimal excavations. Design plans are provided in **Appendix B**.

Figure 6: Example of snowrunner (Source: Sunkid 2022)

Figure 7: Snowrunner ground preparation

Figure 8: Example of Operator Hut

The gallery roofing is approximately 2 m wide, and comprises:

- PVC roll-up doors for entry and exit;
- aluminium arches / support structure;
- high-quality polycarbonate lenses / panes; and
- emergency stop corridors every 18 m with rollup PVC tarpaulins for emergency stop aisles.

The gallery is anchored via ground screws. Refer to **Appendix B** for further details.

The snowrunner will complement the current offerings within the Friday Flat area and provide an additional access aid for kids. The snowrunner will also result in more time for skiing lessons as kids will not have to walk or wait for Freddy for transportation to the beginner terrain areas.

The installation of a gallery will result in the following benefits:

- less effort in maintenance and operation of the snowrunner through reduced snow clearing which in turn increases operating efficiencies.
- greater comfort for guests by protection against wind and weather; and
- modern design and visual attraction.

3.3.3 Trenching for Services Connection

Trenching will be required for the installation of new underground electricity and communications cables to service the snowrunner and Snowsports operations building. The trench will also include sewer and water pipe connections to the Snowsports operations building. The services will be installed within the same trench in accordance with relevant Australian Standards (refer Drawing: Snowsports Operations Building Services – Trench Cross Section, Rev 1 in **Appendix B**). The trench is approximately 40 m long x 0.6 m wide x 0.60-0.80 m deep.

3.3.4 Snowsports operations Building

A small building will be constructed adjacent to the Gunbarrel bottom station which overlooks the teaching terrain (**Figure 4**). The internal building will include a work station, bench seat/rest area for kids during lessons, shelving and bathroom.

The building will be installed on Surefoot footings or similar. The footings require minimal ground disturbance. The predominant external materials (walls and roof) will comprises colorbond basalt corrugated steel which is consistent with existing huts/buildings within Friday Flat. The side walls of the entry will be colourbond manor red. Plans and elevations (Drawing No. A1.101, Rev B) and footing examples are provided in **Appendix B**.

3.3.5 Site Access Route and Stairway

Thredboland kids will access the site accompanied by Snowsports staff from the Thredboland building. Freeriders kids will access the site either accompanied by Snowsports staff, or by following the signage from the Friday Flat base area to the site.

A set of low angled stairs (approx. 16 m long x 1.8 m wide) will be constructed adjacent to the Mountain access road (refer **Figure 9**). The stairway will comprise timber sleepers and gravel to blend in with the landscape. The existing gabion wall at this location will also be extended as a rock wall.

Figure 9: Proposed Stairway Location

After the stairs, guests will turn right across the Mountain access road toward the check-in location. Barrier nets will be installed along the southern end of Gunbarrel bottom station to guide guests to the check-in location.

Parents / guardians / onlookers will be able to access the site on foot and watch from the area nearby the check-in location.

During the end of day pick-up time, parents/guardians etc. who have been skiing/snowboarding will be able to pick up their kids via a staffed section of the exclusion fencing along the High Noon spillway to avoid having to go the 'long way' around. A Snowsports staff member will monitor this section of the fence to ensure the general public do not enter the area.

3.3.6 Fencing

To effectively manage traffic and site access during operation, fencing (e.g. safety nets or snow fencing) will be installed across the top section of the site to separate the public as they come along Werners Way / the Highnoon spillway from Snowsports guests within the site (refer **Figure 4**). The safety net fencing will be erected each morning and removed at night to allow snow groomers within the site.

Safety nets will also be placed along the south-western end of the Gunbarrel bottom station to guide Snowsports guests to the check-in location and exclude kids from running into the bottom station.

Chicane fencing or similar will be installed across the High Noon spillway to slow down skiers / snowboarders heading towards Friday Flat base area / Gunbarrel Chairlift line and provide a path with breaks / rest spots for instructors and Freeriders that are traversing the spillway to access the Wombats snowrunner.

3.3.7 Signage

The proposed signage in **Table 1** will be utilised to assist in the effective management of traffic, skiers/snowboarders and site access. Refer for **Appendix B** examples of signage.

Table 1: Signage Summary

Sign	Temporary / Permanent	Location	Purpose
Run closed to public	Temporary – winter only	Along skiers right / temporary fence on High Noon spillway	Exclude the public from accessing the beginner zone
Slow zone	Temporary – winter only	Along High Noon spillway	To reduce speed at crossing point
Check-in flags	Temporary – winter only	Check-in location below Snowsports operations building	Clearly identify check-in location for Snowsports guests

3.4 Project Timing

The anticipated timing for construction is between February – April 2023. Construction is anticipated to take approximately 2-3 months to complete.

3.5 Disturbance Footprint

The total disturbance footprint for the Development will be approximately 320 m^2.

3.6 Site Access

During construction, the Development site is accessible via Friday Drive and the Mountain access road (**Figure 10**).

During operation, staff and guests will be directed to access the Snowsports operations building and check-in via Thredboland and the southern end of Gunbarrel bottom station / Mountain access road. The route will be marked with signage and temporary fencing (refer site plans in **Appendix B**).

Figure 10: Construction Site Access (Source: NSW Government 2021d)

3.7 Development Components

3.7.1 Machinery, Plant and Equipment

Construction vehicles and plant will include (but not limited to):

- 4WD vehicles and utilities;
- excavator;
- telehandler;
- delivery trucks.

3.7.2 Stockpile Sites

The main stockpile locations will be located within the carpark adjacent to the Thredbo Waste Transfer Station (refer **Appendix C**). Access to these locations will be restricted to KT staff and contractors. Temporary stockpiles may be required within the construction corridor to effectively manage materials during the works. Where required, these sites will be located on disturbed areas and avoid native vegetation. Soil stockpiles will be managed in accordance with the *Soil Stockpile Guidelines for the Resort Areas of Kosciuszko National Park* (OEH 2017) (Soil Stockpile Guidelines).

3.7.3 Site Facilities and Temporary Structures

The site compound will be located at Friday Flat. Existing amenities (e.g. staff room and toilets) at Friday Flat and Gunbarrel bottom station will be available for construction staff. There will be no compound or temporary structures within the construction corridor.

3.7.4 Pre-construction Activities

Pre-construction activities involve site preparation works, which will include:

- establishment of site boundary/fencing;
- erection of site signage and pedestrian/traffic controls; and
- installation of erosion and sediment controls.

3.7.5 Construction Activities

The proposed construction program will comprise the following:

- installation of snowrunner, gallery roofing and two (2) operators hut, including minor earthworks;
- construction of Snowsports operations building;
- trenching for electricity and communications cables, and sewer and water pipes;
- construction of stairway adjacent to the Mountain access road; and
- extension of an existing gabion retaining wall with a rock retaining wall.

Post-construction activities will comprise:

- stabilisation and rehabilitation works;
- removal of erosion and sediment controls;
- demobilisation of plant and machinery; and
- site clean-up.

3.7.6 Operational Activities

The Development will operate during the winter/ski season, as required.

4 Relevant Legislation and Planning Instruments

A review of key legislation and planning instruments applicable to the Development is provided in **Table 2**.

Table 2: Legislative Review

Acts & Planning Instruments	Summary
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides a legal framework to protect and manage nationally and internationally important aspects of the Australian environment. The EPBC Act is administered by the Department of Agriculture, Water and the Environment (DAWE) and was established to: • provide for the protection of the environment, especially Matters of National Environmental Significance (MNES); • promote ecologically sustainable development (ESD) through the conservation and ecologically sustainable use of natural resources; • promote the conservation of biodiversity; • provide for the protection and conservation of heritage; • Promote a cooperative approach to the protection and management of the environment involving governments, the community, landholders and Indigenous peoples; • assist in the cooperative implementation of Australia's international environmental responsibilities;

	• recognise the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and • to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge. Under Part 3 of the EPBC Act, a person must not undertake an action (e.g. a development) that will have, or is likely to have, a significant impact on a protected matter (MNES), without approval from the Australian Government Minister for the Environment. Refer to **Section 7.5** for detail.
State	
Environmental Planning and Assessment Act 1979 (EP&A Act) Environmental Planning and Assessment Regulation 2021 (EP&A Regulation)	The EP&A Act is the primary piece of legislation governing development within NSW. Some of the key objects of the EP&A Act are to: • promote the social and economic welfare of the community and a better environment facilitate ESD; • promote the orderly and economic use and development of land and the delivery and maintenance of affordable housing; • protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats; • promote the sustainable management of built and cultural heritage; and • promote good design and amenity of the built environment, including the protection of the health and safety of their occupants. DPE assesses development proposals within NSW alpine resort areas where the Minister for Planning is the consent authority under Part 4 of the EP&A Act. Refer **Section 5.1** for matters to be considered. This SEE has been prepared in accordance with the requirements of the EP&A Regulation. Throughout the planning and design phases of the Development, KT has considered the principles of ESD.
National Parks and Wildlife Act 1974 (NPW Act) *National Parks and Wildlife Regulation 2019* (NPW Regulation)	The objects of the NPW Act include: • the conservation of nature; • the conservation of objects, places or features (including biological diversity) of cultural value within the landscape; • fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation; and • providing for the management of land reserved under the Act in accordance with the management principles applicable for each type of reservation. The NPW Act provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution if they later unknowingly harm an object without an Aboriginal heritage impact permit. A due diligence assessment has been undertaken in **Section 7.3**. All development proposals in KNP require authorisation under the NPW Regulation and must be referred to the NSW National Parks and Wildlife Service (NPWS) for referral comment prior to commencement of works.
Biodiversity Conservation Act 2016 (BC Act) Biodiversity Conservation Regulation 2017 (BC Regulation)	The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ESD. The Development is consistent with principles of ESD, as demonstrated in the subsequent sections of this report. The BC Regulation sets out threshold levels for when the Biodiversity Offset Scheme (BOS) will be triggered. The threshold has two elements:

	• whether the amount of native vegetation being cleared exceeds the area threshold; and • whether the impacts occur on an area mapped on the Biodiversity Values Map (BVM). If clearing and other impacts, including biodiversity impacts prescribed by Clause 6.1 of the BC Regulation, exceed either trigger, the BOS applies. The BOS also applies when the 'test of significance' in section 7.3 of the BC Act identifies that the development or activity is likely to significantly effect threatened species or ecological communities, or their habitats. Refer to **Section 7.6** for detail.
Water Management Act 2000 (WM Act) *Water Management (General) Regulation 2018* (WM (General) Regulation)	Controlled activities carried out in, on, or under waterfront land are regulated by the WM Act. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 m of the highest bank of the river, lake or estuary. The NSW Department of Planning and Environment – Water (Water NSW) administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure minimal harm to waterfront land as a consequence of carrying out the controlled activity. As such, a controlled activity approval must be obtained from Water NSW before commencing the controlled activity, unless an exemption applies under the WM (General) Regulation. Refer to **Section 7.2.1** for detail.
Environmental Planning Instruments	
State Environmental Planning Policy (Precincts – Regional) 2021 (Regional Precincts SEPP)	The aim and objectives of the Policy for Kosciuszko National Park and alpine resorts (Chapter 4) are: • to encourage the carrying out of a range of development in the alpine resorts that do not result in adverse environmental, social or economic impacts on the natural or cultural environment; • provide planning controls to encourage ESD; and • minimise the risk of community exposure to environmental hazards within the alpine resort areas. Development in NSW alpine resort areas are governed by the Regional Precincts SEPP. Key requirements under Chapter 4 (Kosciuszko National Park and alpine resorts) include an assessment of the environmental impacts of the development on the alpine environment and rigorous assessment of geotechnical and land stability issues. Applications are also required to consider the socio-economic and cultural impacts of proposed development. Refer **Section 5.2** for detail.

5 Planning Framework

An assessment against the relevant matters of the EP&A Act and relevant environment planning instruments, policies and guidelines is provided in this section.

5.1 Environmental Planning and Assessment Act 1979

Pursuant to Section 4.15 of the EP&A Act, the consent authority is to consider the matters listed in **Table 3** in relation to the Development.

Table 3: Matters for Consideration – General

(1) Matters for consideration – General	Comment
the provisions of—	
(i) any environmental planning instrument	The relevant sections of the Regional Precincts SEPP have been addressed in **Section 5.2**.
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved)	There are no draft Environmental Planning Instruments that are applicable to the Development.
(iii) any development control plan	There are currently no applicable development control plans.
(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4	There are no planning agreements applicable to Thredbo under the Regional Precincts SEPP.
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph)	The DA and supporting information has been prepared in accordance with the requirements of the EP&A Regulation.
(a) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	The likely impacts of the Development on the natural and built environment, and social and economic impacts in the locality have been assessed in **Section 7**.
(b) the suitability of the site for the development	The suitability of the site for the Development is described in **Sections 2.3** and **7.1**.
(c) any submissions made in accordance with this Act or the regulations	Tourist accommodation is located less than 50 m away from the Development, therefore public exhibition is required in accordance with the *Community Participation Plan* (DPIE 2019). The Development is also located on waterfront land, therefore the DA is integrated development requiring referral to Water NSW. KT will consider any submissions made during the assessment process.
(d) the public interest.	The Development is considered to be within the public interest for the following reasons: • the Development aligns with the aim and objectives of the Regional Precincts SEPP (Chapter 4); • the Development is compatible with the site; • the Development will not have any significance adverse environmental impacts; • the Development is consistent with the principles of ESD; and • the Development will complement the existing winter offerings in the resort and provide a greater guest experience.

5.2 Regional Precincts SEPP

The relevant sections of Chapter 4 (Kosciuszko National Park and alpine resorts) of the Regional Precincts SEPP are addressed in this section.

5.2.1 Section 4.9 – Land Use Table (Thredbo Alpine Resort)

Pursuant to Section 4.9 (Land Use Table), Chapter 4 of the Regional Precincts SEPP, 'recreation infrastructure and ski slope huts', are permissible with consent within the Thredbo Alpine Resort.

5.2.2 Section 4.12 – Matters to be considered by Consent Authority

Table 4 addresses Section 4.12 (Matters to be considered by consent authority) in relation to the Development.

Table 4: Matters to be Considered by Consent Authority

Matters for Consideration	Comment
(1) In determining a development application that relates to land to which this Chapter applies, the consent authority must take into consideration any of the following matters that are of relevance to the proposed development—	
a) the aim and objectives of this Chapter, as set out in section 4.1	The Development is consistent with the objectives of the Chapter, as demonstrated in this SEE.
b) the extent to which the development will achieve an appropriate balance between the conservation of the natural environment and any measures to mitigate environmental hazards (including geotechnical hazards, bush fires and flooding)	The Development has been designed with consideration of potential environmental hazards. Appropriate environmental controls outlined in the SEMP (**Appendix C**) will be implemented during construction to minimise potential impacts to the existing environment. Based on negligible excavations proposed and the assessment of site conditions, AssetGeoEnviro (2022) (**Appendix I**) determined the Development presents minimal geotechnical impact. The Development will be constructed in accordance with the recommendations outlined in the Geotechnical Investigation Report (**Appendix I**).
c) having regard to the nature and scale of the development proposed, the impacts of the development (including the cumulative impacts of development) on the following— i. the capacity of existing transport to cater for peak days and the suitability of access to the alpine resorts to accommodate the development ii. the capacity of the reticulated effluent management system of the land to which this Chapter applies to cater for peak loads generated by the development iii. the capacity of existing waste disposal facilities or transfer facilities to cater for peak loads generated by the development, iv. the capacity of any existing water supply to cater for peak loads generated by the development	The Development will not impact on the capacity of the existing transport, reticulated effluent management system, existing waste disposal facility or existing water supply.
d) any statement of environmental effects required to accompany the development application for the development	This SEE meets this requirement.
e) if the consent authority is of the opinion that the development would significantly alter the character of the alpine resort—an analysis of the existing character of the site and immediate surroundings to assist in understanding how the development will relate to the alpine resort	The Development will not impact on the existing character of the site or immediate surroundings. The Development is compatible with the existing infrastructure at Friday Flat.
f) the *Geotechnical Policy—Kosciuszko Alpine Resorts* (2003, Department of Infrastructure, Planning and Natural Resources) and any measures proposed to address any geotechnical issues arising in relation to the development	In accordance with the *Geotechnical Policy Kosciuszko Alpine Resorts* (DIPNR 2003), the Development will require a Minimal Impact Certification (Form 4). Refer **Sections 5.3.2** and **Appendix I** for detail.

g) if earthworks or excavation works are proposed—any sedimentation and erosion control measures proposed to mitigate any adverse impacts associated with those works	Minor earthworks are required for the Development. Appropriate erosion and sediment controls will be implemented during construction in accordance with the SEMP (**Appendix C**).
h) if stormwater drainage works are proposed—any measures proposed to mitigate any adverse impacts associated with those works	No stormwater drainage works are required for the Development.
i) any visual impact of the proposed development, particularly when viewed from the Main Range	The Development will result in the installation of a snowrunner and associated infrastructure. Friday Flat comprises three (3) existing snowrunners, ski lift infrastructure and several buildings and huts. Therefore, the Development is not anticipated to negatively affect the visual amenity of the site and surrounds. The Development will not be visible from the Main Range.
j) the extent to which the development may be connected with a significant increase in activities, outside of the ski season, in the alpine resort in which the development is proposed to be carried out	The Development will not increase activities outside the ski season.
k) if the development involves the installation of ski lifting facilities and a development control plan does not apply to the alpine resort— i. the capacity of existing infrastructure facilities, and ii. any adverse impact of the development on access to, from or in the alpine resort	The Development is not anticipated to impact on the capacity of existing infrastructure facilities or result in adverse impacts on access to, from or in the resort.
l) if the development is proposed to be carried out in Perisher Range Alpine Resort— i. the document entitled *Perisher Range Resorts Master Plan*, as current at the commencement of this Chapter, that is deposited in the head office of the Department, and ii. the document entitled *Perisher Blue Ski Resort Ski Slope Master Plan*, as current at the commencement of this Chapter, that is deposited in the head office of the Department	Not applicable.
m) if the development is proposed to be carried out on land in a riparian corridor— i. the long term management goals for riparian land, and ii. whether measures should be adopted in the carrying out of the development to assist in meeting those goals.	The majority of the works are located within the outer riparian corridor of Merritts Creek (refer **Figure 13**). This area is heavily modified due to previous disturbance for the ski run and Mountain access road. Refer **Section 7.2.2** for further detail. Following the completion of construction, all disturbed areas will be rehabilitated to ensure
(2) The *long term management goals* for riparian land are as follows—	
a) to maximise the protection of terrestrial and aquatic habitats of native flora and native fauna and ensure the provision of linkages, where possible, between such habitats on that land,	No native trees or shrubs will be removed for the works. Only minor grass clearing within a heavily disturbed environment is required. The Mountain access road is located between the riparian vegetation associated with Merritts Creek and the Project site. As demonstrated in **Section 7.6**, no impacts to conservation significant terrestrial or aquatic habitats or species are anticipated from the Project. Appropriate environmental controls will be implemented during construction via the SEMP to mitigate potential impacts to existing environmental values. The Project involves the extension of the existing gabion wall to a rock wall alongside the Mountain access road. No adverse impacts to the banks of Merritts Creek are proposed. Appropriate temporary erosion and sediment controls will be implemented during construction, and the rock wall will achieve greater embankment stability in the long term. All disturbed areas within the site will be rehabilitated following completion of works to ensure soil stabilisation.
b) to ensure that the integrity of areas of conservation value and terrestrial and aquatic habitats of native flora and native fauna is maintained,	
c) to minimise soil erosion and enhance the stability of the banks of watercourses where the banks have been degraded, the watercourses have been channelised, pipes have been laid and the like has occurred.	
(3) A reference in this clause to land in a riparian corridor is a reference to land identified as being in such a corridor on a map referred to in section 4.4.	

5.3 Plans, Policies and Guidelines

5.3.1 Kosciuszko National Park Plan of Management 2006

The *Kosciuszko National Park Plan of Management 2006* (KNP POM) outlines objectives and management strategies to guide the long-term management of values within specific areas of KNP. The KNP POM includes several management zones, which comprise of seven management units that contain places and values of exceptional significance. Thredbo is included in the Thredbo Management Unit, considered an area of exceptional recreational significance. As such, the management provisions applicable to this unit (Section 10) apply.

Under the provisions of the Regional Precincts SEPP, all development applications within KNP are referred to NPWS who are responsible for administering the KNP POM.

The Development will improve the quality of the resort experience for guests by providing a designated area for beginner skiers and snowboarders to develop their skills. As demonstrated in this report and supporting documentation, the Development meets the applicable management objectives and provisions in Section 10 the KNP POM.

5.3.2 Geotechnical Policy Kosciuszko Alpine Resorts 2003

The *Geotechnical Policy Kosciuszko Alpine Resorts* (DIPNR 2003) (Geotechnical Policy) applies to the land. The Development site is located within the "G" area of the Geotechnical Policy Map, Thredbo (G5). Section 3.1 of the Geotechnical Policy specifies minor construction works which present minimal or no geotechnical impact on the site or related land as determined and certified (Form 4) by a geotechnical engineer or engineering geologist.

AssetGeoEnviro (2022) determined the Development presents minimal geotechnical impact and therefore requires only Form 4 – Minimal Impact Certification. Refer to **Section 7.1.4** and **Appendix I** for detail.

6 Assessment Method

The assessment for the Development consisted of a desktop review of publicly available data sources and information. The desktop review was followed by site visit carried out within the Development area to describe the environmental values present on the site and to aid the evaluation of potential impacts of the Development to those values. A summary of the assessment methods is provided in the following sections.

6.1 Desktop Assessment

A desktop assessment was carried out to identify relevant environmental values, that potentially occur within the Development area. Key database and information sources utilised in the desktop assessment are listed in **Table 5**.

Other resources were also investigated to inform the impact assessment, listed in **Section 10**.

Table 5: Key Database Searches

Database	Search Parameters	Date of Search	Reference
ePlanning Spatial Viewer (NSW Government 2021a)	Lot 876/DP 1243112	12 November 2021 – 31 May 2022	-
Water Management (General) Regulation 2018 hydroline spatial data 1.0 (NSW Government 2022c)	2 Friday Drive, Thredbo, NSW 2625	24 February 2022	**Appendix D**
Biodiversity Values Map and Threshold Tool (NSW Government 2021b)	2 Friday Drive, Thredbo, NSW 2625	25 February 2022	**Appendix E**
NSW BioNet	North: -36.45 West: 148.26 East: 148.36 South: -36.55, (10x10km search area)	24 February 2022; 18 August 2022	**Appendix F**
Protected Matters Search Tool (DAWE)	5 km buffer around site	23 August 2022	**Appendix G**
Aboriginal Heritage Information Management System Web Services (Heritage NSW)	Lat,long from: -36.501, 148.3051 – Lat,long to: -36.4967, 148.3128	31 May 2022	**Appendix H**

6.2 Site Assessment

6.2.1 Preliminary Site Assessment

A preliminary site assessment was undertaken by KT personnel and DJRD Architects on 18 November 2021 to validate the desktop assessment results, inform the design process and ensure appropriate environmental controls are implemented to avoid, mitigate and/or management potential impacts on environmental values.

6.2.2 Geotechnical Investigation

A geotechnical site investigation was undertaken on 29 November 2021 by Asset Geotechnical Engineering Pty Ltd (AssetGeoEnviro 2022) at four locations within the site. Details are provided in Section 3 of **Appendix I**.

7 Existing Environment and Impact Assessment

This section outlines the existing environmental values of the site and potential impacts of the Development on the natural, human and built environment of the site and surrounds.

7.1 Land

7.1.1 Topography and Soils

The site is located between 1360 and 1380 m Australian Height Datum (AHD). The site is situated at the toe of a gentle slope of approximately 10° to 12° up to the north west before again increasing to about 22° to 26° (AssetGeoEnviro 2022). The gentle slope provides suitable teaching terrain for beginners.

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" (AssetGeoEnviro 2022).

7.1.2 Land Uses

The Development is consistent with the current land use and it is not anticipated to impact on the surrounding land uses described in **Section 2.3**.

7.1.3 Disturbance Impact

The Development is located within a highly modified environment. The total disturbance footprint is approximately 320 m^2.

The snowrunner does not require a permanent foundation, making it easy to install with minimal ground preparation.

The footings for the Snowsports operations building and operators hut footings require minimal ground disturbance (refer **Appendix B**).

All disturbed areas will be rehabilitated following construction completion, as such minimal impacts to land are anticipated.

7.1.4 Bushfire Prone Land

The Development site is located within a designated bushfire prone area on the Bush Fire Prone Land Online Mapping Tool (NSW RFS 2022).

The National Construction Code (NCC) contains Performance Requirements and Deemed-to-Satisfy provisions relating to the construction of buildings in bush fire prone areas. In NSW, these provisions apply to Class 1, 2 and 3 buildings, Class 4 parts of a building, Class 9 buildings that are Special Fire Protection Purpose (SFPP) developments, and associated class 10a buildings and decks (Section 2.5 of the *Planning for Bush Fire Protection 2019*).

7.1.5 Geotechnical Assessment

Minor excavation is proposed to be almost entirely within soils and no rock excavation is anticipated.

Based on negligible excavations proposed and the assessment of site conditions, AssetGeoEnviro (2022) (**Appendix I**) determined the Development presents minimal geotechnical impact.

7.2 Water

7.2.1 Watercourses

As shown on the *Water Management (General) Regulation 2018 hydroline spatial data 1.0* map (NSW Government 2021c), two mapped watercourses are located within close proximity of the site (**Figure 11**).

Figure 11: Mapped Watercourses (Source: NSW Government 2022c)

7.2.2 Riparian Corridor and Waterfront Land Assessment

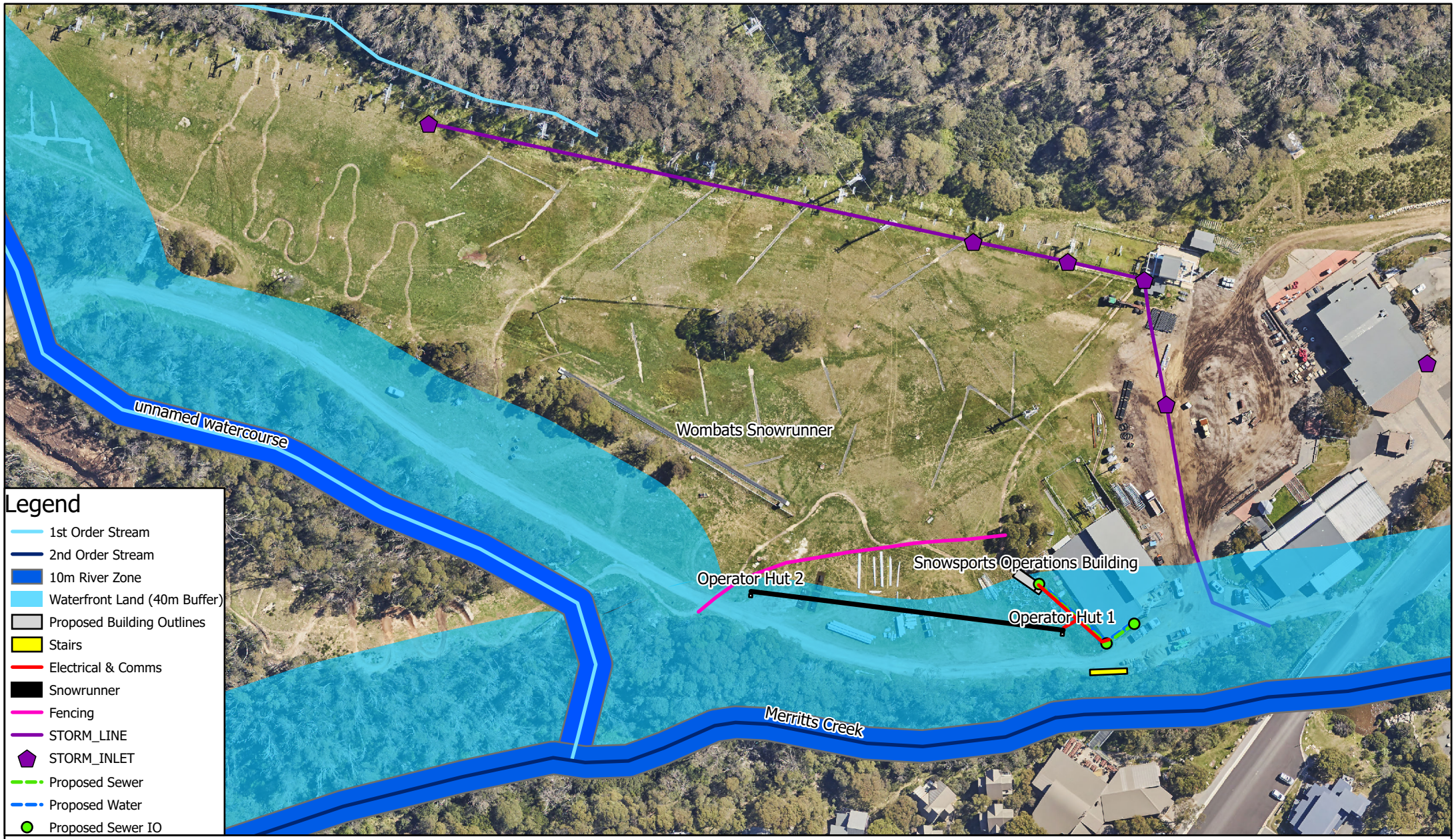
Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 m of the highest bank of the river, lake or estuary (DoI 2018). A *riparian corridor* forms a transition zone between the land, and the river of watercourse or aquatic environment. The *riparian corridor* consists of the channel (bed and banks) and the vegetated riparian zone (VRZ) adjoining the channel.

An assessment in accordance with the *Guidelines for controlled activities waterfront land: Riparian corridors* (DoI 2018) is provided in the subsequent sections.

7.2.2.1 Unnamed Mapped Watercourse

The portion of the unnamed mapped watercourse which traverses the Development site does not exhibit the features of a defined channel with bed and banks, as shown on **Figure 12**. This drainage line was diverted in the 1980s when Friday Flat was first developed. The diversion resulted in the drainage line being diverted around the ski slope area (approximately halfway down the slope), below the Easy Does It Quad lift (to the north-north-east) into a network of underground pipes, including several inlets/drains (refer **Figure 13** and **Figure 14**). As such, it is determined the mapped watercourse is not waterfront land for the purposes of the WM Act. Therefore, no further assessment is required.

Figure 12: Unmapped Watercourse Field Verification



Scale: 1:1,550

105 0 10 20 30 40

Meters

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 55

N

THREDBO

WATERFRONT LAND AND RIPARIAN CORRIDORS

Project: Thredboland and Freeriders
Beginner Zone

Revision: E

Date: 13/09/2022

Produced By: KOS

Drain 1

Drain 3

Drain 2

Figure 14: Inlets within diverted drainage line below Easy Does It Quad Lift

7.2.2.2 Merritts Creek – Mapped Watercourse

Merritts Creek is located to the south of the Development site (**Figure 13**). Merritts Creek is classified as a second order watercourse under the Strahler System (**Appendix D**). To determine whether the Development is located within the riparian corridor of Merritts Creek, an assessment has been undertaken in accordance with method outlined in the *Guidelines for controlled activities waterfront land: Riparian corridors* (DoI 2018).

The VRZ (each side of watercourse) for a second order watercourse is 20 m (DoI 2018). The channel width of Merritts Creek at this location is 10 m. Therefore, the total riparian corridor (40 m + channel width) of Merritts Creek is 50 m.

The Development is located within 40 m of Merritts Creek as shown on **Figure 13**. The outer VRZ has been subject to significant disturbance from previous earthworks associated with the development of Friday Flat and the Mountain access road. Adverse impacts to Merritts Creek and its associated riparian vegetation are considered unlikely given the following:

- no clearing of native trees or shrubs is required (only minor grass clearing is required, predominately Chewings Fescue (exotic species));
- the Development requires minimal ground disturbance within the outer VRZ which has already been subject to significant disturbance;
- the Development will not impact on fauna habitat connectivity;
- the Mountain access road acts as a buffer between the riparian vegetation and the Development site, and contains several drainage berms which divert upslope runoff in a non-erosive manner;
- the Development is unlikely to impact the water quality of Merritts Creek;
- appropriate environmental controls will be implemented during construction as detailed in the SEMP;
- the extension of the existing gabion wall to a rock wall alongside the Mountain access road will result in greater embankment stability in the long term; and
- all disturbed areas will be rehabilitated following completion of works.

7.3 Aboriginal Cultural Heritage

To establish due diligence for the Development, an assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) has been provided in **Table 6**.

Table 6: Aboriginal Cultural Heritage Due Diligence Process

Due Diligence Process	Comment
1. Will the activity disturb the ground surface or any culturally modified trees?	The Development will result in minor ground disturbance within a highly disturbed area. No native trees will be cleared for the Development. There are no culturally modified trees within the Development site.
2. Are there any: a) relevant confirmed site records or other associated landscape feature information on AHIMS? and/or	A search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 31 May 2022. The results (**Appendix H**) identified no Aboriginal sites are recorded in or near the Development site.
b) any other sources of information of which a person is already aware? and/or	Several historical assessments have been undertaken within the resort including Friday Flat and immediate surrounds by Past Traces Heritage Consultants (2017), NGH Environmental (2017), Iron Bark (2013), and URS Australia Pty Ltd (2004; 2005). All studies provide an indication that the ski slope areas have low archaeological potential due to the level of disturbance associated with the previous ski slope work. The studies also concluded that given the steepness and exposed aspect/lack of sheltering tors, the ski slopes are unlikely to have been favourable campsite locations.
c) landscape features that are likely to indicate presence of Aboriginal objects?	The Development site is located in a highly disturbed environment, which has been subject to previous disturbance for the construction of the existing ski slope. Previous disturbance has comprised extensive earthworks, vegetation clearing and removal and disturbance to top soils and soil profiles, thus removing potential for Aboriginal sites to remain within the Development location. There are no landscape features within the Development site that would indicate the presence of Aboriginal objects due to the previous disturbance. As such, it is considered the Development has low potential to impact on unrecorded Aboriginal objects or sites. The Development site is located within 40 m of Merritts Creek, however the land is heavily disturbed. Therefore, in accordance with the Due Diligence process, there is no requirement to move onto Step 3 and no AHIP is required.
3. Can harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or can the carrying out of the activity at the relevant landscape features be avoided?	Not applicable.
4. Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?	Not applicable.

As identified in **Table 6**, all reasonable steps have been undertaken to ensure the Development fulfils the requirements of the Aboriginal Cultural Heritage Due Diligence Process. Potential impacts from the Development on objects or sites of Aboriginal Cultural Heritage significance are considered unlikely. Therefore, an independent impact assessment for Aboriginal heritage and archaeology is not required. In the unlikely event that Aboriginal objects are discovered, all works will cease and NPWS will be notified. Appropriate controls are outlined in the SEMP (**Appendix C**).

7.4 Heritage

A review of the Regional Precincts SEPP, NSW historic inventory and the Thredbo Alpine Village Conservation Plan, Vol.2 Inventory (Clive Lucas, Stapleton and Partners 1997) was undertaken on 31 May 2022. No heritage items are located within the Development site or within close proximity. Therefore, no impacts to heritage items are proposed and a heritage impact statement is not required.

7.4.1 National Heritage Place (MNES)

The Development site is located within KNP which forms part of the Australian Alps National Parks and Reserves (AANP). An impact assessment has been carried out in **Section 7.5.1**.

7.5 Matters of National Environmental Significance

A person must not take an action that has, will have or is likely to have a significant impact on any of the MNES without approval from the Australian Government Minister for the Environment.

A search of the EPBC Act Protected Matters Search Tool (PMST) (DAWE 2021) (records within a 1 km radius of the Development site) was undertaken on 31 May 2022 to determine whether any MNES are likely to occur within the Development area. The Protected Matters Report (PMR) (**Appendix G**) identified five (5) categories (as listed under the EPBC Act) of MNES (**Table 7**) that may be relevant to the Development area and surrounds.

To determine whether a referral and formal assessment is required for the Development, an assessment has been undertaken in **Table 7** with consideration of the relevant significant impact criteria in the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DEE 2013).

Table 7: MNES Summary

MNES Categories	No.[1]	Comment
National Heritage Places	2	*AANP* The Development is unlikely to cause one or more of the National Heritage values of the AANP to be lost, degraded, damaged or notably altered, modified, obscured or diminished (refer **Section 7.5.1** for detail). *Snowy Mountain Scheme* The Development will not cause one or more of the National Heritage values of the Snowy Mountain Scheme to be lost, degraded, damaged or notably altered, modified, obscured or diminished. No further assessment is required.
Wetlands of International Importance	8	The Development is unlikely to cause any significant adverse impacts to any listed wetlands. No further assessment is required.
Listed Threatened Ecological Communities (TECs)[2]	2	The Development is unlikely to result in a significant impact on any TECs, listed threatened species, listed migratory species or their habitat (refer to **Section 7.6** for detail). No further assessment is required.
Listed Threatened Species[2]	33	
Listed Migratory Species[2]	11	

[1]Number of MNES identified in the PMR (**Appendix G**)

[2]While based on some species records, the PMST relies on predictive modelling of suitable habitats and does not necessarily reflect an actual record of the species/community for a particular location.

The Development will not have a significant impact on any of the MNES identified in the PMR. Therefore, a referral to the Australian Government Minister for the Environment is not required.

7.5.1 National Heritage Place – AANP

The ANNP were included on the National Heritage List on 7 November 2008 for their –

1) course or pattern of Australia's natural or cultural history;
2) possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;
3) importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places, or (ii) a class of Australia's natural or cultural environment
4) importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
5) strong or special association with a particular community or cultural group for social, cultural or spiritual reasons; and
6) special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

In total, three reserves, seven national parks and one wilderness area comprise the National Heritage Place.

To determine whether a referral and formal assessment is required for the Development, an assessment against the significant impact criteria in the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE 2013) has been undertaken in **Table 8**.

Table 8: Significant Impact Assessment – Australian Alps National Parks and Reserves (AANP)

	National Heritage Values of the AANP	Significant Impact Assessment
Criteria: An action is likely to have a significant impact on the National Heritage values of a National Heritage place if there is a real chance or possibility that it will cause: • one or more of the National Heritage values to be lost, • one or more of the National Heritage values to be degraded or damaged, or • one or more of the National Heritage values to be notably altered, modified, obscured or diminished.		
1)	The AANP are of outstanding landscape value and are important in the pattern of Australia's natural history, containing glacial and periglacial features, fossils, karst, biological heritage, moth feasting, transhumant grazing, scientific research, water harvesting and recreation. The AANP have outstanding heritage value for the longevity and diversity of its recreational use (Commonwealth of Australia 2008).	The Development will not result in a negative impact to these values. The Development will contribute to the recreational value through direct benefits for winter tourism and guests, as well as supporting economic investment in the resort.
2)	The high altitude peaks and plateaus, glacial lakes and alpine and sub-alpine ecosystems of the alps are rare in Australia's mostly flat, dry and hot continent. The AANP contain a vast range of mountain environments and plant communities adapted to cold climates including tall, wet, fern-filled forests to snowgum woodlands and open expanses of alpine meadows. The alps also contain landforms created by glaciers, remarkable fish fossils and unique fauna including Mountain Pygmy Possum (*Burramys parvus*) and Bogong moth (*Agrotis infusa*) (Commonwealth of Australia 2008; DAWE 2021).	The Development will result in negligible impacts to the overall landscape of the AANP.
3)	The AANP are listed for the north-east Kosciuszko pastoral landscape values which demonstrate the use of mountain resources, namely the summer grasses and herbfields. The landscape demonstrates the past grazing leases which convey the principal characteristics of transhumance and permanent pastoralism in a remote environment (Commonwealth of Australia 2008). The area contains stockman's huts, homestead complexes, stock yards and stock routes which reflect 150 years of summer grazing on the alpine high plains (DAWE 2021).	The Development is not located within the north-eastern area of KNP, therefore it will not impact on these landscape values.

4)	The AANP is a powerful, spectacular and distinctive landscape and natural beauty. The mountain vistas, alpine streams and rivers, lakes, snow-covered eucalypts, high plain grasslands, summer alpine wildflowers, forests and natural sounds are highly valued by community groups (Commonwealth of Australia 2008; DAWE 2021).	The Development will not directly impact on any of these values.
5)	The AANP have a strong association with Australia's pioneering history, while the snowfields and national parks have long been popular recreation areas. Many community groups have a strong association with the alps for social and cultural reasons. The pioneering history of the high country is valued as an important part of the construction of the Australian identity featuring in myths, legends and literature. The mountain huts constructed for grazing, mining and recreation are valued by communities as physical expression of the cultural history of the region (Commonwealth of Australia 2008; DAWE 2021).	The Development will not have a negative impact on these values. The Development will enhance Thredbo's Snowsports program offerings, therefore enhancing the recreational benefits for guests.
6)	There is a long history of scientific research and endeavour in the AANP and its associated with the life or works of highly recognised persons such as Baron Ferdinand von Mueller (botanist), Eugen Von Guerard (artist), and writers/poets, Andrew Barton 'Banjo' Paterson, Elyne Mitchell and David Campbell (Commonwealth of Australia 2008; DAWE 2021).	The Development will not have any impact on the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

As identified in **Table 8**, the Development will not cause any of the heritage values of the AANP to be lost, degraded, damaged or to be notably altered, modified, obscured or diminished.

7.6 Flora and Fauna

7.6.1 Biodiversity Values Map Threshold

The BVM and Threshold Tool (NSW Government 2022b) identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing.

A review of the BVM and Threshold Tool was undertaken on 25 February 2022 which identified the Development site does not comprise land mapped on the BVM (**Appendix E**). As such, the Development cannot trigger the BVM threshold.

7.6.2 Area Clearing Threshold

The Development will require some minor clearing of grass within the site. The predominant species within the area is Chewings Fescue (exotic species). No native tree or shrub vegetation clearing is required. As such, the Development will not trigger the area clearing thresholds.

7.6.3 Conservation Significant Communities and Species

The NSW BioNet desktop search results identified various State and Commonwealth conservation significant flora species, Endangered Ecological Communities and fauna species records occur within the 10x10 km search area (refer **Appendix F**). The PMR (**Appendix G**) identified two (2) TECs, 13 listed flora species, 20 listed fauna species and 11 migratory species or their habitat 'may occur', 'are known to occur' or are 'likely to occur' within the 5 km search area.

7.6.3.1 Test of Significance

The test of significance outlined in Section 7.3 of the BC Act is used to determine whether proposed development or an activity is likely to significantly affect threatened species or ecological communities, or their habitats. An assessment of the Development against the 'test of significance' is provided in **Table 10**.

Table 9: Test of Significance

Test of Significance	Comment
(1) The following is to be taken into account for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats—	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The disturbance footprint is approximately 320 m^2, within a highly modified environment, providing very limited suitable habitat for native fauna species (refer Appendix A for site photos). No tree or native shrub clearing is required for the Development. Minor grass clearing is required. The predominant species within the site is Chewings Fescue (exotic species). Significant impacts to Commonwealth and State listed threatened flora and fauna, ecological communities or their habitats is considered unlikely. The Development will not adversely affect habitat connectivity or any other biodiversity value of conservation significance. The Development is unlikely to adversely effect the life cycle of listed threatened species, such that a viable local population of the species is likely to be placed at risk of extinction.
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity— (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	There are no endangered ecological communities or critically endangered ecologically communities within the site or immediate surrounds.
(c) in relation to the habitat of a threatened species or ecological community— (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	Unlikely. Refer comment against (a).

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	Not applicable. The site and immediate surrounds do not comprise any land declared an area of outstanding biodiversity value.
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Development is not part of a key threatening process outlined in Schedule 4 of the BC Act, nor is it likely to increase the impact of a key threatening process.

7.6.3.2 Summary of Impacts to Species of Conservation Significance

A desktop and site assessment confirmed the Development is located within a heavily modified environment, devoid of native trees and shrubs due to the existing ski run and associated infrastructure. The southern boundary of the site is bordered by the Mountain access road which runs parallel to the riparian corridor of Merritts Creek and provides a buffer between the site and riparian vegetation. The Development does not require any native tree or shrub clearing and will not adversely affect habitat connectivity. The Development is unlikely to result in a significant impact on any Commonwealth or State listed communities, threatened flora and fauna, or migratory species identified in the desktop assessment.

7.7 Social and Economic

The social impacts of the Development will be positive through the provision of a dedicated ski area for Thredboland and Freerider skiers/snowboarders. The Development will promote greater safety for kids during lessons, which will contribute to an enhanced guest experience.

The economic impacts generated by the Development will be positive in terms of direct investment into the resort and the generation of short-term construction jobs, however these are anticipated to be nominal given the scale of the Development and timing for construction completion.

7.8 Traffic and Access

7.8.1 Construction Vehicles and Machinery

All construction vehicles will enter and exit the Development site via the Mountain access road via Friday Drive (refer **Figure 10**). All machinery and plant will be confined to the construction corridor and dedicated stockpile locations identified in the SEMP (**Appendix C**).

7.8.2 Impacts to Existing Winter Operations

7.8.2.1 Impacts to Gunbarrel Lift Access

The Development is not anticipated to adversely impact on the operation of the Gunbarrel Chairlift access via the eastern side. Rather, the Development will improve the current congestion experienced around the lift line.

7.8.2.2 Snow Grooming Operations

During the preliminary planning stage, key Mountain Operations staff were consulted with to determine the best location of infrastructure to ensure minimal impacts to the existing snow grooming operations. No adverse impacts to snow grooming operations are anticipated.

7.9 Landscape Character and Visual Amenity

The Development is located within the visual catchment of the River Inn (tourist accommodation / hospitality venue). The view is predominately screened by riparian vegetation associated with Merritts Creek. No significant adverse impacts on the alpine resort character or visual amenity of the site and surrounds are anticipated given the Development is consistent with the surrounding land uses / pre-existing ski infrastructure within Friday Flat.

7.10 Air Quality

The following land uses have been identified within close proximity of the site:

- tourist accommodation (River Inn and Woodridge lots) – approximately 40 m south-southeast; and
- Thredboland / KT offices – approximately 65 m northeast.

There is potential for dust emissions to be generated during earthworks and construction, however these impacts will be short-term and negligible with the proposed mitigation measures (refer **Section 8**). Further, the riparian vegetation associated with Merritts Creek acts as a buffer between the site and tourist accommodation.

7.11 Noise and Vibration

Works will take place during off-peak visitation periods. Given the nature of the construction method, land uses to the south-southeast may at times be sensitive to noise from construction (e.g. loading/unloading materials, construction of building, movement alarms). However, noise impacts are expected to be low given the works will be conducted during standard hours, the duration of works is short-term and appropriate mitigation measures (**Section 8**) will be implemented during construction.

7.12 Built Environment

The site and surrounds comprise existing ski lifts, associated buildings and snowmaking infrastructure. The Development will provide an additional snowrunner and Snowsports operation building which fits with the current building form within Friday Flat. The colours and materials of the building are in keeping with the surrounding building character. As such, impacts on the built environment are expected to be negligible.

7.13 Climate and Snow Deposition

The Snowsports operations building comprises a skillion roof with a pitch of 12 degrees. The building has been designed to withstand the extreme alpine environment and shed snow from the building entrance to protect occupants from falling snow and ice.

7.14 Waste

The Development will generate the following waste streams:

- general solid waste (putrescible) e.g. waste from litter bins, food waste; and
- general solid waste (non-putrescible) e.g. plastic, paper, carboard and construction waste.

The following waste receptacles will be provided for the storage and disposal of waste associated with the construction of the Development:

- general litter bins for waste such as food waste and non-recyclable plastic;
- recycling bins for waste such as carboard packaging, paper, recyclable plastic;
- skip bins; and
- KT's waste transfer facility (materials to be segregated for re-use, recycling etc.).

Excess spoil from excavations will be taken off-site and placed within the resort's existing stockpile locations at the top carpark for re-use within the resort. Any waste that cannot be re-used within the resort will be transported off-site by a licence contractor and disposed of at the Jindabyne Landfill.

Waste minimisation and management strategies that will be implemented for the Development are provided in **Section 8**.

8 Mitigation and Management Measures

Recommended mitigation and management measures to reduce potential impacts on the key values of the natural, built and human environment within the site and surrounds are provided in **Table 10**.

Table 10: Recommended Mitigation and Management Measures

Mitigation and Management Measures	
General	
1	A Site Environmental Management Plan (SEMP) will be implemented prior to the commencement of construction activities. The SEMP will address matters such as construction hours, waste management, erosion and sediment controls, biosecurity and complaints management.
2	All Project staff and contractors should undergo a site-specific induction which will cover environmental awareness training, environmental obligations and compliance requirements, emergency and incident response, reporting, and relevant procedures.
3	Prior to commencement of works, the Development site will be temporarily fenced, roped or flagged to clearly delineate the construction area and no-go zones.
Land and Water	
1	During construction, appropriate ESCs will be installed to minimise impacts to the water quality of run-off and the potential for sediment to leave the site and impact on the surrounding environment. ESCs to be inspected and maintained in accordance with SEMP.
2	All stockpiles will be managed in accordance with the *Soil Stockpile Guidelines for the Resort Areas of Kosciuszko National Park, version 1.0* (OEH 2017) (Soil Stockpile Guidelines).
3	All storage of petroleum products, oils or chemicals to be in accordance with Australian Standards.
4	Refuelling procedures to be implemented to minimise spills of fuel products.
5	Progressive rehabilitation of disturbed areas to reduce erosion risks in accordance with the *Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park* (DECC 2007) (Rehabilitation Guidelines).
6	Incorporate design and construction recommendations outlined in Section 5 of the Geotechnical Investigation Report (AssetGeoEnviro 2022) (**Appendix I**).
Flora and Fauna	
1	Project machinery and vehicles to arrive/depart from KNP and the Development site in a clean condition, free of mud and vegetative propagules
2	Machinery to be regularly maintained and manoeuvred to prevent the spread of weeds and pathogens.
3	Disposal and storage of putrescible wastes must be undertaken appropriately to ensure feral animals aren't attracted to the site.
4	Prior to the commencement of construction works, all weed species identified within the construction corridor to be treated in accordance with best practice methods to ensure these weeks are not spread further within the site or throughout KNP.
Traffic and Access	
1	Traffic and construction vehicle access will be managed as per regular daily operation in the resort.
2	All vehicle and plant operators will be licensed and trained.
3	Appropriate signage will be installed to ensure the safety of road users, cyclists and pedestrians, and prevent unauthorised access to the construction site.

Air Quality	
1	Reasonable and practicable measures (e.g. water sprays, vehicles carrying rubble must be covered) will be implemented to prevent dirt and dust from affecting the amenity or the surrounding environment during construction. Measures will be detailed in the SEMP.
2	In the event a complaint is received in relation to air quality/dust nuisance, the source of the complaint will be investigated, and if required corrective actions will be implemented to minimise or avoid impacts.
Noise and Vibration	
1	Project staff will take reasonable and practicable management measures to avoid and mitigate environmental nuisance from noise associated with the works e.g. avoid dropping materials from a height, turn off plant that is not being used.
2	Construction works and operation of plant will comply with Australian Standard *AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites* and the *Interim Construction Noise Guideline* (DECC 2009) e.g. ensure plant is regularly maintained, and repair or replace equipment that becomes noisy, keep drivers informed of designated vehicle routes and parking locations
3	Construction works will be conducted during standard hours stipulated in the conditions of approval.
4	In the event a noise complaint is received, the source of the complaint will be investigated, and if required corrective actions will be implemented to minimise or avoid noise impacts.
Cultural Heritage	
1	Where unexpected items of potential archaeological, built or Aboriginal cultural heritage significance are discovered, works will cease, relevant authorities (i.e. NPWS) will be notified and the site will be secured by erecting a no-go zone. If human remains are found, works will cease, the site will be secured and NSW Police will be notified immediately.
Waste	
1	Waste to be managed in accordance with the waste hierarchy – avoid and reduce → reuse waste→ recycle waste → recover energy→ treat waste→ dispose of waste.
2	All construction waste and litter to be minimised and contained within appropriate receptacles. All receptacles will be in good condition.
3	All waste to be managed and disposed of in accordance with legislative requirements and relevant standards, for instance: general litter will be segregated from recyclables; and excess spoil will be removed off-site and transported to KT's main soil stockpile locations and managed in accordance with the Soil Stockpile Guidelines.
4	All waste transportation vehicles should be covered appropriately to ensure waste cannot spill, leak or escape onto the road or wash into stormwater drains.

9 Conclusion

The Development will provide a dedicated snowrunner and teaching terrain to be utilised by Snowsports for kids lessons and programs (i.e. Thredboland and Freeriders ski and snowboard programs). The new check-in location and teaching terrain will reduce congestion around the Gunbarrel lift line and busy area of Friday Flat, as well as the risks of potential collisions between Snowsports guests and the general public. The Development will also reduce the requirement for the operation of Freddy as the snowrunner will provide lift access to other beginner areas (e.g. Wombats snowrunner).

In accordance with the relevant legislative requirements, this SEE has assessed the potential impacts of the Development on the human, built and natural environment of the Development site and surrounds. The Development has been designed to minimise impacts on the surrounding environment.

The Development is anticipated to have minimal impacts on the natural environment given the highly disturbed nature of the site, no removal of native vegetation is required and the minor disturbance footprint (320 m^2). With the implementation of appropriate environmental controls, the impacts from the Development environment from the works are considered low.

The Development is consistent with the current built form within Friday Flat and the impacts on the built environment are expected to be negligible.

The social and economic impacts of the Development will be positive through the provision of an additional dedicated ski area for beginner skiers and snowboarders which will contribute to greater safety and an enhanced guest experience. The Development will also provide direct investment into the resort and generate construction jobs, though impacts will be nominal.

In summary, the site is considered suitable to accommodate the Development, and the Development will provide a positive contribution to the resort and programs offered by Snowsports.

10 References

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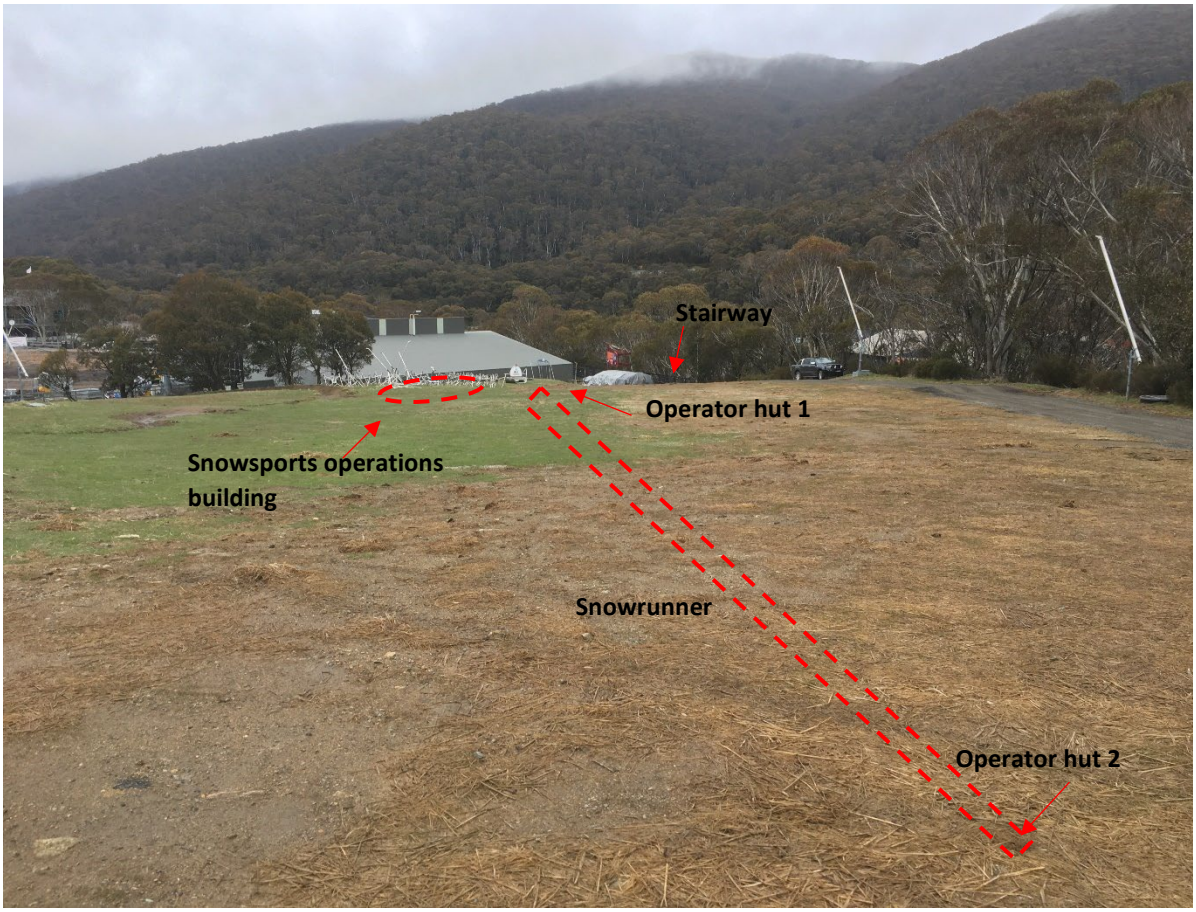
11 Acronyms and Abbreviations

Acronyms	
AANP	Australian Alps National Parks and Reserves
AHD	Australian Height Datum
AssetGeoEnviro	Asset Geotechnical Engineering Pty Ltd
BC Act	*Biodiversity Conservation Act 2016*
BC Regulation	Biodiversity Conservation Regulation 2017
BOS	Biodiversity Offset Scheme
BVM	Biodiversity Values Map
Cth	Commonwealth
DA	Development Application
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Industry and Environment (now DPE)
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
Friday Flat	Friday Flat ski area, Thredbo Alpine Resort
Ha	hectare
KNP	Kosciuszko National Park
KNP POM	Kosciuszko National Park Plan of Management 2006
km	kilometres
LGA	Local Government Area
m	metres
m^2	Metres squares
MNES	Matters of National Environmental Significance
NCC	National Construction Code
NPW Act	*National Parks and Wildlife Act 1974*
NPW Regulation	National Parks and Wildlife Regulation 2019
NPWS	National Parks and Wildlife Service
OEH	NSW Office of Environment and Heritage
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PMR	Protected Matters Report
Regional Precincts SEPP	*State Environmental Planning Policy (Precincts—Regional) 2021*
RFS	NSW Rural Fire Service
SEE	Statement of Environmental Effects
SEMP	Site Environmental Management Plan
TEC	Threatened Ecological Community
Thredbo	Thredbo Alpine Resort
VRZ	Vegetated riparian zone
WM Act	*Water Management Act 2000*
WM (General) Regulation	Water Management (General) Regulation 2018

12 Appendices

Appendix A Site Photos



Top of site, facing downhill toward Gunbarrel bottom station

Bottom of site, facing uphill

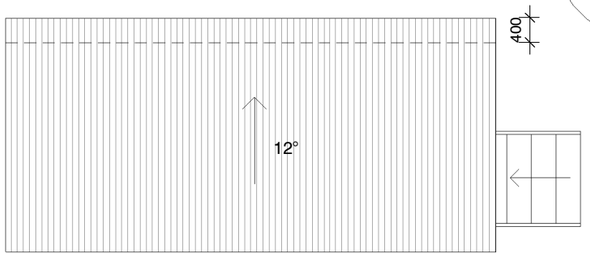
Bottom of site, facing towards River Inn

Snowsports operations building location

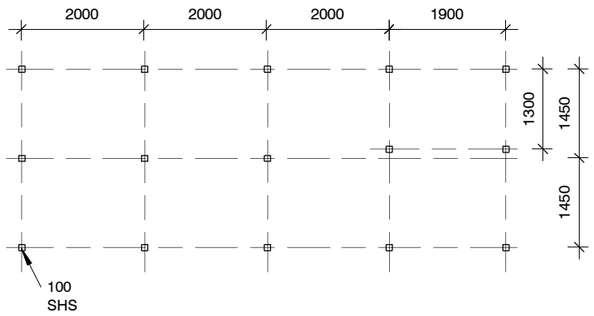
Bottom of site facing western boundary towards Mountain access road and riparian vegetation associated with Merritts Creek

Snowsports guests to walk up to check-in location behind the Gunbarrel bottom station

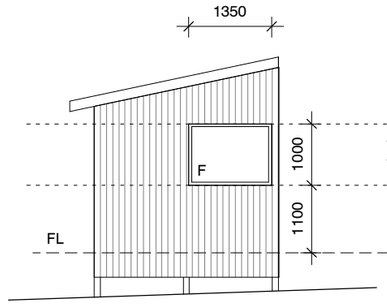
Appendix B Site Plans and Design Drawings



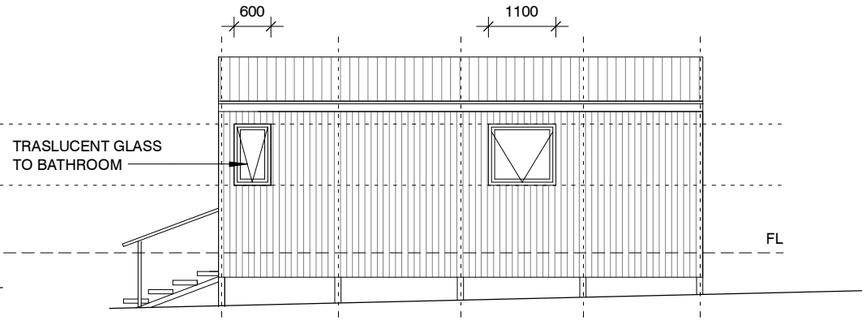
ROOF PLAN



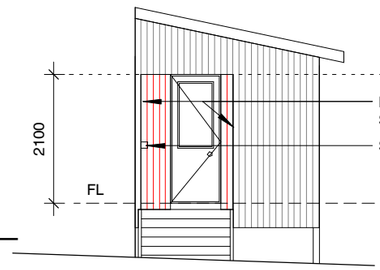
FLOOR FRAMING



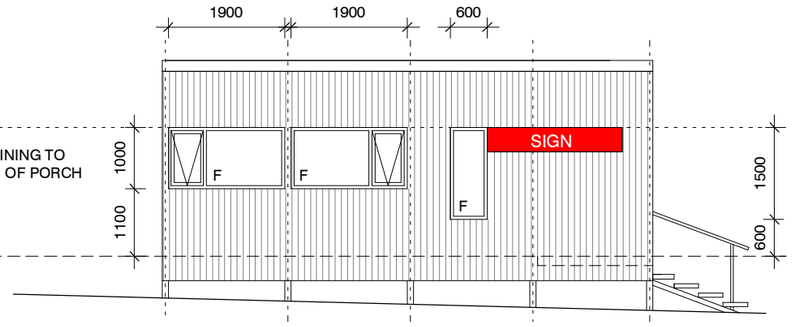
NORTH WEST ELEVATION



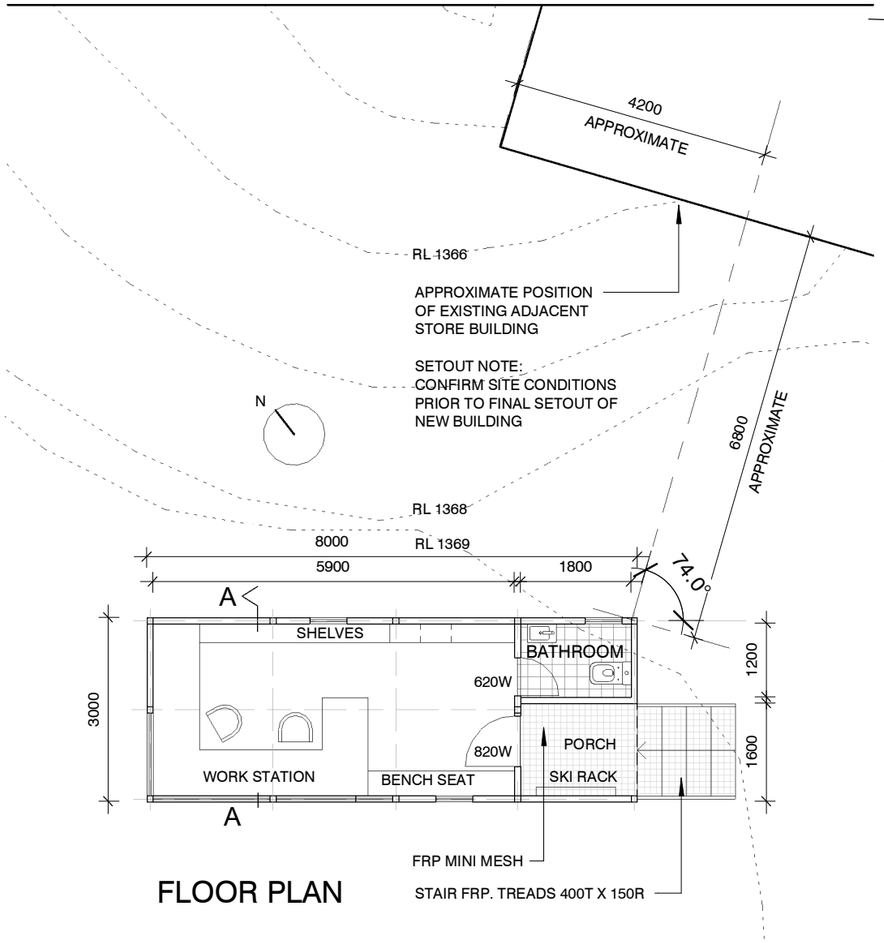
NORTH EAST ELEVATION



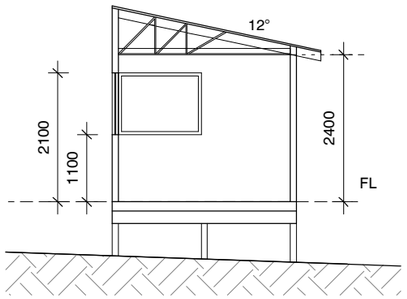
SOUTH EAST ELEVATION



SOUTH WEST ELEVATION



FLOOR PLAN

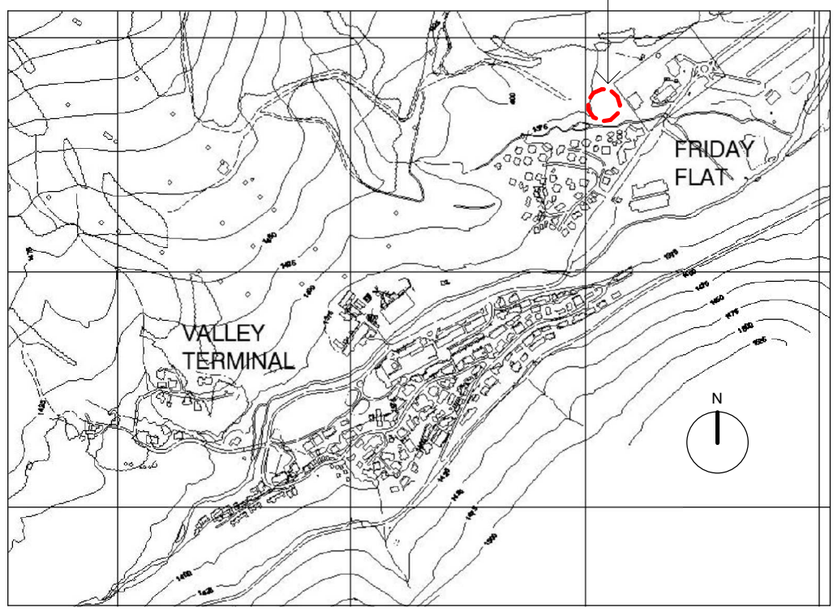


SECTION A-A

WALLS+ROOF
CUSTOM ORB
COLORBOND "BASALT"

WALLS
CUSTOM ORB
COLORBOND "MANOR RED"

NEW SUPERVISORS BUILDING



This drawing should be read in conjunction with all relevant contracts, specifications and drawings. Dimensions are in millimetres. Levels are metres. Do not scale off drawings. Use figured dimensions only. Check dimensions on Site. Report discrepancies immediately.

NOTES

AUTHORISED FOR ISSUE

B	02/09/22	BATHROOM ADDED	RG
A	31/05/22	ISSUE FOR DA	RG

ISSUE DATE SUBJECT VALID'N.

DEVELOPMENT APPLICATION

PROJECT
NEW SUPERVISORS BUILDING

FRIDAY FLAT, THREDBO VILLAGE

CLIENT
Kosciuszko Thredbo Pty Ltd

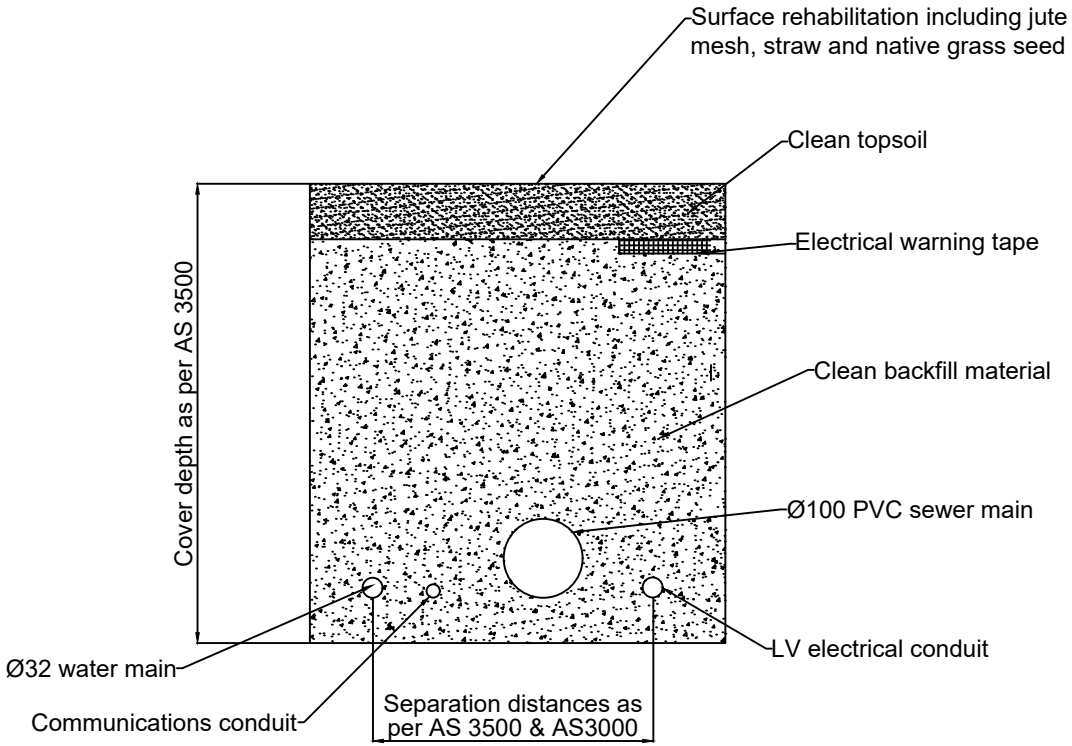
THREDBO

ARCHITECT
djrd architects
T +612 9319 2955
ABN: 48 942 921 969
Nominated Architects:
Andrew Hopwell 6562
Daniel Beekwilder 6192
63 Myrtle Street
Chippendale NSW 2008
Sydney Australia
djrd.com.au

DRAWN	SCALE AT A3
Author	1 : 100

DESCRIPTION
PLAN AND ELEVATIONS

PROJECT No	DRAWING No	REVISION
22 424	A1.101	B



NOTES

1. Minimum depth, trench width and separation of all services will be met in accordance with AS/NZS 3500 Plumbing and Drainage and AS3000 Electrical Installations
2. Clean backfill and pipe bedding will meet AS/NZS 3500 Plumbing and Drainage and AS3000 Electrical Installations

DRAWING

Snowsports Operations Building Services - Trench Cross Section

PROJECT

Thredboland and Freeriders Beginner Zone

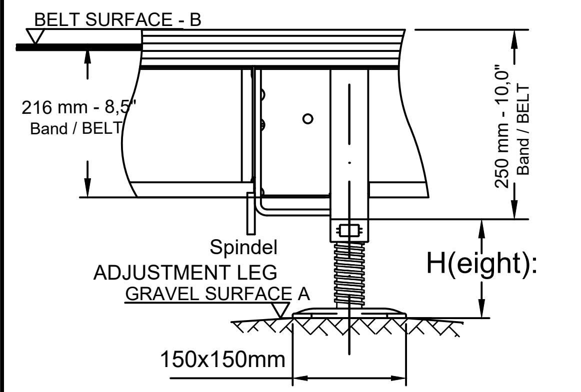
THREDBO

REV	DATE	DESCRIPTION
1	03/09/22	Original for DA

DESIGNED BY K. O'Sullivan	CHECKED BY P. Fleming
SCALE NTS	FILE NAME Snowsports Ops Services Trench.dwg
SHEET 1/1	

SUREFOOT FOOTING EXAMPLES

DETAIL- W (ADJUSTMENT LEG) TYPE- G



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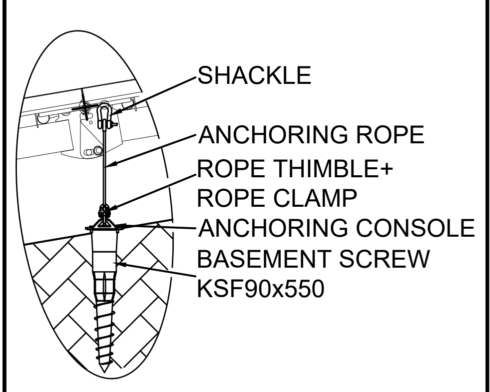
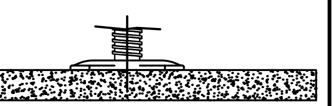


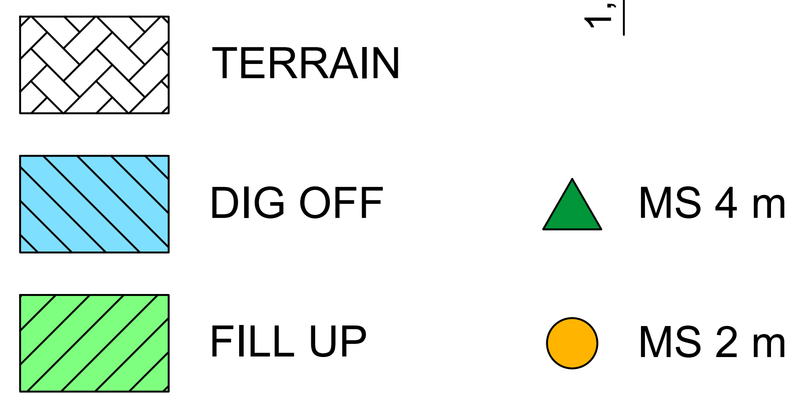
OPTION:
CONCRETE PLATE
300x300x40mm



WEIGHT:

STRUCTURE: 1000 N/m
PASSENGER: 1000N/m (theo. maximum)
TOTAL 2000 N/m

LOAD PER PAIR OF LEGS: 6000 N
PER LEG: 3000 N



General product characteristics

Project number: pr22-10-061
Serial number:
Total Length: 98,25m
Transport Length: 95 m
Ø Grade: 14 %
Belt width: 600 mm
Country version:
Passenger: Skier
Field of application: Outdoor
Operating season: Winter
Further information: -

Drive station 100

Type: Jumbo
Motor: 15 kW
Speed: 0,7 m/s
Drum diameter: 600 mm
Exit type: Standard
Anchoring: by customer
Snow pit: by customer
Support beam: by customer
Position control box: Standard
Further options: -

Return station 200

Type: Jumbo
Belt tension: hydraulic
Snow pit: -
Support beam: by customer
Terminal: Standard
Further options: -

Midsection 300

Number of 2 m-Elements: 1 pcs.
Number of 4 m-Elements: 23 pcs.
Belt type: Blue Eye
Belt connector: RS187
Lateral cover: Tarpaulin
Height lateral cover: standard
Anchoring: screw-in foundation

Distance anchoring: 2 m
Further options: -

Gallery 500

Type: Evolus N
Roofing: midsections
Ermergency exit: Tarpaulin
Distance between emergency exity: 18 m
Anchoring: screw-in foundation

Safety stop track: 4 pcs.
Entrance/Exit: Roll-up door
Lateral cover: Tarpaulin
Height lateral cover: standard
Further options: -

Position control box: outside

Index	Date	Description of changes	Editor

Projekt/project:
Thredbo
Australia (AU)

Transport-Length: 95m

Produkt/product:
SUNKID ZAUBERTEPPICH
SUNKID CONVEYOR BELT

Hersteller/Manufacturer:
BRUCKSCHLÖGL GesmbH
MASCHINENBAU-FÖRDERTECHNIK-SEILBAHNTECHNIK
A-4822 Bad Goisern am Hallstättersee / Au 132

Baureihe/Model range: SKD 27
Datum/Date: 03.06.2022
Maßstab/Scale: 1:150
Seiten/Pages: 1/1

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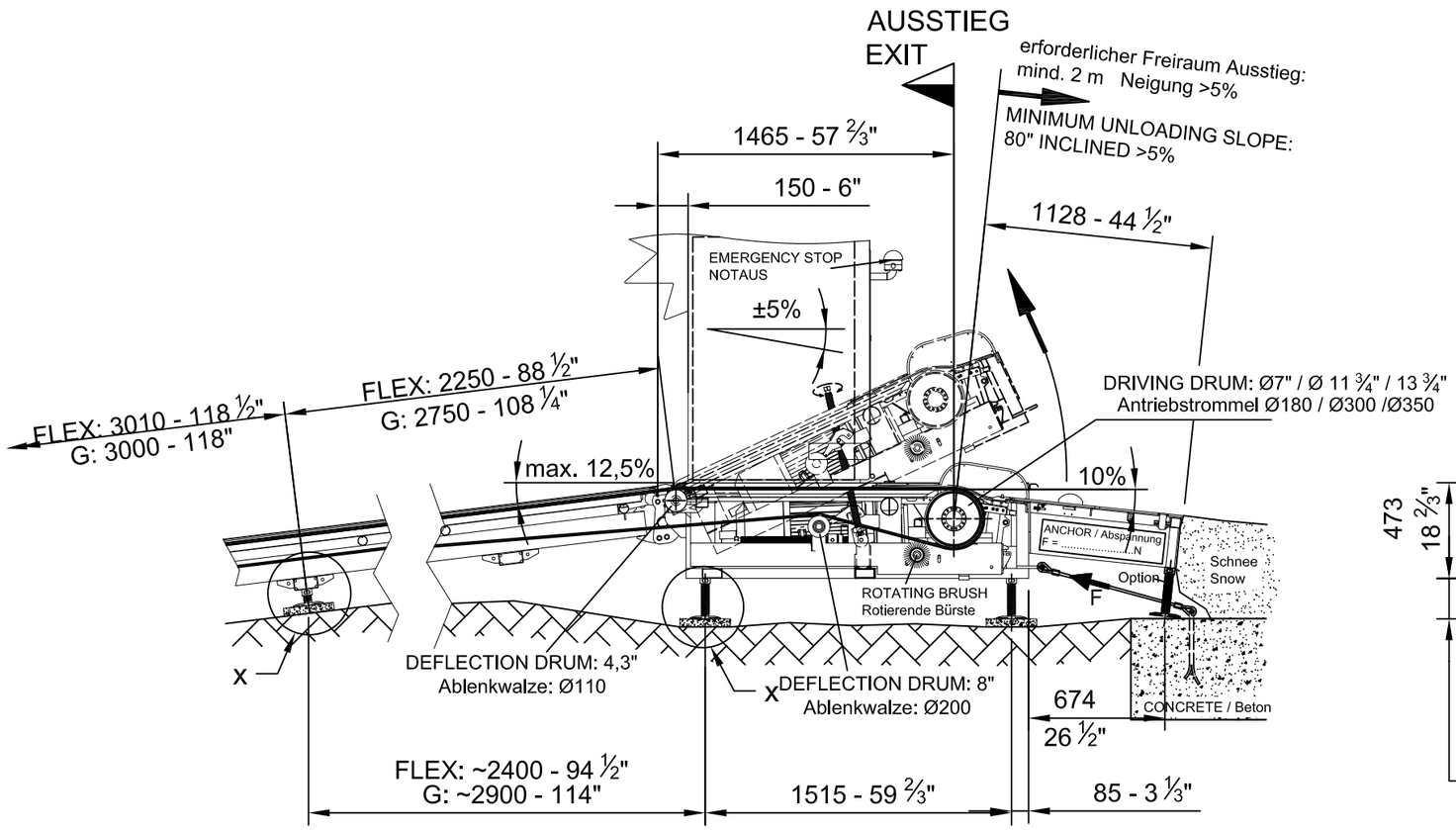
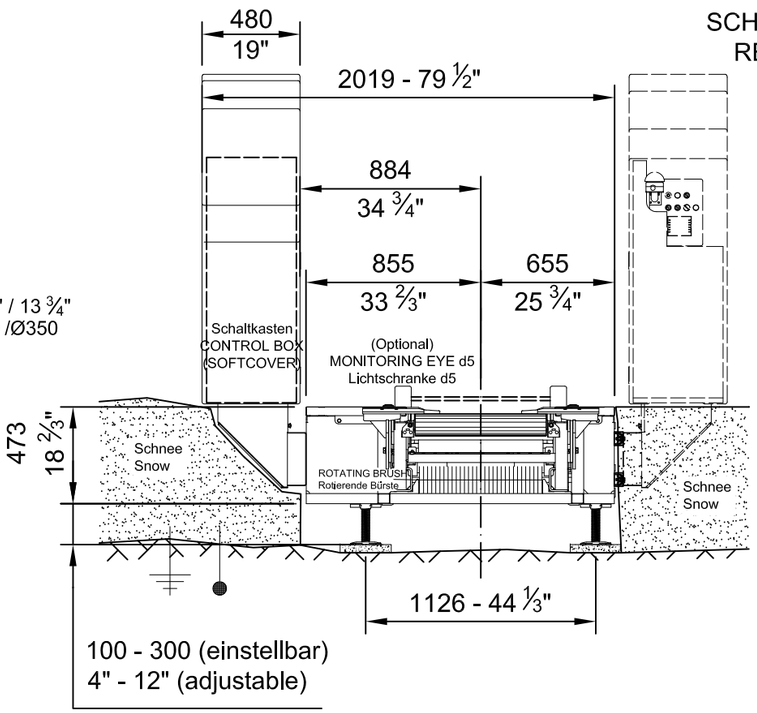
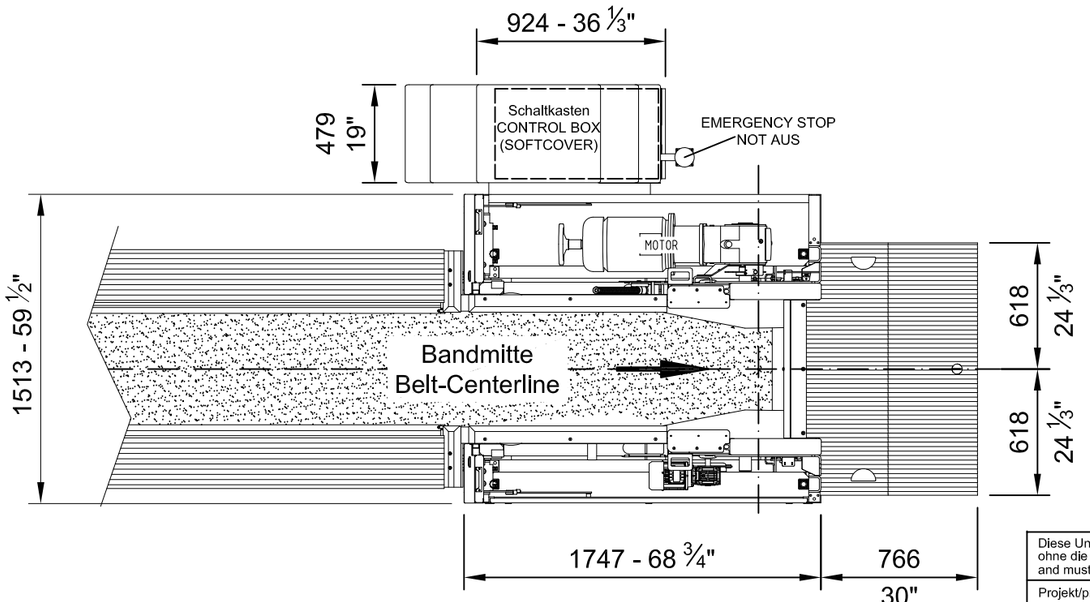
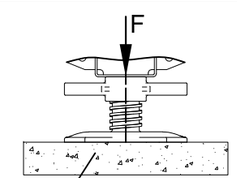






Detail X - Stellfuß / ADJUSTMENT LEG
(ohne Maßstab / WITHOUT SCALE)



Unterlage für Stellfüße
support for adjustment legs

Belastung "F" pro Stellfuß LOAD "F" PER ADJUSTMENT LEG	
Mittelsegment MIDDLE SECTION	3000N
Antriebsstation DRIVING STATION	6500N

MASSE IN MM
MEASURES IN MM

Projekt/project:
Antriebsstation 2,2 - 11kW
Ausstieg + Abspannung
DRIVE STATION 2,2 - 11kW
EXIT + ANCHOR

erstellt durch/created by: -
Ansprechpartner/Representatives: -

erstellt mit AutoCAD LT 2014

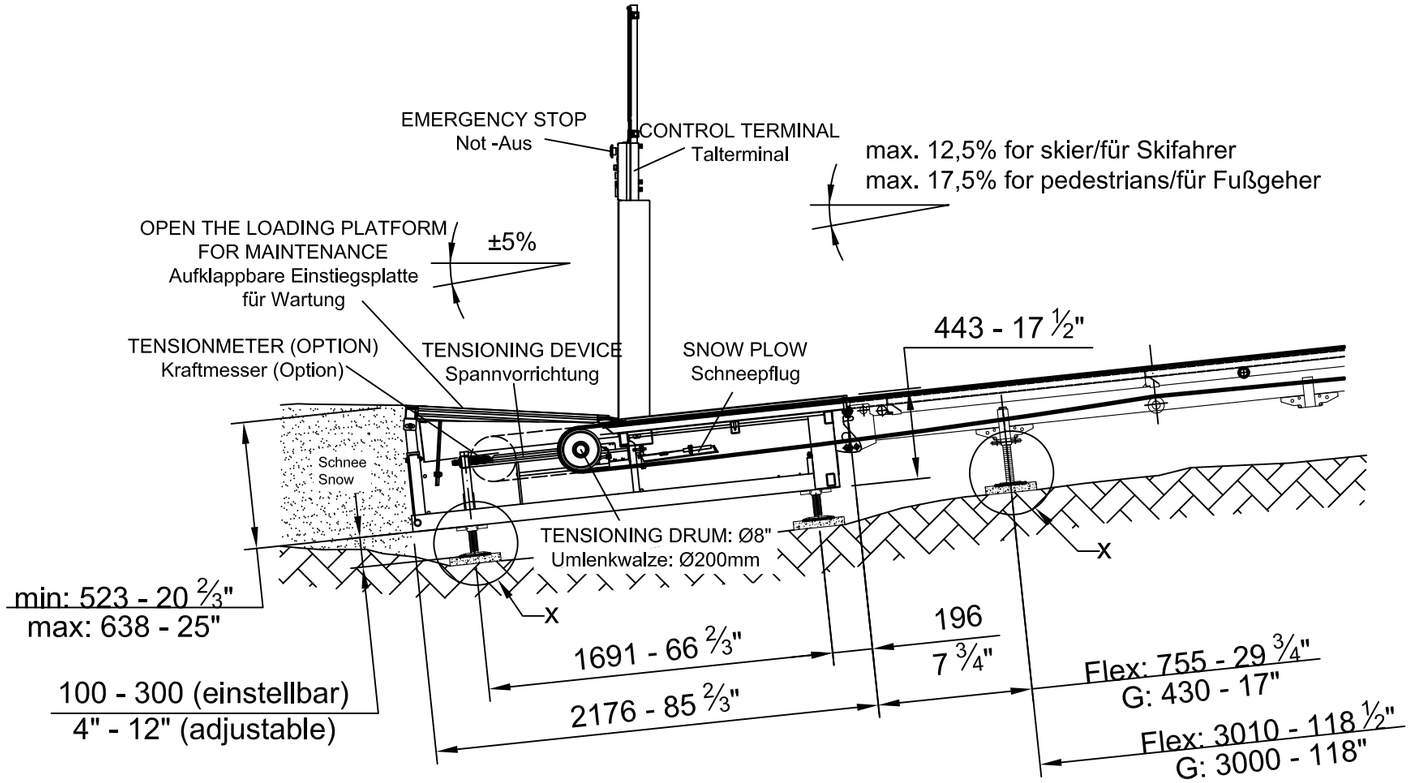
Hersteller/Manufacturer:
BRUCKSCHLÖGL GES.M.B.H
MASCHINENBAU-FÖRDERTECHNIK-SEILBAHNTECHNIK
A-4822 Bad Goisern am Hallstättersee / Au 132

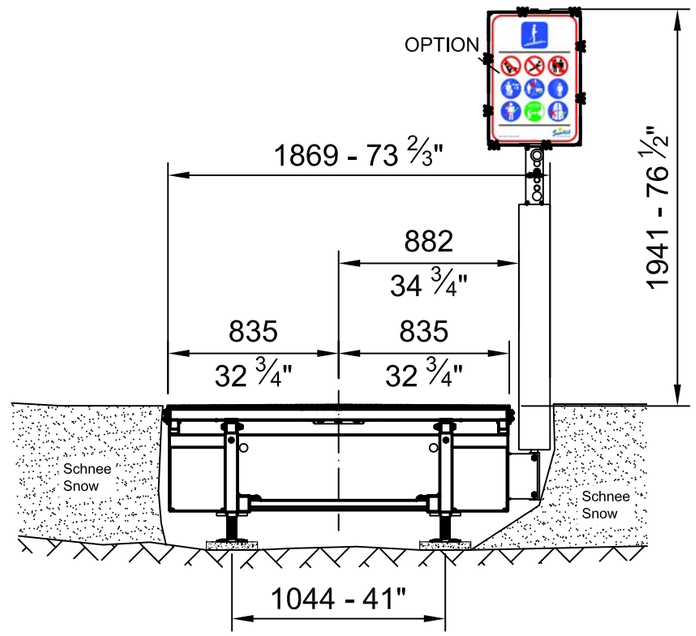
Produkt/product:
SUNKID ZAUBERTEPPICH
SUNKID MOVING CARPET

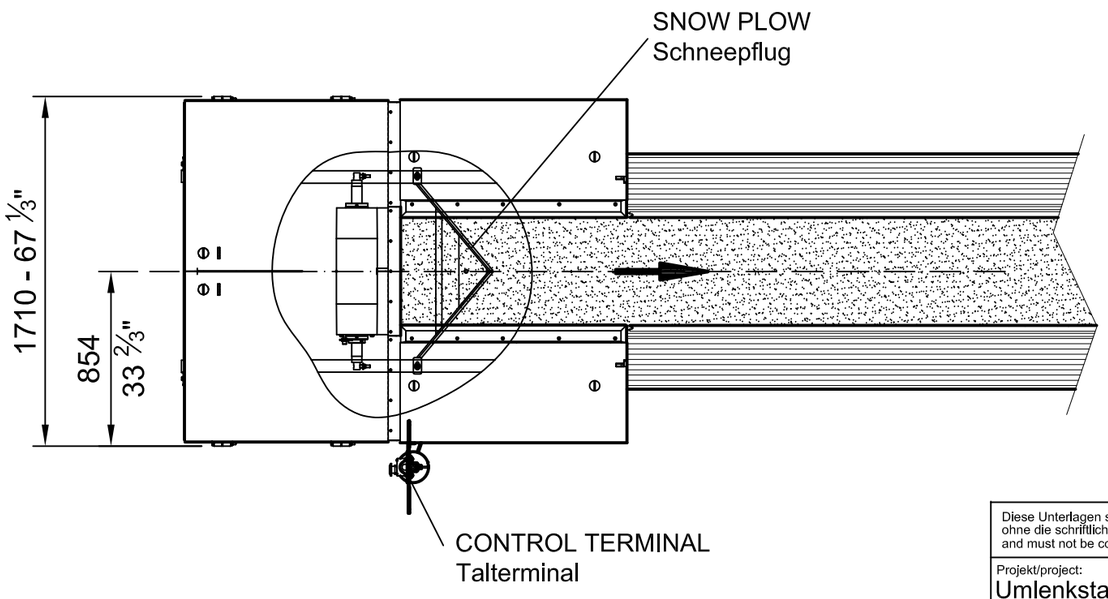
Details/details:
Endlosband - 600mm breit/BELT - 24" WIDE

EDV Nr.: m21-10-101.dwg

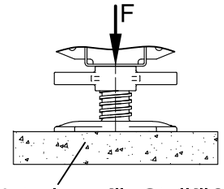
Baureihe/Model range: SKD 26
Datum/Date: 28.01.2021
Maßstab/Scale: 1:30 (A3)
Seiten/Pages: 1/1







Detail X - Stellfuß / ADJUSTMENT LEG
(ohne Maßstab / WITHOUT SCALE)



Unterlage für Stellfüße
support for adjustment legs

Belastung "F" pro Stellfuß LOAD "F" PER ADJUSTMENT LEG	
Mittelsegment MIDDLE SECTION	3000N
Umlenkstation RETURN STATION	2500N

MASSE IN MM
MEASURES IN MM

Projekt/project:
Umlenkstation Standard und Einstieg
RETURN STATION STANDARD and LOADING AREA

erstellt durch/created by: LP
Ansprechpartner/Representatives: MO

erstellt mit AutoCAD LT 2014

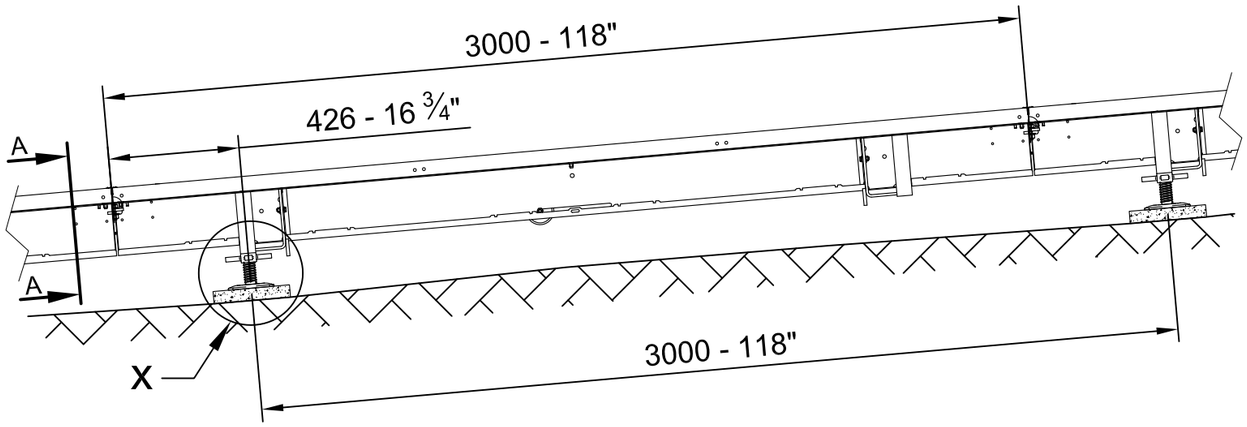
Hersteller/Manufacturer:
BRUCKSCHLÖGL GES.M.B.H
MASCHINENBAU-FÖRDERTECHNIK-SEILBAHNTECHNIK
A-4822 Bad Goisern am Hallstättersee / Au 132

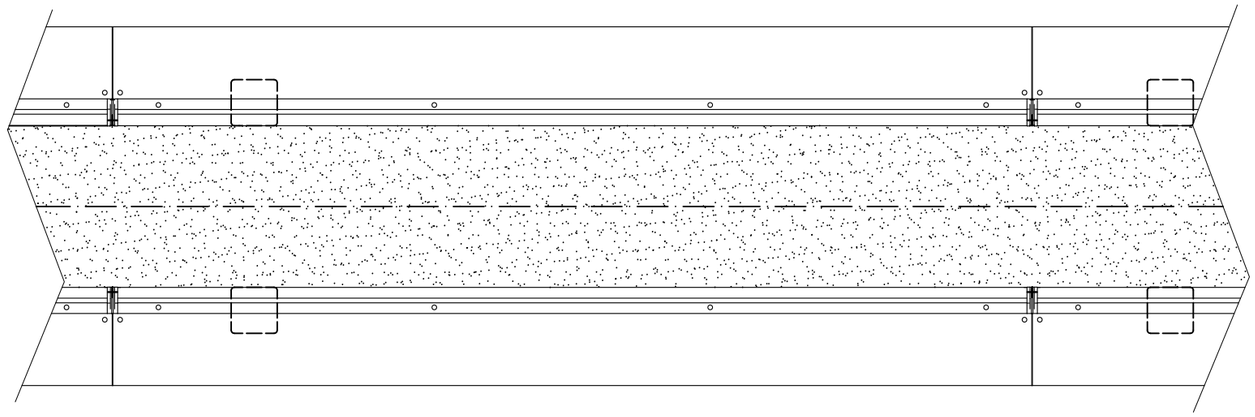
Produkt/product:
SUNKID ZAUBERTEPPICH
SUNKID MOVING CARPET

Details/details:
Endlosband - 600mm breit / BELT - 24" WIDE

EDV Nr.: m21-10-201_B600.dwg

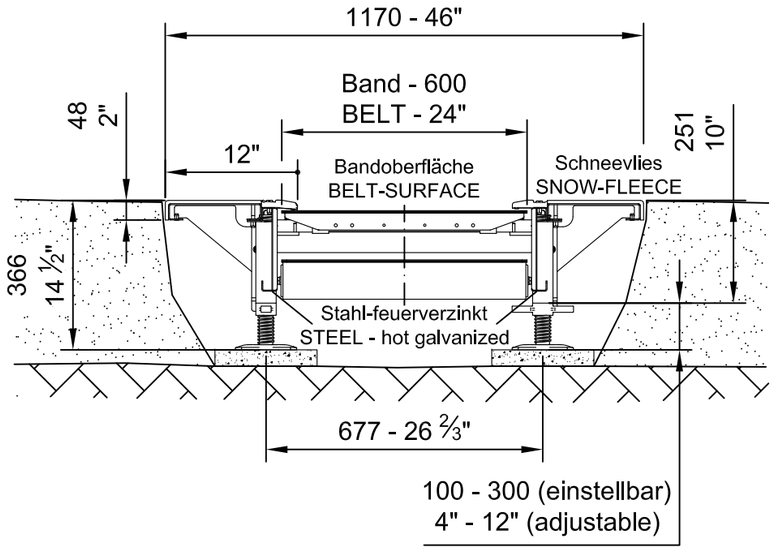
Baureihe/Model range: SKD 26
Datum/Date: 01.02.2021
Maßstab/Scale: 1:30 (A3)
Seiten/Pages: 1/1



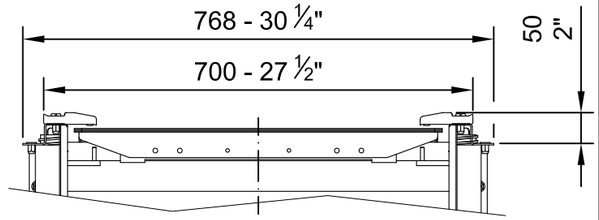


MASSE IN MM
MEASURES IN MM

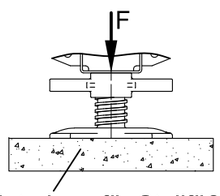
Querschnitt A-A (Maßstab 1:15)
CROSS SECTION A-A (SCALE 1:15)



Optional ohne Abdeckung
(Maßstab 1:10)
OPTIONAL WITHOUT
WALKWAY DESIGN
(SCALE 1:10)



Detail X - Stellfuß / ADJUSTMENT LEG
(ohne Maßstab / WITHOUT SCALE)



Unterlage für Stellfüße
support for adjustment legs

Belastung "F" pro Stellfuß LOAD "F" PER ADJUSTMENT LEG	
Mittelsegment MIDDLE SECTION	3000N

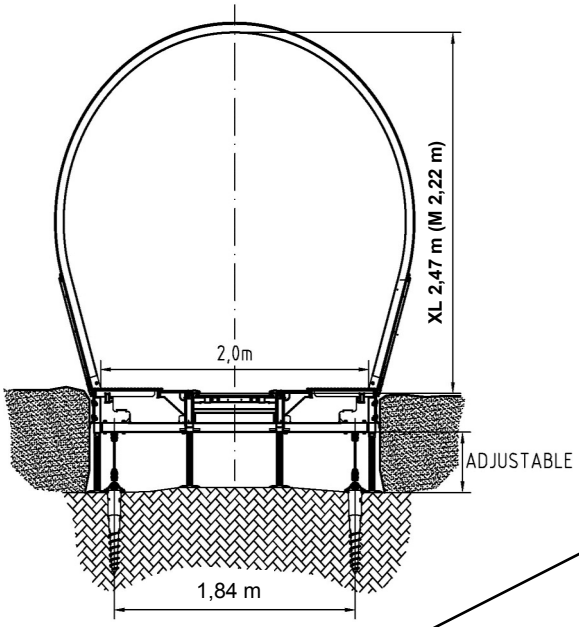
Projekt/project: Mittelsegment Type G 12 Zoll - Abdeckung MIDDLE SECTION TYPE G 12 INCH - COVER	Hersteller/Manufacturer: **BRUCKSCHLÖGL** GES.M.B.H MASCHINENBAU-FÖRDERTECHNIK-SEILBAHNTECHNIK A-4822 Bad Goisern am Hallstättersee / Au 132	Produkt/product: SUNKID ZAUBERTEPPICH SUNKID MOVING CARPET	Baureihe/ Model range SKD 26
			Datum/Date 01.02.2021
		Details/details: Endlosband - 600mm breit/BELT - 24" WIDE	Maßstab/ Scale 1:20 (A3)
erstellt durch: created by: LP Ansprechpartner: Representatives: MO			Seiten/Pages 1/1
erstellt mit AutoCAD LT 2014		EDV Nr.: m21-10-301_12Z.dwg	

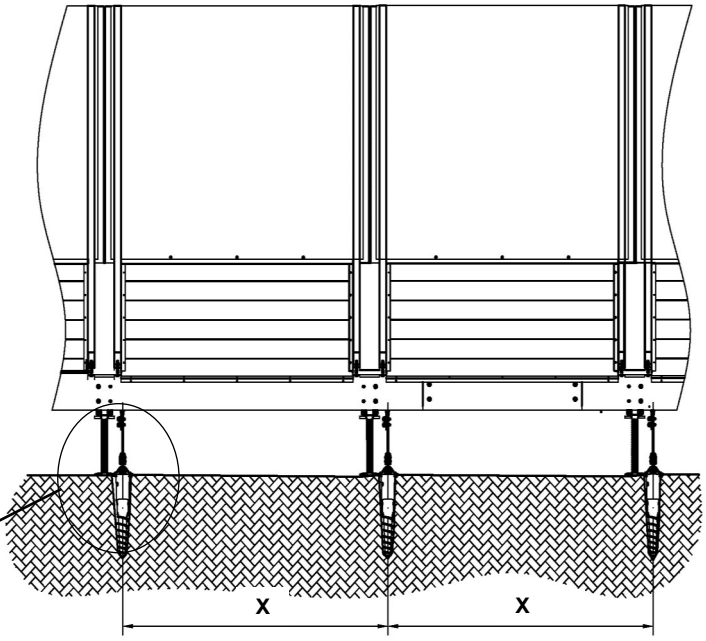
SunKid GmbH
A-6460 Imst/Tirol
Tel: (+43) 05412/68131
Fax: (+43) 05412/68132
e-mail: info@sunkidworld.com
Web-Site: www.sunkidworld.com
UID-Nr.: ATU 42030100

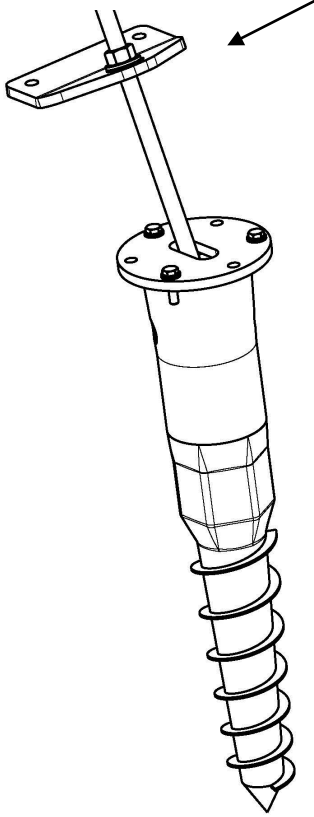
SUNKID GALLERY
"EVOLUS"

sunkidworld.com

OPTION NO.: 2177-2179
ASSEMBLY







CONTENTS

Occupational safety recommendations
All points relating to occupational safety are identified by this symbol.

Sunkid GALERIE Type “EVOLUS”
Sturmsicherung / WIND-PROTECTION

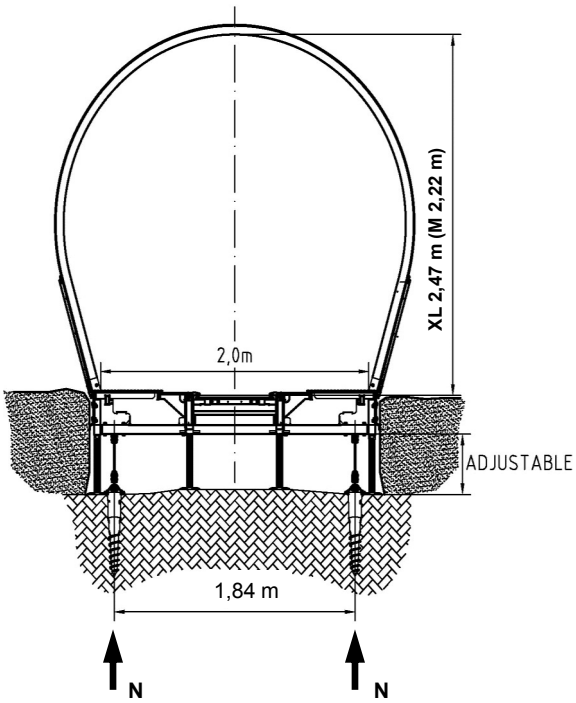
A-6460 Imst/Tirol
Tel: (+43) 05412/68131
Fax: (+43) 05412/68132
e-mail: info@sunkidworld.com
Web-Site:
www.sunkidworld.com
UID-Nr.: ATU 42030100

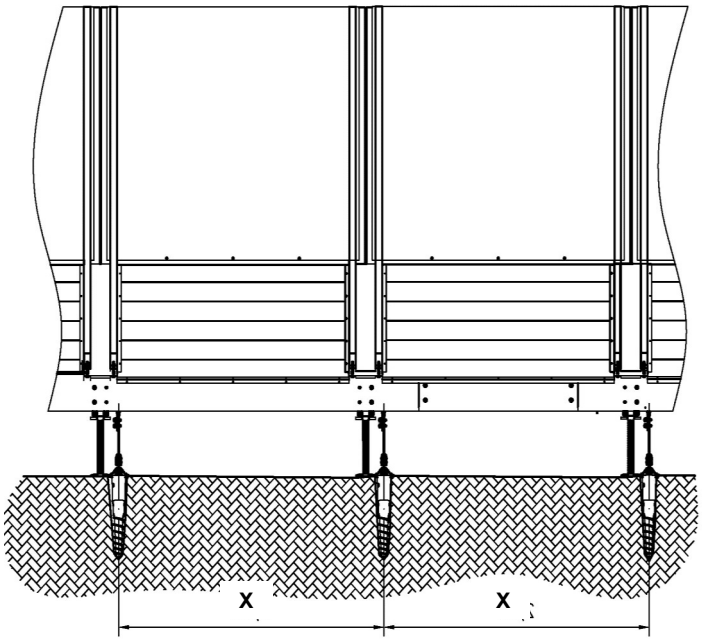
PROJECT:	Datum/Date:
	SKD Nr.:

Type - G / Flex	Number of midesections: Anzahl der Längenelemente:	
Max. Windgeschwindigkeit : Max Wind-Speed: .....km/h		

Lt. STATISCHER BERECHNUNG, Dipl.—Ing. Johann Stallinger (Ziviltechniker), GZ 11/083; 18.11.2011 + Anhang vom 10.10.2012.

WITH REGARD TO THE STATIC CALCULATION, Dipl. Ing. Johann Stallinger (CIVIL ENGINEER), GZ 11/2083; 18.11.2011 + Annex dated 10.10.2012.





Windgeschwindigkeit WIND SPEED	Abstand X DISTANCE X	*EVOLUS XL* Erforderliche Abspannkraft N REQUIRED RESISTANCE FORCE N	*EVOLUS M* Erforderliche Abspannkraft N REQUIRED RESISTANCE FORCE N
Up to 80 km/h	-	Keine Abspannung erforderlich / ANCHORING NOT REQUIRED	
Up to 100 km/h	8 m	4,12 kN*	3,60 kN*
Up to 130 km/h	4 m	6,98 kN*	6,08 kN*
Up to 165 km/h	2 m	7,04 kN*	6,12 kN*

* SAFETY RATE 1,3 CONSIDERED / Sicherheitsfaktor 1,3 berücksichtigt

Erforderliche Abspannkraft projektspezifisch SPECIFIC REQUIRED RESISTANCE FORCE	
Abstand projektspezifisch SPECIFIC DISTANCE	

ANCHOR POINTS / ABSPANNPUNKTE GALERIE : see Galerie MANUAL / lt. Betriebsanleitung Galerie
ANCHOR POINTS TERRAIN: Depends on terrain—local calculation necessary

Bad Goisern, am

BRUCKSCHLÖGL GES.M.B.H A-4822 Bad Goisern
MASCHINENBAU-FÖRDERTECHNIK-SEILBAHNTECHNIK
Tel: +43(0)6135/7484 Fax: +43(0)6135/7486
office@bruckschloegl.at www.bruckschloegl.at

ANCHORING

You can start the assemling of the anchoring after the rectangular tube of the base is mounted. There is a description of this step in the manual called “EVOLUS-Betr-GB-…..”.
The screw base of the anchoring must be drilled into the ground before the side attachment element gets fixed. Pay attention to the uphill positioning which is shown at figure 1. There is a special drilling machine needed to drill the screw base into the ground (not included in delivery). Depending on project and soil conditions, the screw bases can have a lenght of 550mm, 800mm or 1000mm.

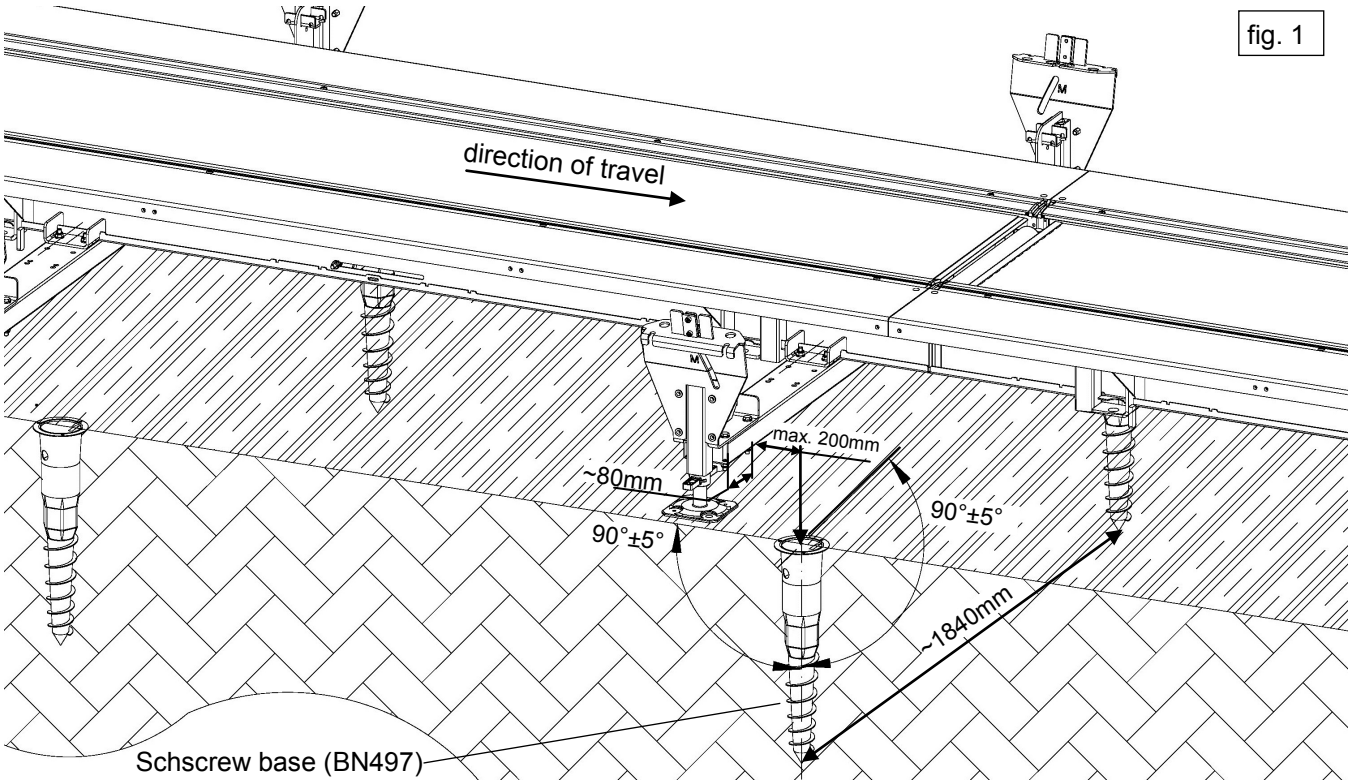


fig. 1

Now, some more components have to get mounted. You must put the thread bar through the cover plate and fix the articulated piece from the bottom side to the thread bar. After that the cover plate has to be fixed with washers and screws on the screw base. Pay attention that the long hole of the cover plate is in the same direction as the travel direction when the cover plate is fixed. (fig. 2)

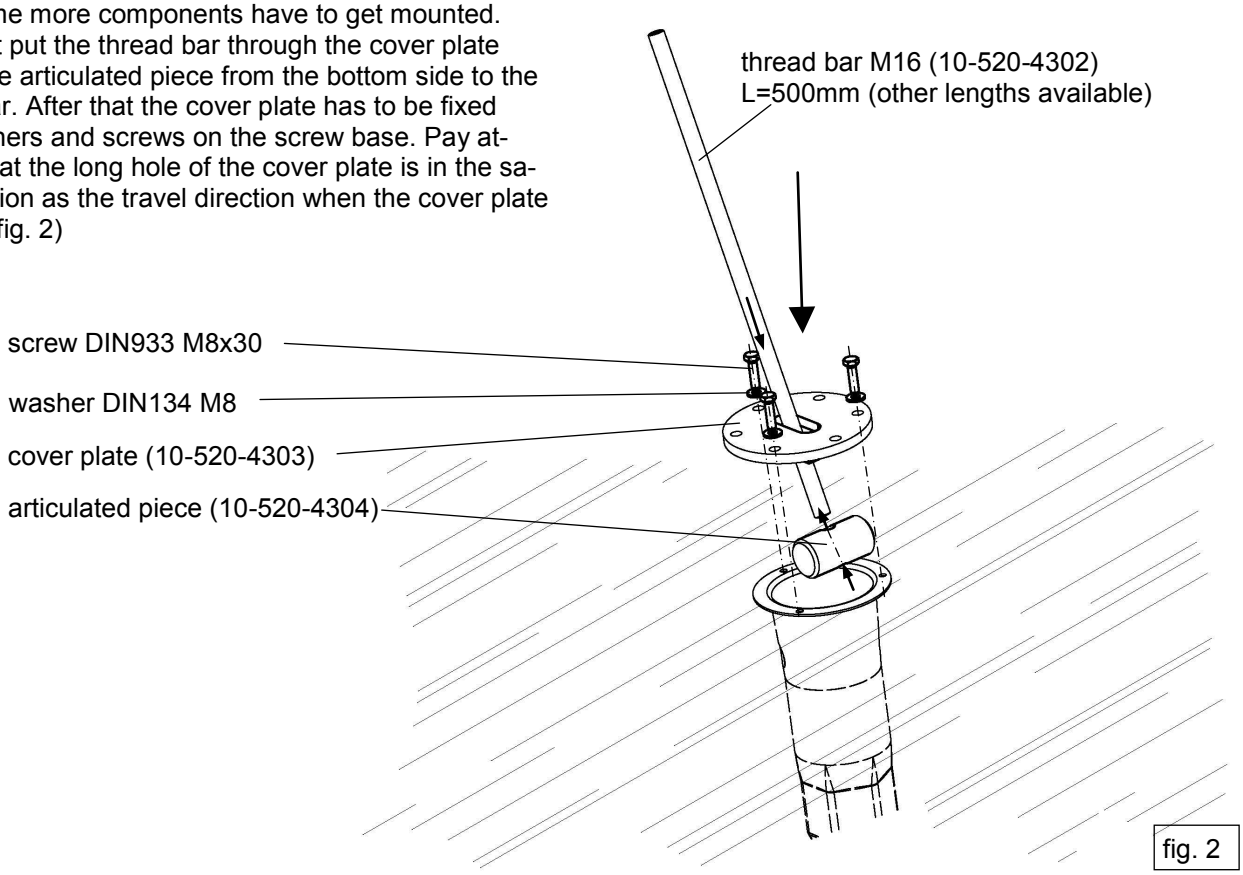
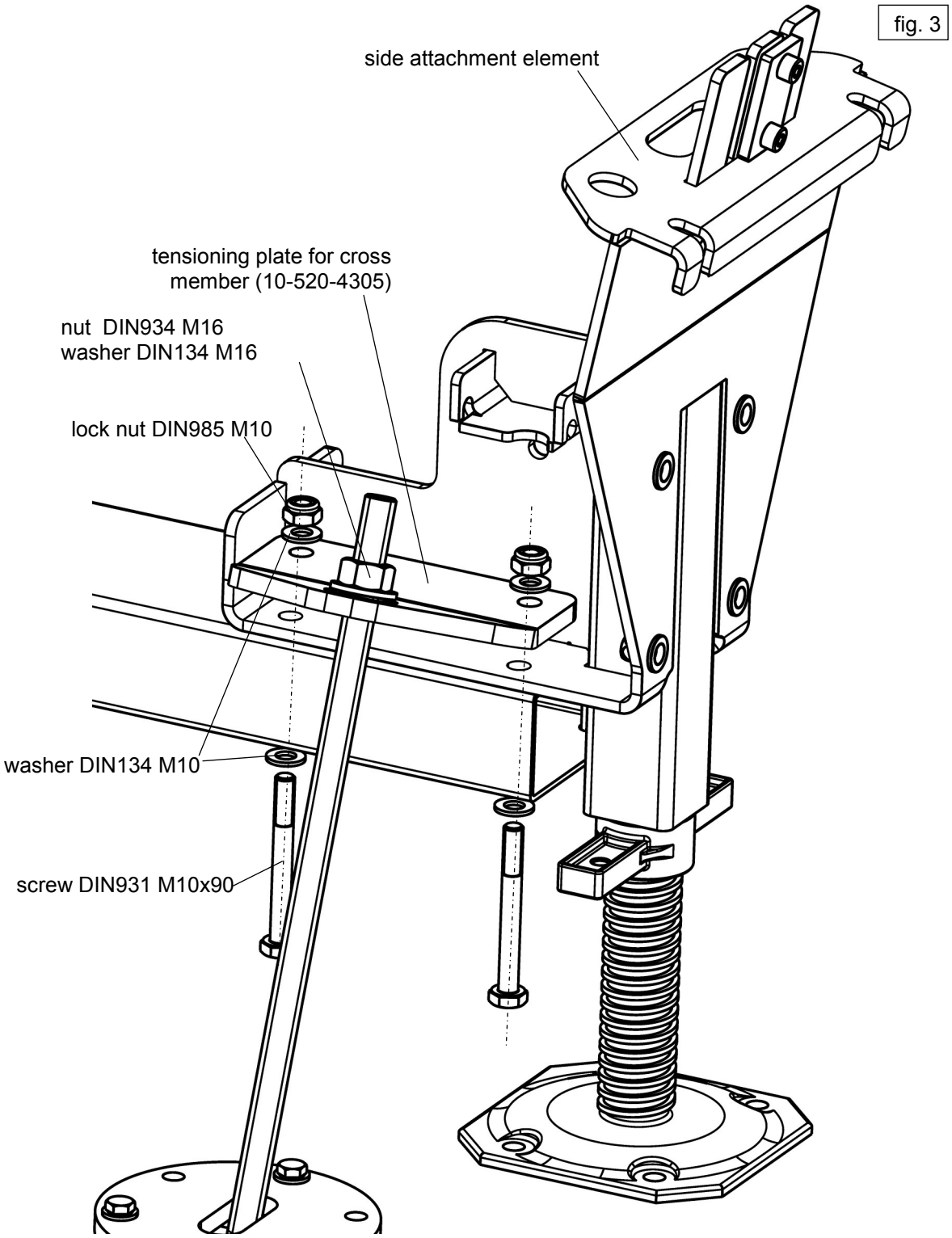


fig. 2

FIXING TO SIDE ATTACHMENT ELEMENT

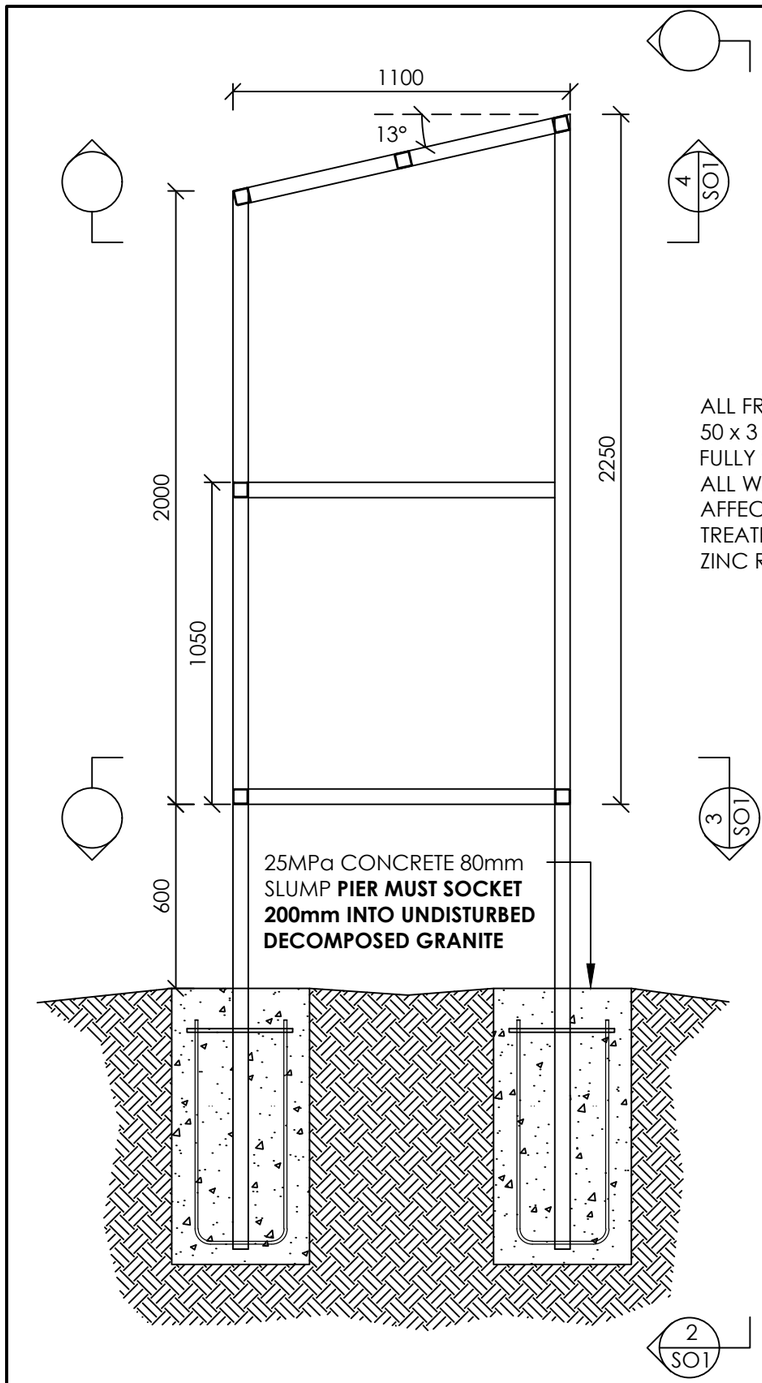
Finally, you have to put the tensioning plate for cross member onto the thread bar and the whole anchoring must be fixed with the side attachment element to the rectangular tube. The tensioning plate for cross member must be fixed on the thread bar with a washer and a nut. This nut must be fixed hand-tight, that the thread bar is not able to move anymore. (fig. 3)

fig. 3

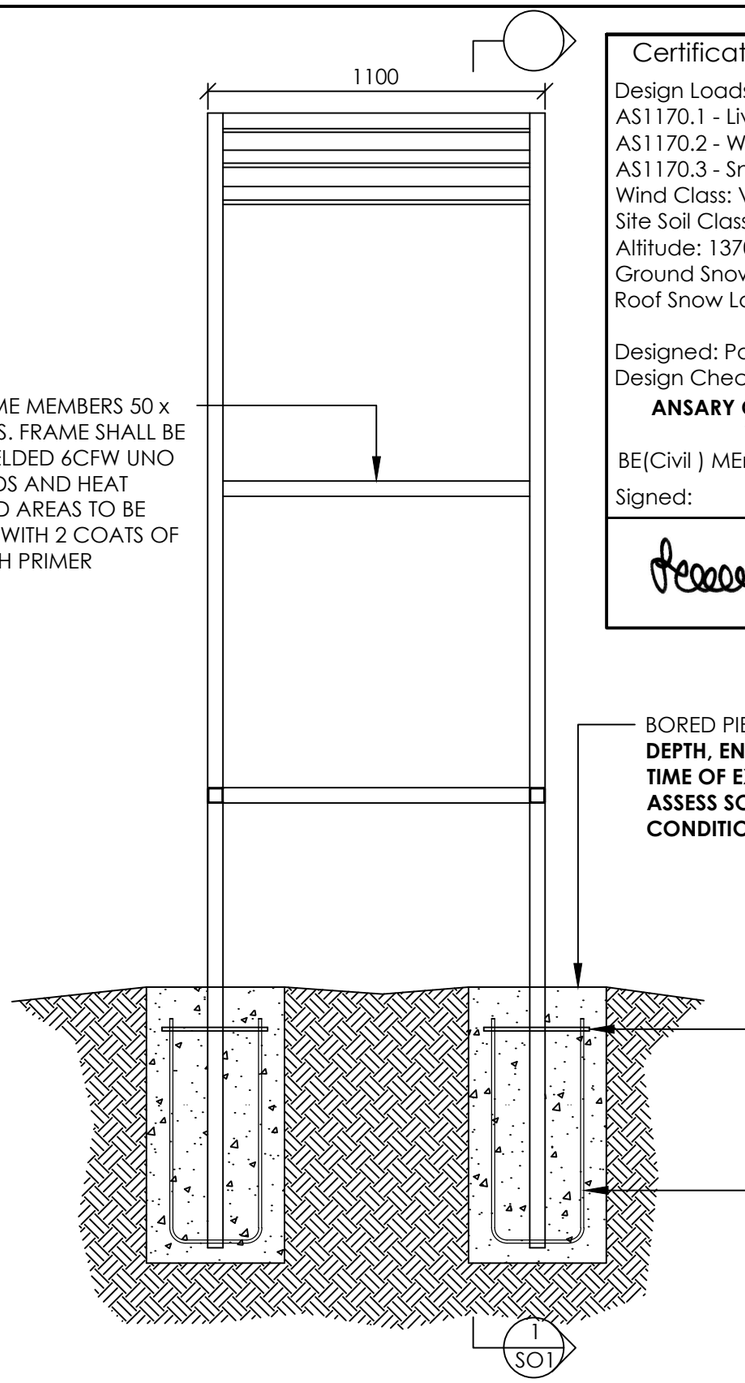


After this step, the assembly of the anchoring is finished. Afterwards, the assembly of the gallery can be continued as you can see in the manual called “EVOLUS-Betr-GB-SKD….”.

The system must be taken out of operation for the entire duration of the assembly work (main switch off!).



SETDOWN SECTION 1
Scale 1:20 -



SETDOWN SECTION 2
Scale 1:20 -

S01 **HUT CONSTRUCTION DETAILS**
Class P Site, HUT FRAME ON BORED PIERS
Scale 1: NTS UNO

Certification & Site Parameters

Design Loads in accordance with;
AS1170.1 - Live loads
AS1170.2 - Wind loads
AS1170.3 - Snow loads
Wind Class: Vu = 50m/s - N3 (W41N)
Site Soil Class: P
Altitude: 1370 AHD
Ground Snow Load: 5.99 KPa
Roof Snow Load: 4.193 KPa

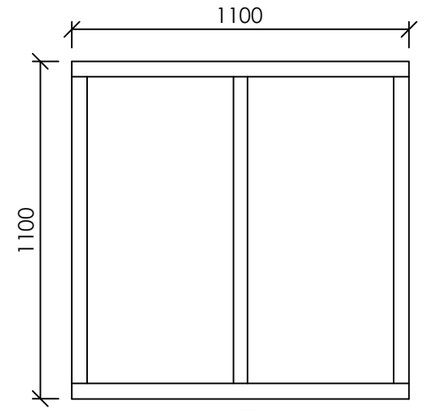
Designed: Paul Larkin
Design Checked By:

ANSARY CONSULTING ENGINEERS
Tarek El-Ansary
BE(Civil) MEngSc(Civil) MIEAust CPEng.

Signed: Date:16 June 2022

NOTE; ALL STEEL FRAME MEMBERS 50x50x3 DURAGAL SHS, EXTERNAL CLADDING CUSTOMORB-WOODLAND GREY

EXISTING HUT IMAGES



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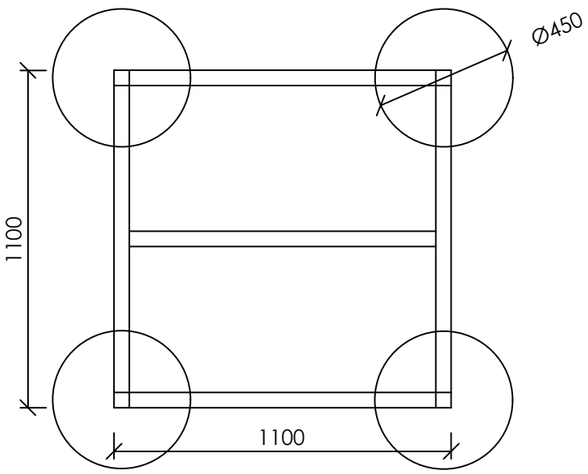


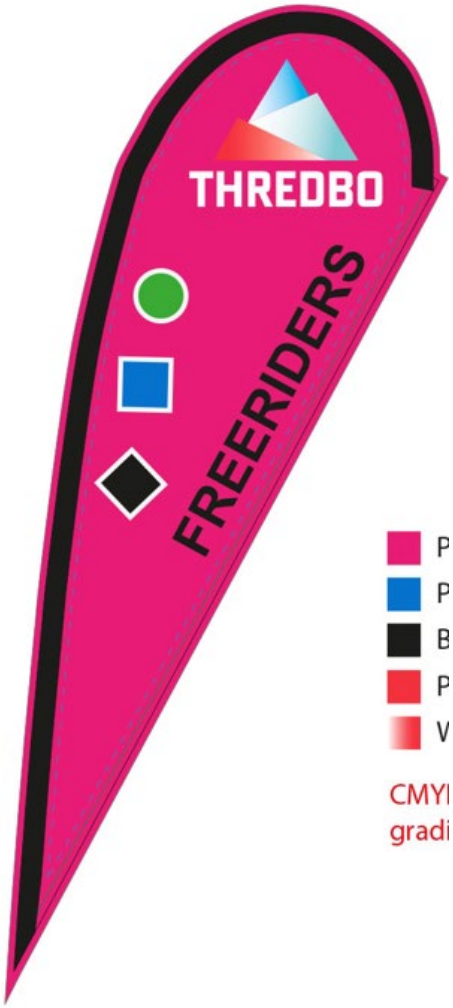
SETDOWN SECTION 4
Scale 1:20 -

GROUNDED
STRUCTURAL ENGINEERING AND DRAFTING SERVICES

Director: PAUL LARKIN
Email: paul@groundedeng.com
Mobile: 0429 071 387
PO Box 220 Jindabyne NSW 2627

Project: SNOWRUNNER HUT THREDBO NSW 2625	Draftsman: S.WAKEFORD Contact: 0429 071 387		Drawing Title: HUT CONSTRUCTION DRAWING	AS 1100	SIZE: A3
Client: KOZCIUSKO THREDBO	Checked: PL	DATE: 17-3-2022	Drawing Number: S01 / Revision: A / Sheet 2 of 2		SCALE: VARIES

Signage Examples



Appendix C Site Environmental Management Plan (SEMP)

Site Environmental Management Plan (SEMP)

Thredboland and Freeriders Beginner Zone

Thredbo Alpine Resort
Kosciuszko National Park, NSW

June 2022

Thredboland and Freeriders Beginner Zone Project

Site Environmental Management Plan (SEMP)

Kosciuszko Thredbo Pty Ltd
1 Friday Drive, Thredbo, New South Wales 2625
www.thredbo.com.au

Document Control

REVISION	DATE	REVISION TYPE	AUTHOR	APPROVED BY
A	10.06.2022	Draft	C.Chalk	P.Fleming
0	24.06.2022	Final	C.Chalk	P.Fleming

Contents

Figures

Tables

1 Introduction

This Site Environmental Management Plan (SEMP) has been prepared for implementation by Kosciuszko Thredbo Pty Ltd (KT) (and its contractors) for the Thredboland and Freeriders Beginner Zone (the Project).

The Project is situated in Thredbo Alpine Resort (Thredbo), approximately 35 kilometres (km) south-west of Jindabyne, New South Wales.

1.1 Purpose

This SEMP has been developed to outline how construction processes for the Project are to be managed in order to maintain and protect the environmental values of the Project site and surrounds.

1.2 Objective

The objectives of this SEMP are to:

- provide mitigation measures to minimise the potential for environmental harm and/or environmental nuisance;
- provide guidance for the development of detailed construction environmental management plans;
- ensure all Project personnel understand individual roles and responsibilities;
- provide corrective actions to be implemented in the event of environmental harm and/or environmental nuisance; and
- ensure Project personnel understand incident and emergency response procedures.

1.3 KT Environmental and Social Sustainability Policy

All activities undertaken by KT will be in accordance with the Company's *Environmental and Social Sustainability Policy* 2021 (KT083).

1.4 Applicable Legislation

The Project will be carried out in accordance with the applicable legislative requirements outlined in the following Acts and subordinate legislation:

- *Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*;
- *Biodiversity Conservation Act 2016*;
- *Environmental Planning and Assessment Act 1979*;
- *Environmentally Hazardous Chemicals Act 1985*;
- *Heritage Act 1977*;
- *National Parks and Wildlife Act 1974)*;
- *Protection of the Environment Operations Act 1997*;
- *Soil Conservation Act 1938;*
- *Waste Avoidance and Resource Recovery Act 2001;*
- *Water Management Act 2000;* and
- *Work Health and Safety Act 2011.*

2 Project Description

The Development will provide a dedicated snowrunner and teaching terrain to be utilised by Snowsports for kids lessons and programs (i.e. Thredboland and Freeriders ski and snowboard programs).

The Development will comprise the following:

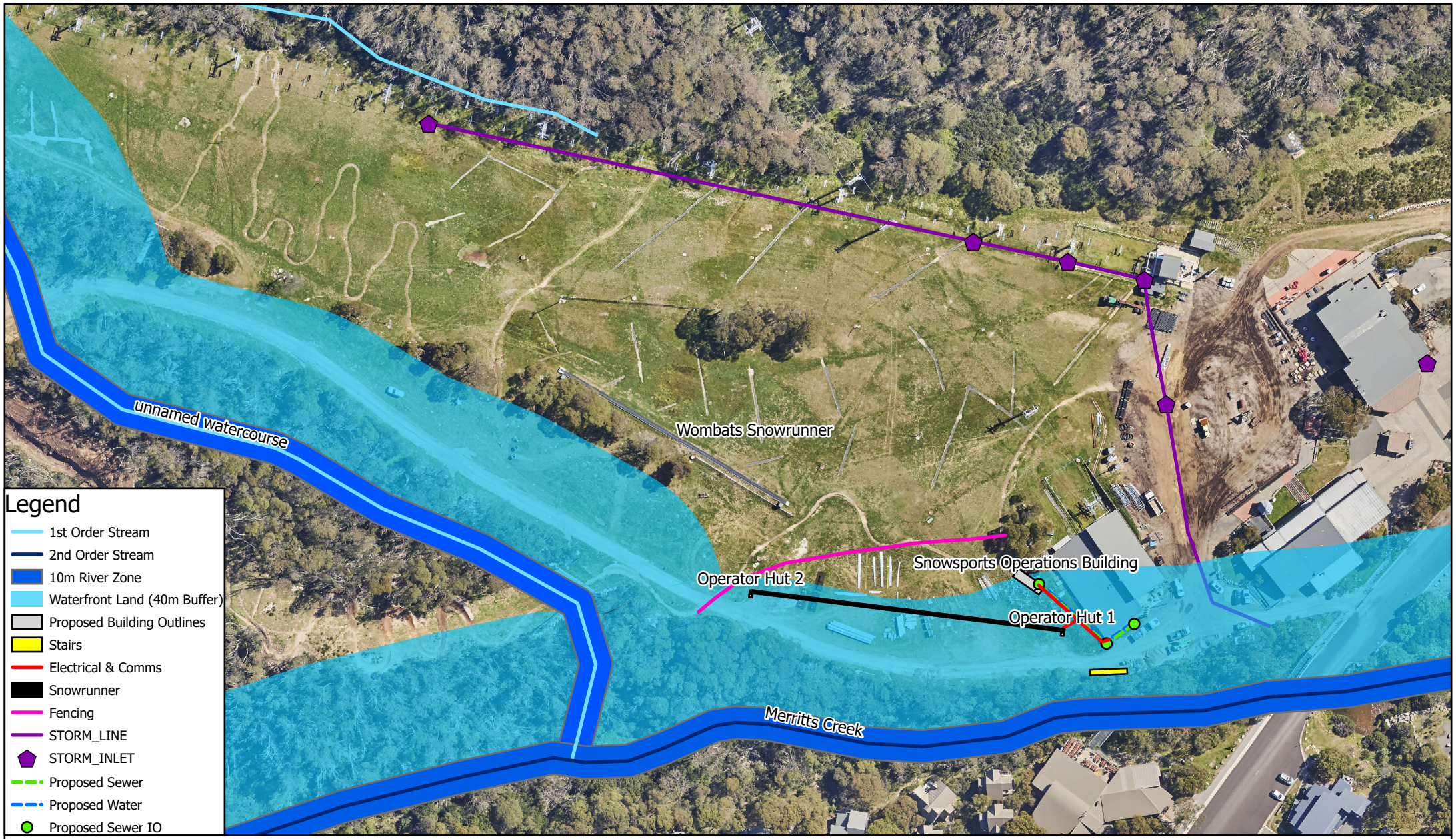
- installation of snowrunner, gallery roofing and two (2) operators hut, including minor earthworks;
- construction of Snowsports operations building;
- trenching for electricity and communications cable to service the new snowrunner and Snowsports operations building;
- construction of stairway adjacent to the Mountain access road; and
- extension of an existing gabion retaining wall with a rock retaining wall.

2.1 Project Location

The Project is located within Friday Flat, adjacent to Gunbarrel Bottom Station. The works are located within 40 m of Merritts Creek as shown on **Figure 1**.

2.2 Site Description

The Project site is located within a highly disturbed environment, comprising existing snowmaking infrastructure (i.e. underground pipes and aboveground hydrants and guns). The surrounding environment comprises ski runs, ski lifts, and associated infrastructure and buildings.



Scale: 1:1,550

105 0 10 20 30 40

Meters

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 55

N

THREDBO

WATERFRONT LAND AND RIPARIAN CORRIDORS

Project: Thredboland and Freeriders
Beginner Zone

Revision: E

Date: 13/09/2022

Produced By: KOS

2.3 Construction Detail and Activities

A summary of the construction program and activities is provided in **Table 1**.

Table 1: Construction Detail and Activities

Aspect	Details
Site Access	The Project site is accessible via Friday Drive and Mountain summer access road.
Construction Program and Activities	Pre-construction activities involve site preparation works, which will include: • establishment of site boundary/fencing; • erection of site signage and pedestrian/traffic controls; and • installation of erosion and sediment controls. The proposed construction program will comprise the following: • installation of snowrunner, gallery roofing and two (2) operators hut, including minor earthworks; • construction of Snowsports operations building; • trenching for electricity and communications cable to service the new snowrunner and Snowsports operations building; • construction of stairway adjacent to the Mountain access road; and • extension of an existing gabion retaining wall with a rock retaining wall. Post-construction activities will comprise: • stabilisation and rehabilitation works; • removal of erosion and sediment controls; • demobilisation of plant and machinery; and • site clean-up.
Machinery, Plant and Equipment	Construction vehicles and plant will include (but not limited to): • 4WD vehicles and utilities; • excavator; • telehandler; and • delivery trucks.
Stockpile Sites	The main stockpile locations are identified in **Appendix B**. Access to these locations will be restricted to KT staff and contractors. Temporary stockpiles may be required within the construction corridor to effectively manage materials during the works. Where required, these sites will be located on disturbed areas and avoid native vegetation. Soil stockpiles will be managed in accordance with the *Soil Stockpile Guidelines for the Resort Areas of Kosciuszko National Park* (OEH 2017) (Soil Stockpile Guidelines) and ESCP (**Appendix C**).
Site Facilities and Temporary Structures	The site compound will be located at Friday Flat. Existing amenities (e.g. staff room and toilets) at Friday Flat and Gunbarrel will be available for construction staff. There will be no compound or temporary structures within the construction corridor.
Project Timing	The anticipated timing for construction is between February – April 2023. Construction is anticipated to take approximately 2-3 months to complete.
Working Hours	The working hours for construction will be stipulated in the conditions of consent.

3 Environmental Management

3.1 Environmental Management Structure and Responsibility

3.1.1 Project Team Structure

The Project team structure is provided in **Figure 2**.

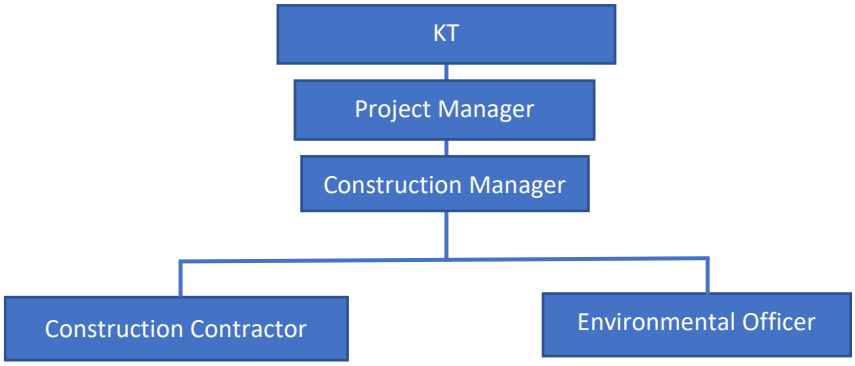


Figure 2: Project Team Structure

3.1.2 Roles and Responsibilities

The roles and responsibilities are outlined in **Table 2**.

Table 2: Roles and Responsibilities

Role	Responsibilities
Project Manager	• ensure the SEMP is made available, communicated, maintained and understood by all Project staff; • responsible for the overall management of the construction and operation of the Project; • ensure the SEMP is updated with applicable conditions of approval following the provision of Development Consent from DPE; • ensure that the requirements of the SEMP and sub-plans have been addressed in all contractor environmental management documentation; • review of incidents, non-conformances and non-compliance; and • ensuring Project personnel and contractors are adequately trained and qualified to fulfil their roles.
Construction Manager	• implement and maintain the SEMP; • ensure all Project personnel comply with the requirements of the SEMP; and • report any incidents, non-conformances to the Project Manager.
Environmental Officer	• oversee all works which are part of the Project on behalf of KT; • ensure compliance with all environmental protection measures detailed in the SEMP, supporting management plans and conditions of approval; • ensure all environmental controls are in place and adequately functioning during construction; and • conduct construction inspections and complete reporting requirements e.g. progress reports, environmental incidents, non-compliance, corrective action and auditing.
All Personnel	• comply with requirements of this SEMP; • report any actual or potential environmental incidents to the Construction Manager immediately; • identify and report non-conforming or potentially hazardous work practices, equipment, machinery or products; • only perform tasks for which they are trained and competent; • assist with environmental incident investigations and applying corrective actions; and • ensure all machinery, plant and equipment are in good working order and condition prior to use.
Construction Contractor	• comply with SEMP and legislative requirements; and • construction contractor to develop and implement management plans in accordance with this SEMP, conditions of approval and contractual obligations.

3.2 Key Contacts

Key contacts for the Project are provided in **Table 3**. Prior to commencement of works, contact details (name and contact number) will be provided for Project personnel.

Table 3: Key Project Personnel Contact Details

Company / Agency	Role / Reason	Name	Contact
Key Project Personnel			
KT	Project Manager	TBC	-
KT	Environmental Officer	Brent Bourke	-
TBC	Construction Manager	TBC	-
Government Agency Contacts			
Department of Planning and Environment (DPE) (Alpine Resorts Team)	Development approval and compliance	-	(02) 6456 1733
National Parks and Wildlife Service (NPWS)	Flora, fauna, archaeology	-	(02) 6450 5600
Environment Protection Agency (EPA)	Water, noise, air pollution and regulation	-	131 555
NSW Soil Conservation Service	Soil erosion and sediment control	-	02 9842 8300
Thredbo Village Services			
Thredbo Medical Centre	General medical attention	-	(02) 6457 6254
Fire and Rescue Thredbo, NSW	Incident / emergency	-	(02) 6457 6144
Emergency Contacts			
NSW Police	In case of fire, medical or police emergency	-	000
NSW Fire and Rescue		-	
NSW Ambulance		-	

3.3 Communication

KT is committed to ensuring effective communication and consultation is undertaken to inform the development of this SEMP and ensure it is implemented on-site as per the Project roles and responsibilities in **Section 3.1.** Where required, communication with key external stakeholders such as DPIE and NPWS will be undertaken. A summary of the key consultation activities is provided in **Table 4**.

Table 4: Summary of Consultation Activities

Consultation Activity	Communication Method	Frequency
Internal	Site inductions	Prior to commencement of works
	Pre-start meetings and toolbox talks	Daily
	Reports to Project Manager identifying project progress, any environmental incidents, and review of any complaints or enquiries	Weekly
External	Face-to-face meetings, phone and email correspondence with relevant Government Departments / Agencies	As required
	In-writing notifications to Government Departments / Agencies and relevant parties	As required

3.3.1 Notification Protocols

A summary of the key notification protocols is provided in **Table 5.** Notification requirements will be updated as required.

Table 5: Regulatory Agency Notification Protocols

Party to Notify	What to Notify	When to Notify	Responsibility to Notify Regulatory Agency
DPE	Commencement of construction	DPE will be notified in writing at least 48 hours prior to the commencement of construction.	Project Manager
NPWS	Details of any material suspected of being a European or Aboriginal culturally significant site, relic or artefact.	Immediately upon discovery of any archaeological/culturally significant site or relic that are encountered. NSW Police to also be notified immediately upon discovery of human remains.	Project Manager
NSW Environmental Protection Agency	Details of pollution incident – who, what, when, where, how, any other supporting information and evidence (e.g. photos)	Immediately upon identification of pollution incident causing or threatening material harm to the environment, in accordance with ***KT's Construction site Incident and Emergency Procedures Thredbo Village 2021/2022***.	KT Environmental Manager

3.4 Competence and Training

All Project staff will be made aware of the site-specific environmental controls through a site induction, and pre-start meetings / toolbox talks prior to the commencement of construction.

The site induction will cover the following key aspects:

- roles and responsibilities;
- overview of environmental risks and specific locations of environmental and/or cultural heritage significance;
- the scope of legislative requirements and other licences and approvals;
- communication and notification requirements e.g. procedures for notifying and reporting incidents and complaints;
- environmental management and controls stipulated in this SEMP;
- workplace health and safety issues;
- emergency preparedness and response; and
- procedures for notifying and reporting incidents and complaints.

3.5 Environmental Incident and Emergency Response

All Project personnel are required to follow KT's ***Construction site Incident and Emergency Procedures Thredbo Village 2021/2022***. The procedure will be available on-site and all Project staff will be trained on their implementation through the site induction. The procedure classifies examples of emergencies and incidents and provides specific procedures for response to such events, such as:

- serious injuries requirement urgent medical help;
- there are threats to property or life;
- criminal activity e.g. you have witnessed a serious crime or accident;

- sewer or water service breaks;
- bushfire, building fire, spot fire on-site;
- electricity service faults;
- leaking gas;
- fires and explosions; and
- release of pollution e.g. release of sediment into watercourse, chemical spill.

The procedure also outlines general site management principles, incident reporting and notification requirements and provides an emergency contacts list.

In the event of an environmental incident, emergency or near-miss, the following steps should be taken:

1) **STOP** works in the area and if safe to do so ensure the safety of personnel within the vicinity;
2) **NOTIFY** relevant persons e.g. emergency services or Construction Manager;
3) **ISOLATE** the risk or hazard e.g. turn off machinery/plant, implement immediate site controls, set up exclusion zone; and
4) **REPORT** and notify relevant persons (e.g. Project Manager, regulatory agencies).

Environmental incident and near-miss reporting requirements are detailed in **Section 7.1**. Contact details for key Project personnel and emergency services are provided in **Table 3**.

External contractors are required to prepare and implement an emergency and incident response procedure. The contractor will be responsible for responding to any environmental emergency caused by any action (or inaction) of the contractor's staff, including notification requirements to external parties such as EPA and Fire, Fire and Rescue NSW.

4 Risk Assessment

To ensure that potential environmental risks are identified and managed, an environmental risk review has been included in **Table 6**. A risk matrix (**Appendix A**) was used to consider the likelihood and consequence of impacts identified in the SEE (KT 2022).

Table 6: Environmental Risk Assessment

Aspect	Activity / Project Phase	Potential Impact	Inherent Risk			Controls	Residual Risk		
			Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Injury/death to fauna as a result of earthworks and construction	Earthworks; construction	Loss in population of fauna.	2	2	Low (4)	Flora and Fauna Management (**Section 5.3**)	2	1	Low (2)
Release of sediments and soils through disturbance of land	Earthworks; stockpiling	Loss of topsoil, reduction in water quality from the release of sediment laden water.	3	3	Mod (9)	Soil and Water Quality Management (**Section 5.2** & **Appendix C**)	2	3	Mod (6)
Rehabilitation of disturbed areas	Rehabilitation	Failure of rehabilitation and stabilisation works resulting in increased erosion.	2	3	Mod (6)	Flora and Fauna Management (**Section 5.3**)	2	2	Low (4)

Introduction and/or proliferation of weed/pest species in vehicles, plant, shoes and materials	All Project phases	Loss of biodiversity.	2	2	Low (4)	Biosecurity Management (**Section 5.4**)	2	1	Low (2)
Storage and disposal of waste	All Project phases	Increase in pest numbers; impacts to road users and/or the environment from vehicles with unsecured loads.	3	2	Mod (6)	Waste Management (**Section 5.5**)	2	2	Low (4)
Generation of dust through movement of vehicles and plant	Removal of topsoil, stockpiling, excavating and backfilling.	Sensitive land users identified within 50 m of site (i.e. River Inn and tourist accommodation in Woodridge). Potential nuisance or health impacts from the release of dust on land users from the works are considered to be negligible.	2	2	Low (4)	Air Quality Management (**Section 5.7**)	2	1	Low (2)
Leak or spill of fuel or oil from fuel storage, plant and vehicles	Earthworks; removal / installation of infrastructure.	Land and water contamination caused by the release of hydrocarbons.	2	3	Mod (6)	Fuels, Chemicals and Hazardous Substance Management (**Section 5.8**)	2	2	Low (4)
Release of noise and/or vibrations through use of heavy/loud plant or equipment	Earthworks; construction activities	Noise and/or vibration nuisance experienced by land users within 50 m of the site resulting from the use of heavy/loud plant or equipment.	2	2	Low (4)	Noise and Vibration Management (**Section 5.6**)	2	1	Low (2)
Transport and loading/unloading of goods and materials and equipment and plant operation	All Project phases	Sensitive land users identified within 50 m of the site. Potential noise impacts on sensitive land uses considered negligible.	2	2	Low (4)	Noise and Vibration Management (**Section 5.6**)			Low (2)
Excavation works	Earthworks	Potential damage or destruction of unknown Aboriginal or European cultural heritage items or sites; loss of cultural heritage values. Considered unlikely due to significant disturbance within Project footprint.	2	2	Low (4)	Cultural Heritage Management (**Section 5.9**)	2	1	Low (2)
Construction vehicles and plants utilising existing road network	All Project phases	Inconvenience to existing transport networks/potential traffic impacts from the works are considered to be low.	2	1	Low (2)	Traffic and Transport Management (**Section 5.10**)	1	1	Very low (1)

5 Mitigation and Management Measures

To mitigate and manage potential Project impacts identified in the risk review (**Table 6**), the following environmental management activities and controls will be implemented.

A SEMP checklist is provided in **Appendix D** which specifies the timing/frequency for implementation of controls, responsibilities and verification/sign-off. The checklist comprises general environmental management controls and will be updated following the provision of development consent and conditions of approval to ensure all site-specific requirements are met. The checklist should be completed prior to, during and post construction.

5.1 General

The following measures will be implemented:

- ensure works are conducted by suitably qualified and trained personnel;
- ensure all site environmental management controls relevant to that stage of work are implemented in accordance with the approved plans and conditions of consent (refer **Appendix D** for controls checklist);
- provide approved plans and relevant documentation in the site office or other suitable location so that they are easily assessible by all construction staff; and
- prior to commencement of works, the construction corridor will be temporarily fenced, roped or flagged to clearly delineate the construction area and no-go zones.

5.2 Soil and Water Quality

	Soil and Water Quality Management
Objective	Minimise potential impacts to receiving water sources. Reduce the potential for erosion and sediment moving offsite.
Mitigation Measures	*General / erosion and sediment control principles* • where required, drainage, erosion and sediment controls (ESCs) to be designed and installed in accordance with Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition (Landcom 2004), refer **Appendix C** for installation notes; • all erosion and sediment control measures are to be checked regularly to ensure they remain in good working order at all times (e.g. prior to forecast rain, daily during extended periods of rainfall and after significant rainfall events); • all reasonable and practicable efforts will be taken to delay the disturbance to existing ground cover (organic or inorganic) prior to land-disturbing activities; *Trenches* • backfill will be placed at equivalent compaction of the surrounding soil with an excavator to minimise possibility of soil subsidence; and • where trenches are left open overnight, egress points for fauna (e.g. timber ramps) will be installed. *Excavations* • ensure excavation depths and widths are the minimum necessary; and • divert surface water away from excavation openings. *Soil and stockpile management* • all stockpiles will be constructed and managed in accordance with *Soil Stockpile Guidelines for the Resort Areas of Kosciuszko National Park* (OEH 2017); • any excess excavated material will be removed from site and transported to the designated soil stockpiles sites; and • temporary stockpile sites within the construction corridor should adhere to the following criteria (Landcom 2004; OEH 2007): – not exceed 2 m in height, have a slope <50% (26°) – be at least 2 m from vegetation, concentrated water flows, roads, publicly accessible areas or hazardous areas

	– avoid impacts to native vegetation and be located on disturbed areas – located directly adjacent to the works – located on relatively flat ground, where possible – in areas with sufficient room to accommodate the volume of material being stockpiled – be contained by appropriate ESCs.
Performance Criteria	No significant sediment deposition observed leaving the site.
Corrective Actions	If sediment is observed leaving the site, identify the source and amend the ESCs on-site to ensure appropriate controls are in place. If required, additional ESCs to be installed.

5.3 Flora and Fauna

Flora and Fauna Management	
Objective	Minimise potential impacts to native flora. Minimise potential impacts to native fauna, their breeding places and habitat. Minimise the introduction or proliferation of invasive species. Rehabilitate the site as soon as possible following completion of works to restore the habitat.
Mitigation Measures	*General* • the construction works will be confined to the approved construction corridor; • reasonable and practicable native fauna management measures will be implemented during construction to avoid environmental harm and nuisance to native fauna, known habitats and breeding places; • maintain a clean and tidy work area to ensure animals are not attracted to the site, including provision of covered bins during proposed works; • all reasonable and practicable measures must be taken to minimise the disturbance to trees, shrubs and ground covers outside of the construction corridor (adjacent to Gunbarrel Bottom Station); *Rehabilitation* • all exposed areas shall be progressively stabilised/rehabilitated; • all straw bales used for mulching must be certified as weed free; • all ESC measures will remain in place until all exposed areas of soil are stabilised and/or revegetated; and • all rehabilitation will be undertaken in accordance with the Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park (DECC 2007).
Performance Criteria	No death or injury to fauna as a result of on-site activities. No disturbance outside the approval disturbance area.
Corrective Actions	• review and implement suitable strategies to dissuade fauna from coming to site; and • contact NPWS / LAOKO if injured fauna is identified as a result of site activities.

5.4 Biosecurity

Biosecurity Management	
Objective	Reduce the risk of introducing invasive pest species.
Mitigation Measures	• prior to the commencement of construction works, all weed species identified within the construction corridor will be treated in accordance with best practice methods to ensure these weeks are not spread further within the site or throughout KNP; • project machinery and vehicles to arrive/depart from KNP and the Project site in a clean condition, free of mud and vegetative propagules and pathogens; • all vehicles and machinery entering Thredbo must adhere to the ***Standard Operating Procedure: Use and Maintenance of Wash Down Bay, March 2019 (KT055)*** which requires all vehicles and machinery to utilise the weed wash-down bay prior to entering site to ensure no new weed seeds are introduced to the site and KNP; • machinery to be regularly maintained and manoeuvred to prevent the spread of weeds and pathogens; and • storage of plant and machinery is to be restricted to the designated disturbed areas within the construction corridor.
Performance Criteria	No introduction of invasive species as a result of construction activities.
Corrective Actions	Review existing biosecurity procedures (e.g. clean down procedure) and implement additional controls if required.

5.5 Waste

The Project will generate the following waste streams:

- general solid waste (putrescible) – waste from litter bins, food waste; and
- general solid waste (non-putrescible) –plastic, paper, carboard, demolition and construction waste (e.g. excess building materials).

The following waste receptacles will be provided for the storage and disposal of waste associated with the construction of the Project:

- general litter bins for waste such as food waste and non-recyclable plastic;
- recycling bins for waste such as carboard packaging, paper, recyclable plastic;
- skip bins; and
- KT's waste transfer facility (materials to be segregated for re-use, recycling etc.).

Excess spoil from excavations will be taken off-site and placed within the resort's existing stockpile area located at the carpark adjacent to the Thredbo Waste Transfer Station for re-use within the resort.

	Waste Management
Objective	Minimise construction waste as much as practicable. Reduce the impact of waste on-site and beyond the site boundary.
Mitigation Measures	• all building and construction waste onsite to be minimised in the first instance • all waste will be managed and disposed of in accordance with the KT's waste management procedures; • where possible, construction materials will be salvaged for reuse to divert waste from landfill; • all waste will be separated into waste streams and contained within appropriate receptacles and/or disposed of in accordance with the EPA guidelines; • all receptacles will be in good condition; and • all waste transportation vehicles will be covered appropriately to ensure waste cannot spill, leak or escape onto the road or wash into stormwater drains.
Performance Criteria	No litter or waste material to be released from site in an uncontrolled manner.
Corrective Actions	• investigate cause of inappropriate waste disposal/management; • review on-site waste handling facilities and implement corrective actions e.g. change in receptacle size and/or waste management signage; • if required, implement administrative controls e.g. additional waste management training for staff.

5.6 Noise and Vibration

	Noise and Vibration Management
Objective	Minimise potential noise and vibration nuisance in the surrounding environment.
Mitigation Measures	• project staff will take reasonable and practicable management measures to avoid and mitigate environmental nuisance from noise associated with the works; • works will be undertaken during standard work hours as stipulated in the conditions of approval; and • appropriate noise management strategies will be implemented for construction works and operation of plant in accordance with the Australian Standard AS 2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* and the *Interim Construction Noise Guideline* (DECC 2009) e.g. ensure plant is regularly maintained, and repair or replace equipment that becomes noisy, turn off plant that is not being used.
Performance Criteria	No construction related noise and vibration complaints received.

Corrective Actions	If complaints are received, the following steps will be taken: • investigate specific cause of complaint; • review site activities/processes and identify the source of the noise emissions; • implement immediate corrective actions e.g. swap out noisy equipment; and • if required, implement administrative controls e.g. additional staff training or change work hours to minimise noise.

5.7 Air Quality

	Air Quality Management
Objective	Minimise potential impacts to the existing air quality in the surrounding environment.
Mitigation Measures	• construction staff will take reasonable and practicable measure to prevent dirt and dust from affecting the amenity or the surrounding environment during construction e.g. minimise the area of soil disturbance; • plant and equipment to be maintained and operated in an efficient manner to reduce air pollution; • all vehicles carrying spoil or rubble to/from site should be covered to prevent the escape of dust or other material; and • when there is a risk of works creating dust nuisance, the Project site is to be watered.
Performance Criteria	No complaints received in relation to air pollution.
Corrective Actions	If complaints are received, the following steps will be taken: • investigate specific cause of complaint; • review site activities/processes and identify the source of air emissions; • implement immediate corrective actions on-site e.g. water site, replace equipment deemed to be poorly maintained; and • if required, implement administrative controls e.g. additional staff training, alter construction methods or timing for undertaking dust generating activities.

5.8 Fuels, Chemicals and Hazardous Substances

	Fuels, Chemicals and Hazardous Substances Management
Objective	Eliminate the potential for release of fuels, chemicals and hazardous substances to the environment.
Mitigation Measures	• in the event on an on-site spill, construction staff will follow KT's ***Construction Site Incident and Emergency Procedures Thredbo Village, 2021/2022***; • a copy of KT's ***Thredbo Spill Kit Map (June 2019)*** will be available on-site and all Project staff will be made aware of their locations in the site induction; • hazardous substances, toxic materials or dangerous goods must not be stored or processed on-site at any time without prior approval from the DPE Secretary or nominee; • hazardous chemicals will be appropriately labelled in accordance with the *Code of Practice: Labelling of Workplace Hazardous Chemicals, August 2019* (NSW Government 2019); • hazardous chemicals will be managed in accordance with the *Code of Practice: Managing risks of hazardous chemicals in the workplace, August 2019* (NSW Government 2019); and • appropriate controls will be implemented when refuelling Project vehicles and machinery.
Performance Criteria	No fuel, chemical or hazardous substance spills.
Corrective Actions	Corrective actions will be taken in accordance with the ***Construction Site Incident and Emergency Procedures Thredbo Village, 2021/2022,*** including: immediate spill response, implementation of any necessary control measures as directed by authorities. Where required, an investigation will be undertaken to determine the root cause.

5.9 Cultural Heritage

	Cultural Heritage Management (Indigenous and Non-indigenous)
Objective	Minimise potential impacts on places and objects of cultural heritage significance
Mitigation Measures	• all project personnel will be made aware of their obligations in relation to the management of cultural heritage via the site induction; • project staff will take all reasonable and practicable measures to avoid harm to cultural heritage; and • where unexpected items of potential archaeological, built or Aboriginal cultural heritage significance are discovered, Project personnel will follow the below procedure: - **STOP:** Stop work and leave the site or item where it is. - **NOTIFY:** Notify the Project Manager and NPWS to arrange for representatives to inspect the site. If human remains are found, the NSW Police must also be notified. - **MANAGE:** Management may involve securing the find by erecting a no-go zone. - **REPORT:** The Project Manager will complete any reporting requirements, as directed by NPWS.
Performance Criteria	No loss of cultural heritage values.
Corrective Actions	If a suspected item/artefact of Aboriginal, built or archaeological cultural heritage significance is encountered, follow procedure above – Stop, notify, manage and report. All Project personnel to be made aware of any additional management requirements e.g. no-go zones.

5.10 Traffic and Transport

	Traffic and Transport Management
Objective	Minimise potential impacts on existing road network
Mitigation Measures	• traffic and construction vehicle access will be managed as per regular daily operation in the resort; • all construction vehicles to enter/exit site via the mountain access road; and • mountain bike trail users and pedestrian access will be excluded from the construction corridor via use of signage and exclusion flagging / fencing.
Performance Criteria	• no impacts to existing road network or users; and • no complaints in relation to traffic or vehicle operators.
Corrective Actions	If complaints are received, traffic management procedures will be reviewed and amended (if necessary).

6 Monitoring and Review

6.1 Environmental Monitoring

The Environmental Officer will conduct monitoring during all Project phases (pre-construction, during construction and post-construction) to ensure compliance with this SEMP, associated management plans and conditions of approval (refer **Appendix D** for SEMP checklist).

The Environmental Officer will also undertake weekly inspections utilising the **Weekly Inspection Report** (**Appendix E**).

6.2 SEMP Review

This SEMP is a live document and will undergo reviews and amendments as necessary. Reviews will generally be undertaken –

- if there is a change in the scope of the Project;
- prior to commencement of construction to ensure any relevant conditions of consent and/or other approval, licence or permit requirements are incorporated;
  if there is a need to improve environmental controls to protect environmental values;
- if there is an increase or introduction of a new environmental risk or impacts; and
- at the end of a Project to allow for improvements in subsequent Projects.

The Environmental Officer will be responsible for reviewing the SEMP and the Project Manager is responsible for approving these changes.

7 Reporting

7.1 Weekly Environmental Reporting

The Environmental Officer will provide copies of the **Weekly Inspection Report** (**Appendix E**) to the Project Manager on a weekly basis. All records will be stored within KT's files and distributed to relevant persons / regulatory authorities as required.

The Environmental Officer will report on the effectiveness of drainage, erosion and sediment controls using the **Erosion and Sediment Control Inspection Report** (**Appendix E**). The report forms part of the weekly environmental inspections and will be provided to the Project Manager with weekly internal reporting requirements.

7.2 Environmental Incident Reporting

All incidents and near misses will be managed in accordance with KT's ***Construction site Incident and Emergency Procedures Thredbo Village 2021/2022***. The document provides procedures for responding to incidents and emergences, reporting and notification requirements and emergency contacts.

The following information should be recorded:

- time and date of the incident / near miss;
- a description of the incident / near miss;
- a sequence of events that led to the incident / near miss occurring;
- person/s involved in the incident / near miss (including witnesses);

- written statements from person/s involved (as applicable); and
- details of corrective actions.

The **Environmental Incident Report Form (KT068)** (**Appendix E**) should be completed for all environmental incidents. All parts of the form must be completed in accordance with KT's incident procedure and following the instructions within the form. The form must be signed by the person making the report and the Project Manager/person in charge of the site/activity.

7.3 Complaints Management

Should complaints be received from the public in relation to the Project they will be recorded using the **Complaints Form** (**Appendix E**). The Project Manager will be responsible for investigating, recording and closing out any complaints received. All records will be stored within KT's files and distributed to relevant persons / regulatory authorities as required.

7.4 Non-conformance

A non-conformance is the failure to comply with the requirements of this SEMP and supporting management plans. Non-conformances identified via site inspection or during day to day activities will be documented on the **Environmental Weekly Inspection Form** (**Appendix E**) and closed out in subsequent inspections. The Environmental Officer is responsible for investigation and managing corrective and preventative actions in the event of non-conformance or a situation likely to cause environmental harm.

7.5 Corrective Actions

Corrective actions should be prioritised on the following hierarchy of controls:

1. **elimination** – can activities and processes be eliminated to reduce the risk of reoccurrence?
2. **substitution** – can activities be substituted with another activity of lesser risk?
3. **isolation** – can you isolate the hazard from any person exposed to it?
4. **engineering controls** – can you reduce the risk of reoccurrence through engineering changes?
5. **administrative controls** – can a change in work practices, additional training or additional checks reduce the risk?
6. **personal protective equipment (PPE)** – can PPE be worn to protect personnel from harm?

The Construction Manager will be responsible for managing the implementation of corrective actions on-site.

7.6 Document Control

All Project related documentation will be maintained within KT's Project file. Documents stored within the file include (but not limited to) the following:

- copies of relevant planning approvals and documents, licences and permits;
- all completed induction forms and visitor sign-on register;
- records of routine environmental inspections; and
- records of any environmental incidents, complaints, non-conformances and no-compliances.

8 References

DECC 2007, *Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park*, NSW Department of Environment and Climate Change.

DECC 2009, *Interim Construction Noise Guideline*, July 2009, NSW Department of Environment and Climate Change, https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/09265cng.pdf?la=en&hash=EF4576FD79DBB25D5AC22DFA1A883A2BADA1F77B

DIPNR 2004*, Guideline for the Preparation of Environmental Management Plans*, NSW Department of Infrastructure, Planning and Natural Resources, https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/guideline-for-the-preparation-of-environmental-management-plans-2004.ashx?la=en

DPE 2017, *What to include with your development application*, version January 2017, NSW Department of Planning & Environment, https://www.planning.nsw.gov.au/Policy-and-Legislation/~/media/65E2BA89886F426991525FF25707A9A9.ashx

Heritage NSW 2021, *Propose Aboriginal places and items for protection*, viewed 08 November 2021, https://www.heritage.nsw.gov.au/protecting-our-heritage/nominating-an-aboriginal-place/

KT 2022, *Statement of Environmental Effects – Thredboland and Freeriders Beginner Zone Project*, Kosciuszko Thredbo Pty Ltd.

OEH 2017, *Soil Stockpile Guidelines for the Resort Areas of Kosciuszko National Park, version 1.0, October 2017*, NSW Office of Environment and Heritage, National Parks and Wildlife Service.

9 Appendices

Appendix A Risk Matrix

Likelihood and consequence is defined as follows:

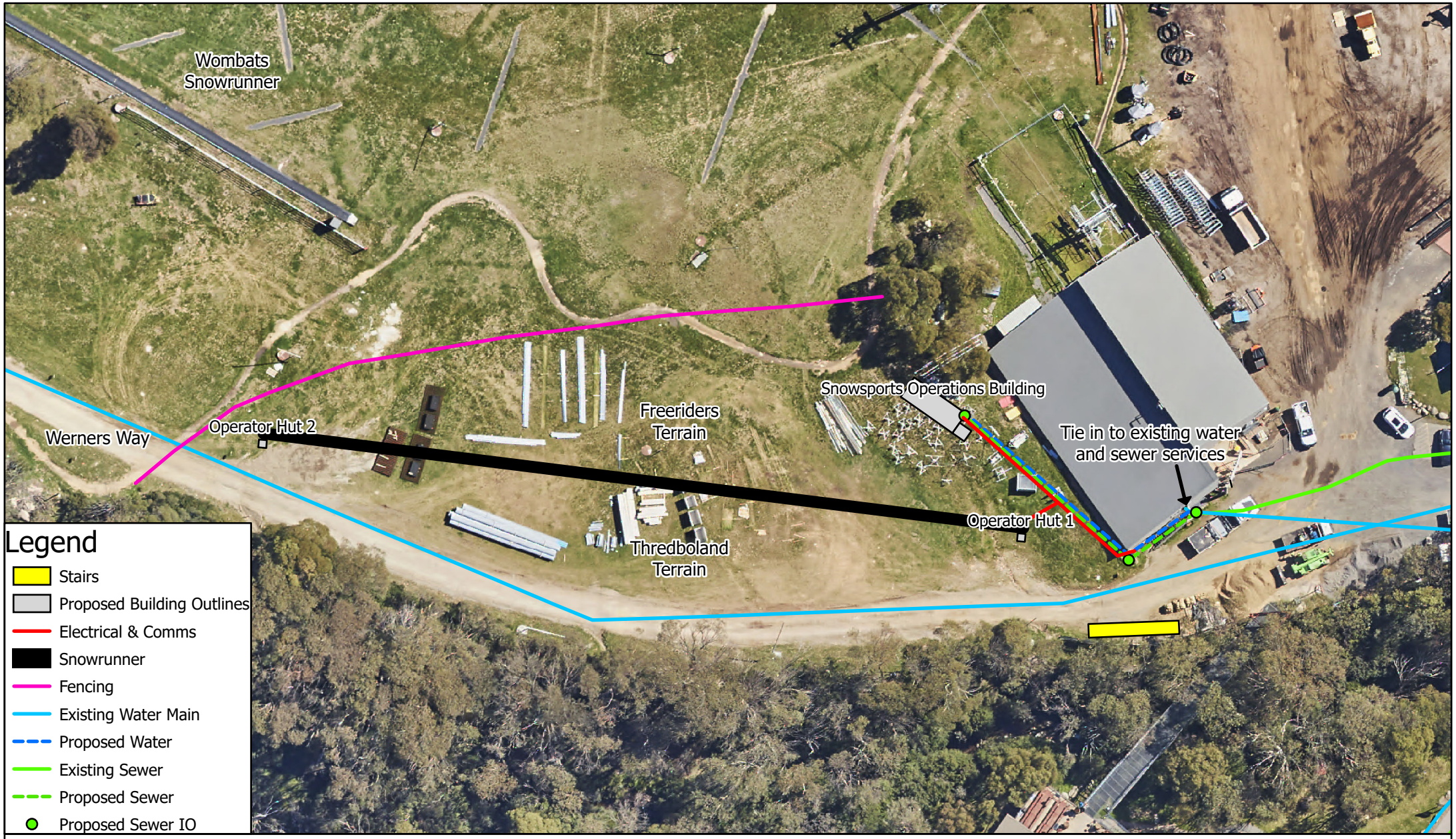
- **Likelihood**: the chance that something might happen; and
- **Consequence:** the outcome of an event which may have the potential to change the existing environmental values.

Likelihood	Consequence				
	Extreme (5)	**Major (4)**	**Moderate (3)**	**Minor (2)**	**Insignificant (1)**
Almost certain (5)	Extreme (25)	Extreme (20)	Extreme (15)	High (10)	Moderate (5)
Likely (4)	Extreme (20)	Extreme (16)	High (12)	Moderate (8)	Low (4)
Possible (3)	Extreme (15)	High (12)	Moderate (9)	Moderate (6)	Low (3)
Unlikely (2)	High (10)	Moderate (8)	Moderate (6)	Low (4)	Low (2)
Rare (1)	Moderate (5)	Low (4)	Low (3)	Low (2)	Very low (1)

Likelihood Rating		Definitions
Rare	**1**	Unlikely to occur during a lifetime or very unlikely to occur
Unlikely	**2**	Could occur but considered unlikely
Possible	**3**	Might occur at some time
Likely	**4**	Will probably occur
Almost certain	**5**	Is expected to occur in most circumstances

Consequence Rating		Definitions
Insignificant	**1**	Very low environmental impact confined to a small area within the Project area. Prompt (typically within a shift) clean-up.
Minor	**2**	Low environmental impact confined within the Project area. Short-term (typically within a week) clean-up.
Moderate	**3**	Reversible offsite environmental impact, requiring short-term clean-up (weeks). On-site medium term (weeks) clean-up.
Major	**4**	Major, offsite, environmental impact requiring medium-term clean-up (months). On-site impact requiring significant clean-up effort (months).
Extreme	**5**	Prolonged or severe, offsite or regional environmental impact requiring long-term clean-up (years) with irreversible residual damage. Extensive, Project area impact requiring long-term clean-up and recovery (years).

Appendix B Figures and Maps



Scale: 1:637

7.53.75 0 7.5 15 22.5 30 Meters

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 MGA Zone 55

N

THREDBO

SITE LAYOUT

Project: Thredboland and Freeriders
Beginner Zone

Revision: F

Date: 06/09/2022

Produced By: KOS

Figure B1: Main stockpile locations located at the Thredbo Waste Transfer Station

Appendix C Erosion and Sediment Controls

Appropriate drainage, erosion and sediment controls will be required to manage soil and surface water during the construction of the development. A summary of proposed controls and associated requirements are outlined below.

Activity	Control	Purpose	Timing	Location	Materials required
Excavations, trenching	Sediment fence	To prevent sediment run-off	Where required, installed prior to commencement of activity and retained in place until exposed areas of soil are stabilised / rehabilitated	Downslope side of any excavations; wetter areas of trenches	Geotextile fabric (non-woven) or silt fence, star pickets/wooden stakes
Trenching	Straw bale filter fencing	To prevent sediment run-off	Where required, during excavation of trenches	Drier areas of trenches, across or at the toe of slope	Straw bales; support posts/stakes; geofabric
Construction nearby drains	Silt fencing; Straw bales; Coir logs	Protect drains from heavy flows and sediment movement.	Prior to ground disturbance in these areas	Immediately down-slope of the construction activity / excavation	Coir logs; stakes; geotextile fabric (non-woven) or silt fence; straw bales
Down-slope excavations	Straw bales	Divert water around and away from open excavation works	Installed once the trenches have been excavated and retained in place until excavations are stabilised/rehabilitated	To be placed at each end of the open trenches	Straw bales; stakes
Cross-slope excavations	Straw bales; Coir logs	Divert water around and away from excavation works	Installed once trenches have been excavated, where required	To be installed on the uphill side of excavations running cross-slope (where required)	Straw bales; stakes; coir logs

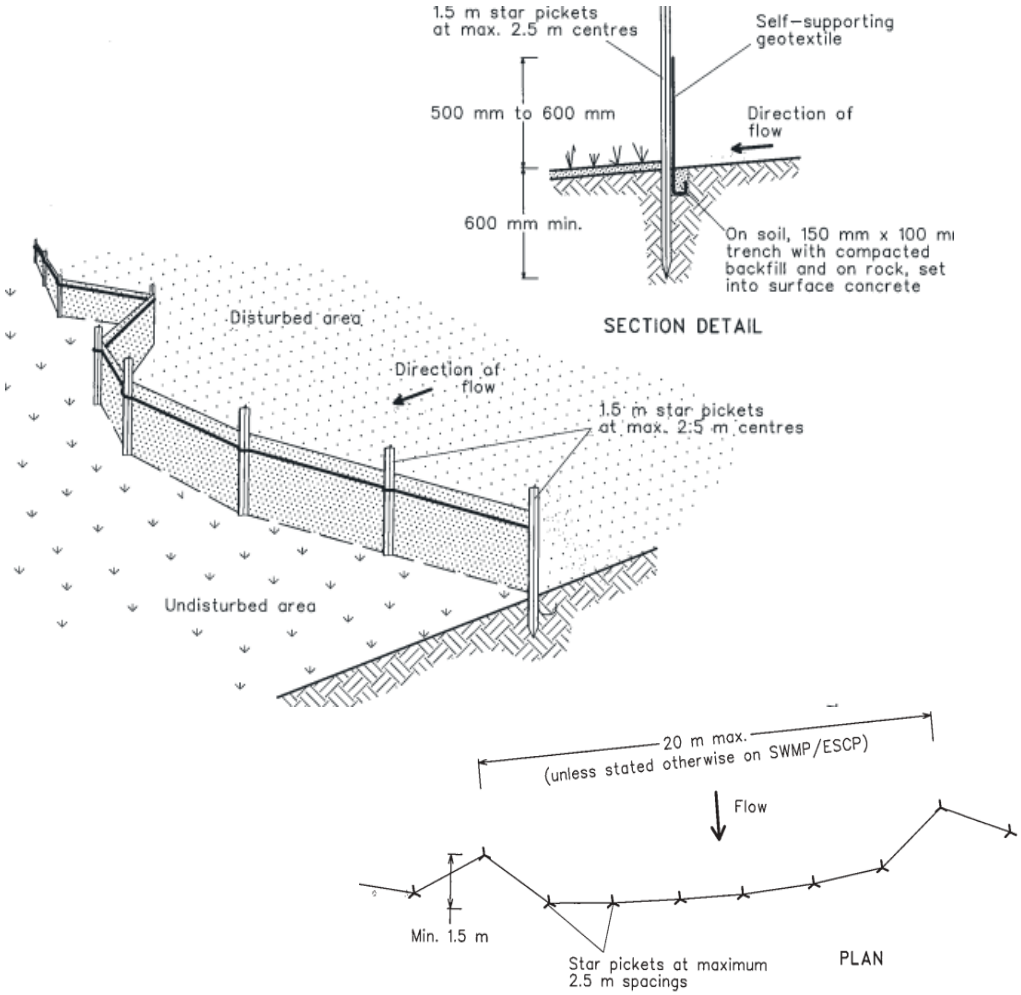
**Refer to subsequent sections for control installation notes*

Control Installation Notes

Sediment Fence

Construction notes:

1) Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns to limit the catchment area of any one section. **The catchment area should be small enough to limit water flow if concentrated at one point to 50 L/s in the design storm event, usually the 10-year event.*
2) Dig a 150 mm deep trench along upslope line of fence for the bottom of the fabric to be entrenched.
3) Install 1.5 m long star pickets into ground at 2.5 m intervals (max) on the downslope edge of the trench. **Fit star pickets with safety caps.*
4) Fix geotextile to the upslope side of the posts ensuring it goes to the base of the trench.



Standard Sediment Fence Installation (Source: Landcom 2004)

Cross Drainage and Sediment Barriers

The recommended spacing for cross drainage and sediment barriers is provided below:

Slope Grade (%)	Cross Drain / Sediment Barrier (m)
5-10	15-20
10-15	10-15
15-25	8-10
>25	5-8

Source: NPWS 2007; Parr-Smith and Polley (1998)
Note: To calculate the grade of a slope: (rise/run) x 100 = slope grade

Coir Logs

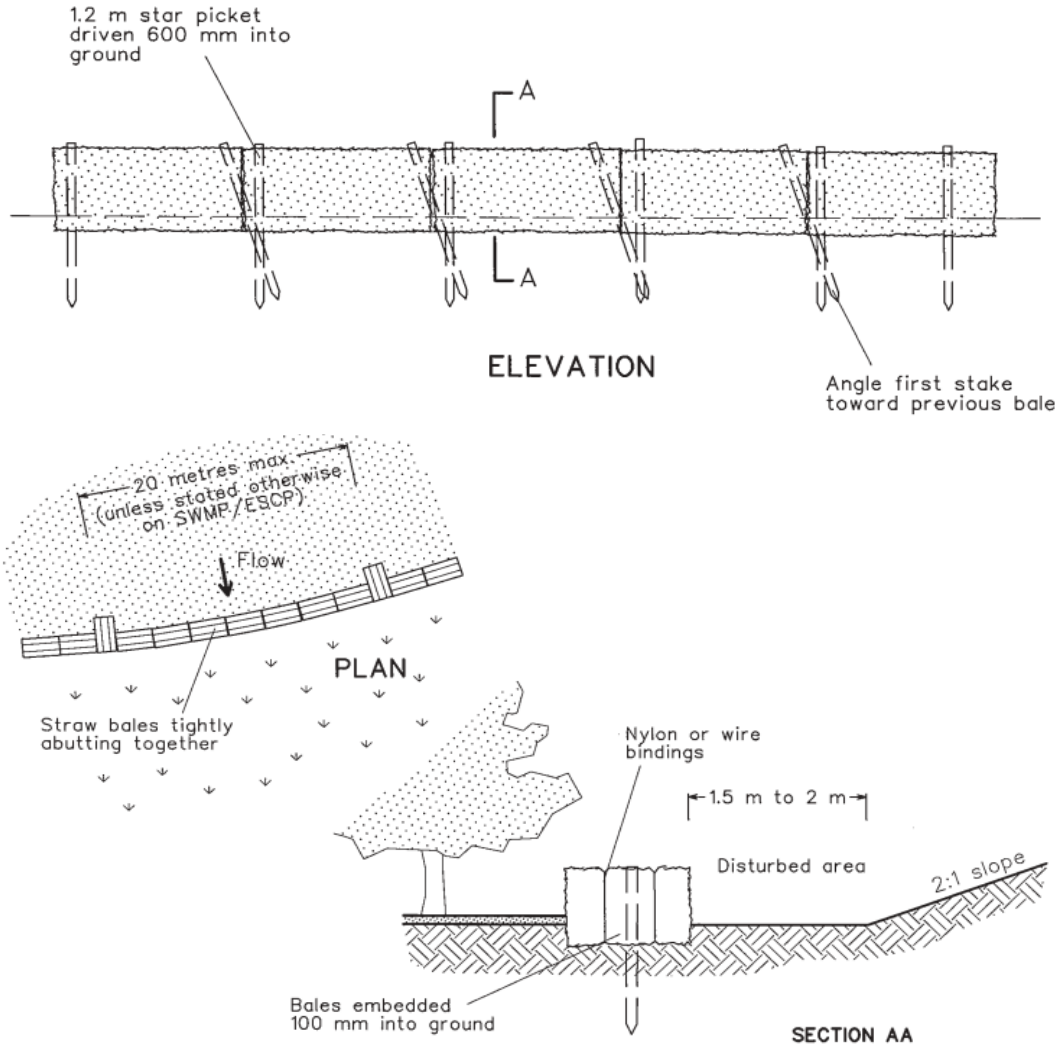
Construction notes:

1) Secure logs by driving the stakes between the outer netting and the core material each side of the logs and secured into the ground (not through centre of log).
2) Ensure spacing of stakes does not exceed an interval of 1 m.
3) Once driven into ground, the stakes should sit at least two-thirds below the ground and one-third above.

Straw Bale Filter

Construction notes:

1) Construct the straw bale filter as close as possible to being parallel to the contours of the site.
2) Place bales lengthwise in a row with ends tightly abutting (1 bale = max height of filter). Fill gaps between bales with straw and wrap with geofabric where necessary.
3) Embed each bale in the ground 75-100 mm and anchor with two 1.2 m stakes/star picket. Angle the first stake in each bale towards the previously laid bale. Stakes should be driven 600 mm into ground, sitting flush with top of bale (if possible). **If using star pickets which protrude above bales, fit with safety caps.*
4) Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1-2 m downslope from the toe.

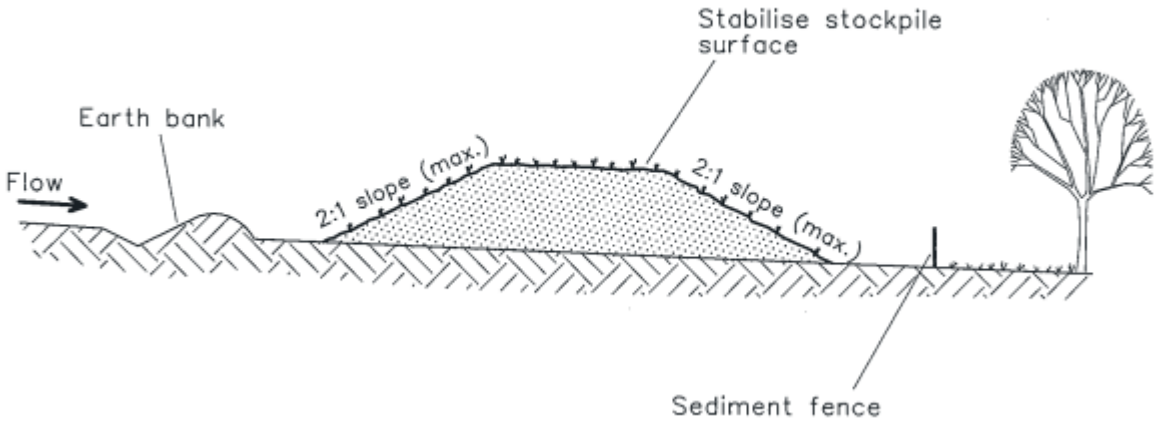


Standard Straw Bale Filter Installation (Source: Landcom 2004)

Soil Stockpile Management

Construction notes:

1) Stockpiles should be located at least 2 m (preferably 5 m) from existing vegetation and waterbodies, concentrated water flows, roads and hazard areas. Recommended location within weed free, disturbed area if possible.
2) Construct stockpiles as low, flat mounds (<2 m high) with a slope <50% (26°).
3) Install appropriate sediment controls (e.g. sediment barriers 1-2 m downslope) around stockpiles.
    - It is recommended to cover stockpiles (e.g. with anchored geofabric) during strong wind or high rainfall events.
    - Straw bales used for sediment and erosion control must be certified weed free.



Stockpile Management (Source: Landcom 2004)

Appendix D Environmental Management Activities and Controls Checklist

Environmental Management Activities and Controls Checklist						
Project Name:			**Location:**			
Environmental Management Control	**Responsibility**	**Timing / Frequency**	**Date of Completion**	**Sign Off**	**Reference**	**Comments**
General						
Site inductions have been provided to all Project personnel on-site.	Project Manager	Pre-construction				
All Project personnel have undergone relevant training / hold relevant permits and qualifications to perform their role.	Project Manager	Pre-construction				
Construction site boundary and no-go zones have been clearly delineated.	Construction Manager	Pre-construction				
Site access to be restricted to authorised personnel.	Construction Manager	During construction				
All plant, materials and equipment to be located in existing disturbed corridors.	Construction Manager	During construction				
All plant and equipment to be removed off-site post-construction.	Construction Manager	Upon completion				
Maintain incident and complaints register.	Project Manager	During construction				
Maintain copies of inspection and monitoring reports.	Environmental Officer	During construction				
Soil and Water Quality						
ESCs to be inspected each day and prior to, and immediately following a significant rainfall event to ensure controls are in good working condition. ESCs designed and installed in accordance with best practice.	Construction Manager	During construction (daily / following significant rainfall event)			**Appendix C** of SEMP	
Stockpiles are managed appropriately in accordance with the Soil Stockpile Guidelines	Construction Manager	During construction			**Appendix C** of SEMP	
Flora and Fauna						
Ensure equipment and construction materials are stored on previously disturbed areas to avoid impacts to native vegetation.	Construction Manager	All Project phases			**Section 5.3** of SEMP	

Reasonable and practicable native fauna management measures have been undertaken to avoid environmental harm and nuisance to native fauna, known habitats and breeding places.	Construction Manager / Environmental Officer	Pre-construction, during construction			**Section 5.3** of SEMP	
Maintain a clean and tidy work area to ensure animals are not attracted to the site, including provision of covered bins during proposed works.	Construction Manager	During construction			**Section 5.3** of SEMP	
Biosecurity						
All weed species that occur within the construction corridor and could spread through disturbance or seed dispersion are treated. Follow up weed control to be carried out if deemed necessary.	Environmental Officer	Pre-construction, during construction			**Section 5.4** of SEMP	
Machinery and personnel to arrive at and depart from the site in a clean condition, free of mud and vegetative propagules.	Construction Manager	Pre-construction, during construction			**Section 5.4** of SEMP	
Machinery to be regularly maintained and manoeuvred to prevent the spread of weeds and pathogens.	Construction Manager	Pre-construction, during construction			**Section 5.4** of SEMP	
Rehabilitation						
All disturbed areas to be progressively stabilised and/or revegetated in accordance with the Rehabilitation Plan (and in consultation with the Environmental Officer) so that no areas remain exposed if works are completed in that area.	Construction Manager	During construction			**Section 5.3** of SEMP	
Disturbance areas are to be rehabilitated immediately following the completion of works.	Construction Manager	Post-construction			**Section 5.3** of SEMP	
Waste						
Site is free from litter and waste is contained within dedicated areas / appropriate receptacles e.g. building waste shall be separated from litter bins.	Construction Manager	During construction			**Section 5.5** of SEMP	
Where possible, waste avoidance and resource recovery strategies for construction waste have been implemented.	Construction Manager	During construction			**Section 5.5** of SEMP	
All waste that cannot be recycled shall be disposed of appropriately at a licenced landfill site.	Construction Manager	During construction, upon completion			**Section 5.5** of SEMP	
No burning or burying of waste on-site.	Construction Manager	During/ post construction			**Section 5.5** of SEMP	
The site shall be left in a tidy state with no evidence of waste left on-site.	Construction Manager	Post-construction			**Section 5.5** of SEMP	

Noise and Vibration						
Works conducted during hours stipulated in conditions of consent.	Construction Manager	During construction			**Section 5.6** of SEMP	
Machinery and equipment fitted with appropriate noise control devices.	Construction Manager	During construction			**Section 5.6** of SEMP	
Machinery and equipment maintained and serviced in accordance with the manufacturer's specification.	Construction Manager	During construction			**Section 5.6** of SEMP	
All justifiable noise complaints have been investigated, managed and reported.	Environmental Officer	During construction			**Sections 5.6** and **7.3** SEMP	
Air Quality						
Areas of exposed soil restricted as much as practicable.	Construction Manager	During construction			**Section 5.7** of SEMP	
Trucks carrying spoil/rubble/waste covered to reduce dust nuisance.	Construction Manager	During construction			**Section 5.7** of SEMP	
All justifiable air quality-related complaints have been investigated, managed and reported.	Environmental Officer	During construction			**Section 5.7** of SEMP	
Fuels, Chemicals and Hazardous Substances						
Emergency procedure available on-site at all times.	Project Manager	During construction			**Section 5.8** of SEMP	
Spill response material is adequate for the type and quality of hazardous materials used / stored on-site.	Construction Manager	Pre-construction, during construction			**Section 5.8** of SEMP	
All construction plant/machinery shall be properly maintained and inspected to avoid spills/leaks.	Construction Manager	Daily during construction			**Section 5.8** of SEMP	
Appropriate controls implemented when refuelling Project vehicles and machinery.	Construction Manager	During construction			**Section 5.8** of SEMP	
Cultural Heritage						
In the event of an unexpected discovery of Aboriginal or Historic Cultural Heritage items, works shall cease and NPWS notified.	All personnel	Earthworks; during construction			**Section 5.9** of SEMP	
Traffic and Transport						
All Project vehicles and machinery to adhere to speed limits and signage and stay within construction corridor.	All personnel	All Project phases			**Section 5.10** of SEMP	
Appropriate traffic controls implemented to direct/exclude pedestrians and mountain bike trail users from the construction corridor i.e. perimeter fencing.	Construction Manager	Earthworks; construction			**Section 5.10** of SEMP	

Appendix E Environmental Schedules

This Appendix includes the following environmental schedules:

- Weekly Inspection Report;
- ESC Inspection Report;
- Complaints Form template; and
- Environmental Incident Report Form.

THREDBO ENVIRONMENTAL SERVICES

SEMP WEEKLY INSPECTION REPORT

Sheet _____of_____

Project: _____ Inspection Date: _____

Inspected by: _____

Weather:	**Morning** Clear/Overcast/ Fine/Rain/Snow	**Afternoon** Clear/Overcast/Fine/Rain/Snow	
Operation	Condition	Plant/Labour	Comments
Silt Fence			
Hay Bale retention ponds			
Hay Bale sediment protection			
Stormwater Pit protection			
Cyclone Fence (including gates)			
Para-web Fence			
Site Signage			
Paint Washout facility			
Vehicle Wash-down			
Waste Skips			
Tree Protection			

Verbal Discussion with Contractor:	Verbal discussion with others:
Materials Received / Required:	Site Instructions Issued:
Inspectors Report / Summary:	Action required:

Signature: _____ Date: _____

THREDBO ENVIRONMENTAL SERVICES

INSPECTION REPORT FOR TEMPORARY EROSION/SEDIMENTATION CONTROLS

Sheet _____of_____

Project: _____ Inspection Date: _____

Inspected by: _____ Inspect the site weekly or immediately after rain.

1. Are temporary drains effective in diverting all runoff from exposed areas to silt traps or other sediment structures before leaving site? If No, state location and action required:	Yes/No
2. Have new areas been disturbed which need temporary controls? If Yes, state where:	Yes/No
3. Are there any disturbed areas where work is sufficiently advanced for revegetation to be undertaken? If Yes, state where:	Yes/No
4. Is any dirty runoff water bypassing or overflowing existing silt traps/sediment control structures? Do existing traps need to be increased in capacity? Are any additional traps needed? If Yes, state location, action needed and priority:	Yes/No Yes/No Yes/No
5. Do any silt traps/sediment control structures need maintenance or repair to operate effectively? If Yes, state location, action needed and priority	Yes/No
6. Are any silt/sediment control structures more than 60% full or otherwise in need of cleaning out? If Yes, state location	Yes/No
7. Are actions taken after last inspection adequate and effective? If NO, list outstanding actions:	Yes/No
Signature:_____ _____Date:_____	

THREDBO ENVIRONMENTAL SERVICES

Record of complaint

Sheet _____of_____

Project: _____ Date / Time: _____

Received by: _____ Reference Number: _____

Complainant details:	Witness details:

Nature of complaint:

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..... Complainant sign:

Action taken:

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Kosciuszko Thredbo Pty Ltd

Environmental Incident Reporting Form

Confidential document after first entry

The purpose of this form is to report any incident that may have resulted in Environmental harm on Kosciuszko Thredbo Pty Ltd premises. Remember to be succinct, stick to the facts and do not make assumptions. Only record information you know to be correct.

The only persons authorised to contact external agencies eg EPA in relation to environmental incidents are the Kosciuszko Thredbo General Manager and Environmental Services Manager or their approved delegates.

Return completed form to the Environmental Services Manager as soon as practicle, on completion of the Environmental incident. It is important to capture photos at the time of the incident as part of this investigation.

Date of Incident:	**Time of incident:**
Reported by:	**Department:**

Location of Incident

EXACT location of the incident (include landmarks and features, nearest cross street etc to make it easier to identify later)		
Site:	Building:	Room:

Description of incident

Provide description and extent of incident: ……... ……... ……... ……... ……...
Have relevant photos been taken and attached? Yes □ No □
If 'No', provide sketch and attach to the rear of this document.
What was the estimated duration of the incident?

Type of incident

□ Spill (including fuel,oil,waste material or other polluting substance)	□ Erosion and sedimentation incident	□ Contaminated water discharge
□ Noise emission/complaint	□ Unauthorised/accidental damage to heritage item	□ Unauthorised/accidental vegetation removal or harm
□ Air Emission	□ Wildlife habitat/nesting area disturbed	□ Other (specify)

Environmental Incident Reporting Form

Level of incident

Level	Example
□ Minor	eg. No material has escaped the site or caused material harm to the environment – it is easy to clean up without additional assistance.
□ Major	eg. Material has escaped the site causing pollution downhill/downstream areas, which will require clean up involving other agencies and/or additional resources not available to local site management. Damage has occurred or is likely to occur to the environment.

Hazardous Material Spilt

□ Petroleum based products/ Hydrocarbons	□ Chemicals domestic or industrial grade
□ Biological waste / Clinical and related waste	□ PCB insulating liquids
□ CFC containing equipment	□ Paints or paint products
□ Radioactive waste	□ Other (specify)
Detail type/ingredient spilt: (UN, MSDS details)	
Detail concentration of material spilt:	
Detail quantity of material spilt:	

Type of Spill

□ Spilt onto ground	□ Spilt into stormwater drain
□ Spilt into waterway	□ Poured down sink
□ Poured down sewer	□ Released into atmosphere
□ Caused odour	□ Caused fire/explosion
□ Caused infectious contamination	□ Other (specify)

Immediate Actions

Was spill contained? Yes □ No □
Detail immediate actions/controls measures taken to rectify or contain the incident …… …… …… …… …… …… …… ……

Environmental Incident Reporting Form

Corrective Actions

Detail corrective clean up action taken

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Disposal

Detail disposal method/plans and location

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Recommended follow up and preventative actions

Detail recommendations

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Persons present at Incident

Were there any witnesses to the accident? Yes ☐ No ☐ If 'Yes', please provide names

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Spill Kit stock used – for restock purposes

Name Spill Kit(s) used: e.g. *'Waste Transfer Station 80Litre Spill Kit'*

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Environmental Incident Reporting Form

Spill Kit Product	Quantity used
Enviropeat Oil Absorbent Material – 25L bag	
1.2m Absorbent sock	
3m Absorbent sock	
Absorbent pads	
Chemical resistant disposable gloves	
Disposable face masks	
Roll of plastic bin bags	
Cable ties	

Declaration

The information and answers given above are true in every detail and no information has been withheld.

Departmental Supervisors Name:	
Departmental Supervisors signature:	*Date:*

Departmental Managers Name:	
Departmental Managers signature:	*Date:*

Spill Kit Replenished

Staff Members Name and Role:	
Staff Members signature:	*Date:*

Created By: Paul Corcoran on 24 Mar 2009
Review Date: 16 Jan 2019

Appendix D Strahler Stream Order Classification

Appendix E Biodiversity Offset Scheme (BOS) Threshold Map

Appendix F Conservation Significant Species Records

A summary of the conservation significant flora and fauna species and communities (listed as Vulnerable, Endangered or Critically Endangered) identified in the NSW BioNet and Commonwealth Protected Matters desktop search results are provided in the table below.

Common Name	Scientific Name	NSW Conservation Status	Commonwealth Status	Source*
Plants				
Shining Cudweed	*Argyrotegium nitidulum*	Vulnerable	Vulnerable	BioNet; PMR
Archer's Carex	*Carex archeri*	Endangered	-	BioNet
Feldmark Grass	*Rytidosperma pumilum*	Vulnerable	Vulnerable	BioNet; PMR
Anemone Buttercup	*Ranunculus anemoneus*	Vulnerable	Vulnerable	BioNet; PMR
Mauve Burr-daisy	*Calotis glandulosa*	Vulnerable	Vulnerable	PMR
Curtis' Colobanth	*Colobanthus curtisiae*	Not listed	Vulnerable	PMR
Clover Glycine	*Glycine latrobeana*	Critically Endangered	Vulnerable	PMR
Hoary Sunray	*Leucochrysum albicans subsp. tricolor*	Not listed	Endangered	PMR
-	*Pimelea bracteate*	Not listed	Critically Endangered	PMR
Bago Leek-orchid	*Prasophyllum bagoense*	Critically Endangered	Critically Endangered	PMR
Tarengo Leek Orchid	*Prasophyllum petilum*	Endangered	Endangered	PMR
Blue-tongued Orchid	*Pterostylis oreophila*	Critically Endangered	Critically Endangered	PMR
Austral Toadflax	*Thesium australe*	Vulnerable	Vulnerable	PMR
Swamp Everlasting	*Xerochrysum palustre*	Not listed	Vulnerable	PMR
Communities				
Alpine Sphagnum Bogs and Associated Fens	Alpine Sphagnum Bogs and Associated Fens	-	Endangered	BioNet; PMR
Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	Critically Endangered Ecological Community	-	BioNet
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin,	Endangered Ecological Community	-	BioNet

Highlands and Australian Alps bioregions	South East Corner, South Eastern Highlands and Australian Alps bioregions			
Natural Temperate Grassland of the South Eastern Highlands	Natural Temperate Grassland of the South Eastern Highlands	-	Critically Endangered	PMR; BioNet
Snowpatch Feldmark in the Australian Alps Bioregion	Snowpatch Feldmark in the Australian Alps Bioregion	Critically Endangered Ecological Community	-	BioNet
Snowpatch Herbfield in the Australian Alps Bioregion	Snowpatch Herbfield in the Australian Alps Bioregion	Critically Endangered Ecological Community	-	BioNet
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Critically Endangered Ecological Community	-	BioNet
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	Critically Endangered Ecological Community	-	BioNet
Windswept Feldmark in the Australian Alps Bioregion	Windswept Feldmark in the Australian Alps Bioregion	Critically Endangered Ecological Community	-	BioNet
Animals				
Southern Corroboree Frog	*Pseudophryne corroboree*	Critically Endangered	Critically Endangered	BioNet
Alpine She-oak skink	*Cyclodomorphus praealtus*	Endangered	Endangered	BioNet
Guthega skink	*Liopholis 55uthega*	Endangered	Endangered	BioNet

White-throated Needletail	*Hirundapus caudacutus*	Not listed	Vulnerable; Migratory	BioNet; PMR
Latham's Snipe	*Gallinago hardwickii*	Not listed	Migratory	BioNet; PMR
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable	Endangered	BioNet; PMR
Orange-bellied Parrot	*Neophema chrysogaster*	Critically Endangered	Critically Endangered	BioNet
Pilotbird	*Pycnoptilus floccosus*	Not listed	Vulnerable	BioNet; PMR
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable	Not listed	BioNet
Oliver Whistler	*Pachycephala olivacea*	Vulnerable	Not listed	BioNet
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Vulnerable	Not listed	BioNet
Scarlet Robin	*Petroica boodang*	Vulnerable	Not listed	BioNet
Flame Robin	*Petroica phoenicea*	Vulnerable	Not listed	BioNet
Pink Robin	*Petroica rodinogaster*	Vulnerable	Not listed	BioNet
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable	Endangered	BioNet; PMR
Koala	*Phascolarctos cinereus*	Endangered	Endangered	BioNet; PMR
Mountain Pygmy-possum	*Burramys parvus*	Endangered	Endangered	BioNet; PMR
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable	Not listed	BioNet
Broad-toothed Rat	*Mastacomys fuscus*	Vulnerable	Vulnerable	BioNet; PMR
Curlew Sandpiper	*Calidris ferruginea*	Endangered	Critically Endangered	PMR
Eastern Curlew	*Hirundapus caudacutus*	Not listed	Critically Endangered; Migratory	PMR
Australian Painted Snipe	*Rostratula australis*	Endangered	Endangered	PMR
Murray Cod	*Maccullochella peelii*	Not listed	Vulnerable	PMR
Macquarie Perch	*Macquaria australsica*	Not listed	Endangered	PMR
Australian Grayling	*Prototroctes maraena*	Not listed	Vulnerable	PMR
Alpine Tree Frog	*Litoria verreauxii alpina*	Endangered	Vulnerable	PMR
Yellow-bellied Glider (south-eastern)	*Petaurus australis*	Vulnerable	Vulnerable	PMR
Smoky Mouse	*Pseudomys fumeus*	Critically Endangered	Endangered	PMR
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable	PMR
Fork-tailed Swift	*Apus pacificus*	Not listed	Migratory	PMR
Yellow Wagtail	*Motacilla flava*	Not listed	Migratory	PMR
Satin Flycatcher	*Myiagra cyanoleuca*	Not listed	Migratory	PMR

Rufous Fantail	*Rhipidura rufifrons*	Not listed	Migratory	PMR
Common Sandpiper	*Actitis hypoleucos*	Not listed	Migratory	PMR
Sharp-tailed Sandpiper	*Calidris acuminata*	Not listed	Migratory	PMR
Pectoral Sandpiper	*Calidris melanotos*	Not listed	Migratory	PMR

*BioNet = NSW Government BioNet Atlas species sightings search (North: -36.45 West: 148.26 East: 148.36 South: -36.55, 10x10km search area); PMR = Australian Government EPBC Act Protected Matters Report (5km search buffer around site).

Appendix G Protected Matters Report

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 23-Aug-2022

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	2
Wetlands of International Importance (Ramsar	8
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	33
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	1
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Historic			
Snowy Mountains Scheme	NSW	Listed place	In feature area
Natural			
Australian Alps National Parks and Reserves	ACT	Listed place	In feature area

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	700 - 800km upstream from Ramsar site	In buffer area only
Barmah forest	200 - 300km upstream from Ramsar site	In buffer area only
Blue lake	Within 10km of Ramsar site	In feature area
Gunbower forest	300 - 400km upstream from Ramsar site	In buffer area only
Hattah-kulkyne lakes	500 - 600km upstream from Ramsar site	In buffer area only
Nsw central murray state forests	200 - 300km upstream from Ramsar site	In buffer area only
Riverland	700 - 800km upstream from Ramsar site	In buffer area only
The coorong, and lakes alexandrina and albert wetland	700 - 800km upstream from Ramsar site	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status

Community Name	Threatened Category	Presence Text	Buffer Status
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community known to occur within area	In feature area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community may occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
FISH			
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In buffer area only
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
FROG			
Litoria verreauxii alpina			
Alpine Tree Frog, Verreaux's Alpine Tree Frog [66669]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
MAMMAL			
Burramys parvus			
Mountain Pygmy-possum [267]	Endangered	Species or species habitat known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Mastacomys fuscus mordicus			
Broad-toothed Rat (mainland), Tooarrana [87617]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Pseudomys fumeus			
Smoky Mouse, Konoom [88]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In buffer area only
PLANT			
Argyrotegium nitidulum			
Shining Cudweed [82043]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calotis glandulosa			
Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Colobanthus curtisiae Curtis' Colobanth [23961]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat may occur within area	In feature area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area	In feature area
Pimelea bracteata [8125]	Critically Endangered	Species or species habitat may occur within area	In feature area
Prasophyllum bagoense Bago Leek-orchid [84276]	Critically Endangered	Species or species habitat may occur within area	In feature area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area	In feature area
Pterostylis oreophila Blue-tongued Orchid, Kiandra Greenhood [22903]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Ranunculus anemoneus Anemone Buttercup [14889]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Rytidosperma pumilum Feldmark Grass [66716]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area	In feature area
REPTILE			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cyclodomorphus praealtus Alpine She-oak Skink [64721]	Endangered	Species or species habitat known to occur within area	In feature area
Liopholis guthega Guthega Skink [83079]	Endangered	Species or species habitat known to occur within area	In feature area
Liopholis montana Mountain Skink [87162]	Endangered	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat may occur within area	In feature area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
[Neophema chrysostoma](#) Blue-winged Parrot [726]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Kosciuszko	National Park	NSW	In feature area

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
Southern RFA	New South Wales	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix H AHIMS Search Results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : Beginner Zone Project

Client Service ID : 686888

Kosciuszko Thredbo Pty Ltd

Po Box 92
Thredbo New South Wales 2625

Attention: Chloe Chalk

Email: chloe_chalk@evt.com

Date: 31 May 2022

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -36.501, 148.3051 - Lat, Long To : -36.4967, 148.3128, conducted by Chloe Chalk on 31 May 2022.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

2	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au

Appendix I Geotechnical Investigation Report

assetgeoenviro

EVT / Kosciuszko Thredbo Pty Ltd

Thredboland and Freeriders Beginner Zone Project
Friday Flat, Thredbo NSW

Geotechnical Investigation

Our ref: 6751-G1 Rev 4
12 September 2022

Your trusted engineering professionals

Document Authorization

Prepared for EVT / Kosciuszko Thredbo Pty Ltd

Our ref: 6751-G1 Rev 4
12 September 2022

For and on behalf of
AssetGeoEnviro

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

Document Control

Distribution Register

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Document Status

Rev	Revision Details	Author	Reviewer		Approved for Issue		
			Name	Initials	Name	Initials	Date
0	Initial issue	A. To	M. Bartel	*MAB*	M. Bartel	*MAB*	6 February 2022
1	Review comments	A. To	M. Bartel	*MAB*	M. Bartel	*MAB*	9 February 2022
2	Update project descriptions	A. To / M. Bartel	M. Bartel	*MAB*	M. Bartel	*MAB*	7 June 2022
3	Updated Plans & Review comments	A. To	M. Bartel	*MAB*	M. Bartel	*MAB*	27 June 2022
4	Updated Plans & Form 4	A. To	M. Bartel		M. Bartel		12 September 2022

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

Contents

Department of Planning & Environment Form 4

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 [x] 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

Thredboland and Freeriders Beginner Zone Project, Friday Flat, Thredbo NSW

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

(List of documentation reviewed)

DJRD Architects Free Riders Supervisor Hut, Project No. 22 424, Drawing No. A1.101, Rev B, 2/9/2022.

Images of SureFoot Concrete Free footing system (see report)

Snowrunner Operators Hut Footings (Grounded Structural Engineering & Drafting, dwg: S01, Rev A; 7/3/2022)

Structural Design of Snowrunner - Conveyor Belt (by Bruckschlogl, dwg SKD 27, dated 3 June 2022).

Structural Design of Snowrunner - Moving Carpet (by Bruckschlogl, dwg SKD 26, 28/1/2021 & 1/2//2021)

Thredboland and Freeriders Begineer Zone - Site Layout Plan (by KT-EVT, Rev F, 6/9//2022)

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

12 September 2022

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

1. Introduction

1.1 General

This report presents the results of a geotechnical investigation for the Thredboland and Freeriders Beginner Zone Project at Friday Flat, Thredbo NSW (the Site). The investigation was commissioned on 26 November 2021 by Peter Fleming of EVT / Kosciuszko Thredbo Pty Ltd.

Drawings supplied to us for this investigation comprised:

- Architectural Plans – Supervisors Hut Plan & Elevations (prepared by: DJRD Architects; project no: 22 424; dwg: A1.101; Rev B; dated: 2 September 2022).
- Thredboland and Freeriders Beginner Zone – Site Layout Plan (prepared by: KT-EVT; Revision F; dated 6 September 2022)
- Structural Design of Snowrunner – Sunkid Conveyor Belt (prepared by: BRUCKSCHLOGL; project no: pr22-10-061; dwg: SKD 27; dated: 3 June 2022).
- Structural Design of Snowrunner – Sunkid Moving Carpet (prepared by: BRUCKSCHLOGL; EDV Nr: m21-10-101, m21-10-201_B600 and m21-10-301_12Z; dwg: SKD 26; dated: 28 January 2021 & 1 February 2021 respectively).
- Structural Details of Snowrunner Operators Hut Footings (prepared by Grounded Structural Engineering and Drafting; dwg: S01; Revision A; dated 17 March 2022)

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

- Placement of a snowrunner and roof, and construction of two snowrunner operator's huts.
- Construction of Snowsports operations building.
- Trenching for installation of services including electricity and communications cable, and sewer and water pipe.
- Construction of stairway adjacent to the Mountain access road.
- Extending an existing gabion retaining wall with a rock retaining wall.

We also understand that concrete free footing system designed by SureFoot is the preferred foundation type for the proposed Snowsports operations building. No significant excavation is planned for the proposed development. The Snowrunner operators hut is to be supported by shallow concrete piers about 580mm deep by 300mm square. The Snowrunner will also have a roof/gallery over the top of it, secured with ground screws.

The objective of this investigation is to provide information on the surface and subsurface conditions at the lower slopes area in Friday Flat and to provide preliminary geotechnical recommendations to aid with the design and construction of the new Snowsports operations building.

1.2 Scope of Work

The main objectives of the investigation were to assess the surface and subsurface conditions and to provide comments and recommendations relating to:

- Site Classification to AS2870-2011 "Residential Slabs and Footings".
- Suitable foundation options and founding stratum.
- Allowable bearing pressure

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.
- Clearance of underground services at proposed test locations.
- Visual observations of surface features.
- Subsurface investigation at four locations to assess the nature and consistency of subsurface soils and bedrock at accessible areas of the Site.
- Engineering assessment and reporting.

This report must be read in conjunction with the attached "Important Information about your Geotechnical Report" and "Important Information about your Landslide Risk Assessment" in Appendix A. Attention is drawn to the limitations inherent in site investigations and the importance of verifying the subsurface conditions inferred herein. Landslide risk considerations presented in this report must be read in conjunction with the attached GeoGuides for Slope Management and Maintenance.

2. Site Description

The Site is located close to Gunbarrel Express Bottom Station 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 lands.

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

At the time of investigation, the Site was generally grassed and used for facilities storage. Soft ground was encountered to the south of the Site which appeared to be filled / disturbed ground likely associated with recent snowmaking trenching works. No signs of granite outcrops were observed during the site walkover.

3. Fieldwork

The fieldwork was undertaken on 29 November 2021 by a Geotechnical Engineer from Asset and included invasive investigation at four locations. Reference is also made to test pits (TP3, TP4, and TP5) from a previous investigation by Asset in 2020 for a Snowmaking Pipeline.

The test locations are shown in the attached Figure 2 and were set out by our Geotechnical Engineer by measurements relative to existing site features. Surface levels at the test locations were estimated by interpolation from levels shown on Google Earth, approximate only.

Buried metallic services and utilities within the Site boundaries near the test locations were cleared by referring to local utility map provided by the client.

The invasive investigation 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.

The test pits were excavated to 1.4m depth, TP3 within assessed well compacted fill likely associated with the original snowmaking pipeline buried at greater depth, TP4 within hard colluvial clay with some cobbles to 200mm size, and TP5 within stiff alluvial clay with some cobbles to 500mm size overlying dense clayey sand (completely weathered granite) at 1.2m depth.

The subsurface conditions encountered were logged during drilling and testing. On completion of logging and sampling, the boreholes were backfilled with the drilling spoil.

Engineering logs are provided in Appendix B together with their explanatory notes.

4. Subsurface Conditions

4.1 Geology

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

The Site lies within an area designated as "G" as defined in the maps accompanying DIPNR's Geotechnical Policy – Kosciuszko Alpine Resorts", November 2003.

4.2 Subsurface Conditions

A generalised geotechnical model for the Site has been developed is shown in Table 1. For a detailed description of the subsurface conditions, refer the attached engineering logs and explanatory notes. For specific design input, reference should be made to the logs and/or the specific test results, in place of the following summary. An interpreted section A-A is shown in the attached Figure 3.

Table 1 – Generalised Site Geotechnical Model

Unit	Origin	Description	Depth to Top of Unit [1] (m)	Unit Thickness [1] (m)
1	Topsoil/ Fill	Silty, clayey SAND grading to Silty CLAY with traces of sand, fine to medium grained sand, low plasticity fines, trace of granite fragments and grass roots, dark brown to dark grey/ dark brown. Appeared to be loosely to moderately compacted.	Ground surface	0.2 to 0.72
2	Colluvium	CLAY, medium plasticity, stiff to hard, some cobbles to 200mm to 500mm size (TP4 and TP5 only).	0.1 / 0.2	1.0 to >1.3
3	Residual	Clayey SAND, medium to coarse grained, dense (TP5 only).	1.2	>0.2
4	Bedrock[2]	GRANITE, CW-XW, blocky mixed with clayey sand matrix, medium to coarse grained sand, trace of granite fragments up to 70mm in size, brown (only in BH2). DCP refusal on assessed less weathered Granite bedrock or boulders.	0.35	Not proven beyond a depth of 1.3 by DCP

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.

Special Note for DCP testing

Caution must be used when inferring subsurface conditions from DCP results. Refusal can be encountered on obstructions such as gravel, cemented materials, rock floaters, or other inclusions within a soil mass. DCP testing on soils with a gravel component or cementation can indicate a higher density than actual. Also, the DCP results in clay soils are significantly affected by the in-situ moisture content. It is therefore strongly recommended that an experienced Geotechnical Engineer is engaged to confirm the inferred subsurface conditions during construction and to provide advice where subsurface conditions are significantly different.

4.3 Groundwater

Groundwater was not observed in the boreholes during auger drilling to depths of 0.2m to 0.72m bgl.

In addition, groundwater was not observed in the DCP tests. Groundwater detection via DCP test is indicated by wet soil materials attached on the DCP rods and conical tip after rods extraction. For all DCP tests, the soil materials attached on the DCP rods and conical tip were dry and moist.

No groundwater was observed in the test pits during the time they remained open.

No long-term groundwater monitoring was carried out.

5. Discussions & Recommendations

No significant excavation is proposed for this development. Geotechnical constraints for the proposed buildings include variable foundation condition such as potentially softer soil or extremely weathered rock below the limited depths of investigation.

Based on from the results of this investigation, it is assessed that the proposed footings for the buildings would be fully within fill material comprising sandy, silty clay. The proposed stairs adjacent to the track and the proposed rock wall extension on the side of the track are anticipated to be within residual soils comprising sandy clays and clayey sands. Some cobbles may be encountered in footing excavations.

Recommendations for design and construction of the development are provided in the following sections.

5.1 Landslide Risk

A landslide risk assessment has been carried out for this site using the methods of AGS 2007[1].

The basis of the assessment undertaken for this site and important factors relating to slope conditions and the impacts of the development that commonly influence the risks of slope instability are discussed in the attached "Important Information about your Landslide Risk Assessment", and the attached GeoGuides.

The preliminary assessment has been carried out by:

- Consideration of the likely slope failure mechanisms and the likely initiating circumstances that could affect the elements at the site. The type and mode of landslide failure has also been classified.
- **Risk to Property.** For each case, the likely consequences with respect to future development have been considered. The current assessed probability of occurrence of each event has been estimated

[1] Landslide Risk Management, Australian Geomechanics, Vol 42, No. 1, March 2007.

on a qualitative basis. The consequences and probability of occurrence have been combined for each case to provide the risk assessment.

- **Risk to Life**. For each case, the risk for the person most at risk is assessed based on multiplying the indicative annual probability of the occurrence of the hazard, the probability of spatial impact, the temporal probability, the vulnerability, and the probability of not evacuating. The risk is then compared with acceptable and tolerable risk criteria.

The following general potential hazards/events are identified for this site and relate to slope instability:

A slump of natural slope (typical)

For the hazards / events identified, the elements that are at risk are the proposed retaining wall extension and the proposed adjacent staircase. Table A provides our preliminary risk assessment for the site with respect to risk to property, and Table B provides our preliminary risk assessment for the site with respect to risk to life.

Where development takes into consideration the possible failure mechanisms and adopts good engineering practice for hillside development, it is envisaged that the outcome of such a development would be a **Low*** risk assessed with respect to property and the risk with respect to life would be **Acceptable**.

The development should be carried out in accordance with good engineering practice that is described in the attached GeoGuides, and in accordance with the general recommendations in the following sections.

Based on the development details, and the assessed site conditions, we conclude that the development presents only minimal geotechnical impact and therefore requires only Form 4 – Minimal Impact Certification. This certification is provided on the second page of this report.

5.2 Earthworks

5.2.1 Excavation

Negligible excavation is proposed for the development. Minor excavation is anticipated to be almost entirely within soils. Rock excavation is not anticipated to be required. If cobbles are encountered that would need removal, a hydraulic excavator would be required.

5.2.2 Subgrade Preparation

The following general recommendations are provided for subgrade preparation for earthworks, pavements, proposed SureFoot footings, and minor structures including the staircase and retaining wall extension:

- Strip existing topsoil.
- Excavate to a suitable subgrade (firm or better clays / medium dense or better sandy soils).
- Earthworks and pavement areas should be proof-rolled and areas which show visible heave under compaction equipment should be over-excavated a further 0.3m and replaced with approved fill compacted to a dry density ratio not less than 100%.

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.

5.2.3 Filling

Where filing (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 • Elsewhere	 0.2m 0.3m	 0.2m 0.3m
Density: • Beneath Pavements • Beneath Structures • Upper 150mm of subgrade	 ≥ 95% Std ≥ 98% Std ≥ 100% Std	 ≥ 70% ID ≥ 80% ID ≥ 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. Asset can provide further advice on this matter if required.

5.2.4 Batter Slopes

Excavations for footings are anticipated to be minor, less than about 0.6m depth. Excavation for the retaining wall extension could be up to about 1m deep to be confirmed and further advice sought if greater than 1m depth. Recommended maximum slopes for temporary batters are presented in Table 3.

Table 3 – Recommended Maximum Dry Batter Slopes

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
Moderately weathered or better Granite	vertical *

* subject to inspection by a Geotechnical Engineer and carrying out remedial works as recommended (e.g. shotcrete, rock bolting).

5.3 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.

5.4 Salinity & Aggressivity

Whilst no specific laboratory testing has been carried out to assess the aggressiveness of soil to concrete and steel, based on the subsurface profile as described above and the Site conditions, we consider that the soils would likely be non-saline, mildly aggressive with respect to buried concrete and non-aggressive to buried steel structures. Further testing would be required to confirm this.

5.5 Footings

Recommendations are provided below for footings. Inspection of footing excavations and installation must be carried out to confirm suitable foundations are achieved at each location.

5.5.1 Snowsports Operations Building

The proposed SureFoot footing system could be adopted for the site if subgrade preparation at each footing is carried out as per 5.2.2. Driving of the steel anchors into the ground should be through medium dense / firm or better soils. If these are not present throughout the driving depth, then local excavation should be carried out to found the SureFoot on suitable material.

An allowable bearing pressure of 100kPa may be adopted for the firm or better clays / medium dense or better sands below the SureFoot footings.

5.5.2 Snowrunner Operators Huts

The footings for the operators' huts comprise short concrete piers nominal 580mm deep by 300mm diameter. Due to the small size of the hut, footing loads are anticipated to be small. The proposed footings are suitable provided that the base of the piers is founded in firm or better clays or medium dense or better sands and an allowable bearing pressure of not more than 100kPa is required.

5.5.3 Staircase

We understand that the preferred foundation type for the proposed staircase modification is timber sleepers / post. Footings are anticipated to be founded at shallow depth below ground level nominal 500mm depth. Footing loads are anticipated to be relatively small, and timber shallow footings are suitable provided that the base of the posts are founded in firm or better clays or medium dense or better sands and an allowable bearing pressure of not more than 100kPa is required. Concrete pads could be considered to reduce long-term maintenance cost associated with timber footings.

5.6 Groundwater Control

Limited groundwater observations made for this investigation are described in Section 4.3. The observations indicate that groundwater is unlikely to be a constraint to the proposed development. However, good practice should be followed to cater for potential groundwater springs within the slope formation. It is anticipated that these could be controlled with suitable diversion during construction and installation of subsoil drainage to collect and divert such seepage away form critical areas. Further geotechnical advice must be sought if significant groundwater is encountered during construction.

6. 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 investigations. To confirm the assessed soil and rock properties in this report, further investigation would be required such as coring and strength testing of rock and should be carried out if the scale of the development warrants, or if any of the properties are critical to the design, construction, or performance of the development.

It is recommended that a qualified and experienced Geotechnical Engineer be engaged to provide further input and review during the design development; including site visits during construction to verify the Site conditions and provide advice where conditions vary from those assumed in this report. Development of an appropriate inspection and testing plan should be carried out in consultation with the Geotechnical Engineer.

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.

This report and details for the proposed development should be submitted to relevant regulatory authorities that have an interest in the property (e.g., Council/ Event/ KT) or are responsible for services that may be within or adjacent to the Site for their review.

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.

Landslide Risk Assessment Tables

Table A – Risk to Life

Table B – Risk to Property

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Table A – Landslide Risk Assessment (Risk to Property)
Proposed New Snowrunner, Friday Flat, Thredbo NSW

Possible Hazards		Consequences (Note 2)	Assessed Likelihood	Risk (Note 1)	Risk Treatment and Comments
Failure Envisaged	Failure Mode				
A - Slump of natural slope (typical)	Slide	Minor	Unlikely	Low	No specific risk treatment considered necessary. Design and construction of the development to be in accordance with recommendations in Geotechnical Report 6751-G1 Rev 1 dated 7 June 2022.

Notes:

1. The risk assessment addresses only the consequences to property from potential landslide events considered relevant to the subject site. Injury to persons or potential for fatality from land sliding is not assessed in this table (refer Table B). The risk assessment is based on a preliminary appraisal only, carried out by inspection. Further assessment or quantification of the assessed geotechnical risks for the subject property would require additional data and/or investigation.
2. The consequences are for a development that is designed to accomodate the potential landslide risk or has demonstrated adequate performance over many years.
3. Refer to report and associated figures for illustration of possible hazards / slope failure mechanisms.
4. Refer to attachments for definitions and explanations of terms used in the risk assessment.

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Table A – Landslide Risk Assessment (Risk to Property)
Proposed New Snowrunner, Friday Flat, Thredbo NSW

Possible Hazard	Use of Affected Structure & Persons at Risk	Likelihood	Indicative Annual Probability P (H)	Probability of Spatial Impact P (S:H)	Temporal Probability P (T:S)	Vulner-ability V (D:T)	Probability of becoming Trapped	Risk for Person Most at Risk [Risk Evaluation]	Risk Outcome: A = Acceptable T = Tolerable NT = Not Tolerable
A3 - Slump of natural slope (typical)	Park users, maintenance workers	Unlikely	1.0E-04	1.00	0.33	0.10	0.10	3.30E-07	A

Notes:

1. The appraisal of the assessed risk relative to acceptable and tolerable risks is based on Table 1 of AGS (2007) – Reference 1, for a new development.
2. Risk mitigation will be required to ensure that the assessed risk outcome during and after the proposed development is acceptable. Referred to report for further details.
3. This table must be read in conunction with Table A.
4. Risk Outcome:

   A = Acceptable $\leq 10^{-6}$

   T = Tolerable $\leq 10^{-5}$

   NT = Not Tolerable - treatment options to be assessed and implemented
5. Temporal Probability based on per-person average assuming 8 hours per day for ski season = 8 / 24 = 0.333

Figures

APPROXIMATE ONLY – SUBJECT TO DETAIL SURVEY.
SOURCE: Kosciuszko Thredbo Pty Ltd (KT).
THIS DRAWING IS USED TO ILLUSTRATE SITE LOCATION ONLY, AND MUST NOT BE USED FOR ANY OTHER PURPOSE. COPYRIGHT OF SOURCE DRAWING REMAINS WITH KT

issue	date	description
B	7.6.22	Update base plan
A	15.12.21	Initial issue

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PROPOSED NEW SNOWRUNNER,
FRIDAY FLAT, THREDBO NSW
for
KT–EVT

SITE LOCALITY

drawn: AT / MAB
date: 7.6.2022
checked: MAB
scale: NTS

job no.: 6751
fig: 1
issue: B

APPROXIMATE ONLY – SUBJECT TO DETAIL SURVEY.

SOURCE: SITE LAYOUT prepared by Kosciuszko Thredbo Pty Ltd, Rev D, dated 22 June 2022.

0 1:600 A4 20m

LEGEND
- Borehole
- Test pit

issue	date	description
C	27.6.22	Amended base plan
B	7.6.22	Amended stairs etc, TP3 shown
A	19.1.22	Initial issue

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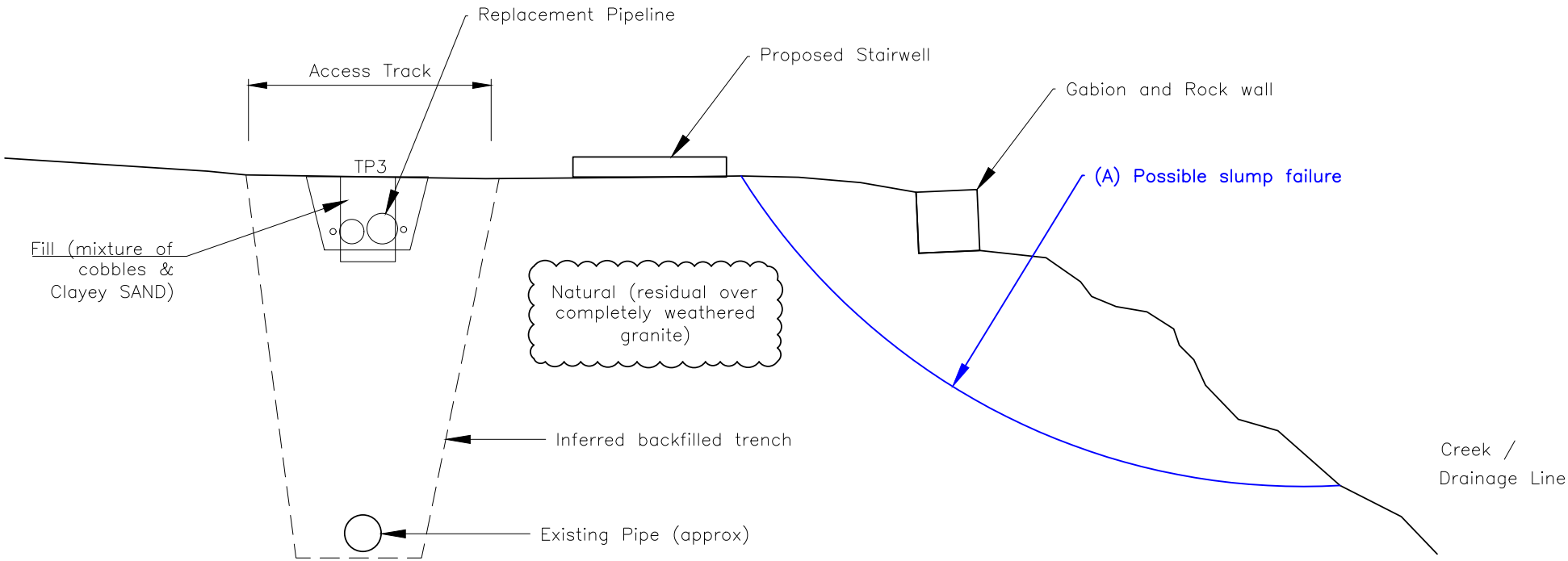
PROPOSED NEW SNOWRUNNER, FRIDAY FLAT, THREDBO NSW
for
KT–EVT

TEST LOCATIONS

drawn: AT / MAB
date: 27.6.2022
checked: MAB
scale: 1:600 A4

job no.: 6751
fig: 2
issue: C



APPROXIMATE ONLY – SUBJECT TO DETAIL SURVEY.

issue	date	description
A	7.6.22	Initial issue

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PROPOSED NEW SNOWRUNNER,
FRIDAY FLAT, THREDBO NSW
for
KT–EVT

Interpreted Section A–A

drawn: MAB
date: 7.6.2022
checked: MAB
scale: 1:100 A4

job no.: 6751
fig: 3
issue: A

Appendix A

Important Information about your Geotechnical Report
Important Information about your Landslide Risk Assessment
CSIRO BTF 18

Important Information about your Geotechnical Report

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 with regard to 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 or not 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 in order 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 of 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 take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.

Important Information about your Landslide Risk Assessment

Basis of The Assessment

Our assessment of landslide risk is presented in the framework of Landslide Risk Management (Australian Geomechanics Society, Vol 42, No 1, March 2007). The attached GeoGuides provide further information on landslide risk management and maintenance.

This assessment is based on a visual inspection of the property and the immediate adjoining land. Limited subsurface investigation may also have been undertaken as part of this appraisal. Slope monitoring has not been carried out within or adjacent to the property for the purpose of this appraisal. The opinions expressed in this report also consider our relevant local experience.

The property is within an area where landslip and/or subsidence have occurred, or where there is a risk of landslide. Important factors relating to slope conditions and the impact of development which commonly influence the landslide risks are discussed herein.

An owner's decision to acquire, develop or build on land within an area such as this involves the understanding and acceptance of a level of risk. It is important to recognise that soil and rock movements are an ongoing geological process, which may be affected by development and land management within the site or on ad- joining land. Soil and rock movements may cause visible damage to structures even where the risk of slope failure is considered low. This report is intended only to assess the landslide risk apparent at the time of inspection.

Our opinion is provided on the present landslide risk for the land specifically referenced in the title to this report. Foundations suitable for future building development are discussed in relation to slope stability considerations. Limited foundation advice may be provided. If so, advice is intended to guide the footing design for the proposed development. However, this report is not intended as, is not suitable for, and must not be used in lieu of a detailed foundation investigation for final design and costing of foundations, retaining walls or associated structures.

Limitations of The Assessment Procedure

The assessment procedures carried out for this appraisal are in accordance with the recommendations in Landslide Risk Management (Australian Geomechanics Society, Vol 42, No 1, March 2007), and with accepted local practice.

The following limitations must be acknowledged:

- the assessment of the stability of natural slopes requires a great degree of judgment and personal experience, even for experienced practitioners with good local knowledge;
- the assessment must be based on development of a sound geological model; slope processes and process rates influencing land sliding or landslide potential will vary according to geomorphologic influences;
- the likelihood that land sliding may occur on a given slope is generally hard to predict and is associated with significant uncertainties;
- different practitioners may produce different assessments of risk;
- actual risk of land sliding cannot be determined; risk changes with time;
- consequences of land sliding need to be considered in a rational framework of risk acceptance;
- acceptable risk in relation to damage to property from landslide activity is subjective; it remains the responsibility of the owner and/or local authority to decide whether the risk is acceptable; the geotechnical practitioner can assist with this judgment;
- the extent and methods of investigation for assessment of landslide risk will be governed by experience, by the perceived risk level, and by the degree to which the risk or consequences of land sliding are accepted for a specific project;
- the assessment may be required at several stages of the project or development; frequently (due to time or budget constraints imposed by the client) there will be no opportunity for long-term monitoring of the slope behaviour or groundwater conditions, or for on-going opportunity for the slope processes and performance of structures to be reviewed during and after development; such limitations should be recognised as relevant to the assessment.

Development on Slopes

Some landslide risk is always attached to the development of land on slopes.

Guidelines for hillside construction and examples of good practices for hillside developments are described in the attached GeoGuides.

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction
There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion
All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation
This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil
All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure
This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage

As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

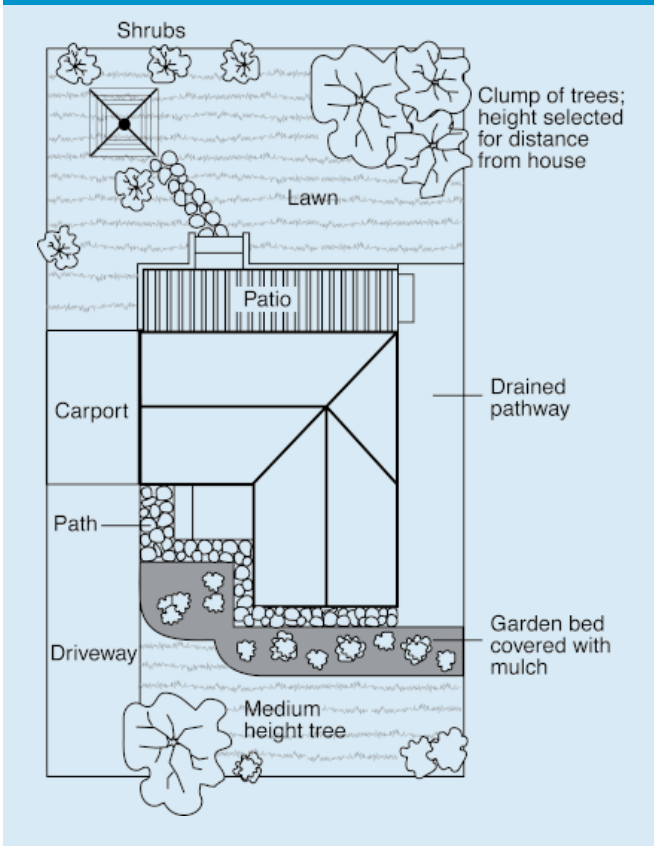
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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Appendix B

Soil & Rock Explanation Sheets
Borehole Logs
Test Pit Log
DCP Logs

Soil and Rock Explanation Sheets (1 of 2)

Log Abbreviations & Notes

METHOD

borehole logs		excavation logs	
AS	auger screw *	NE	natural excavation
AD	auger drill *	HE	hand excavation
RR	roller / tricone	BH	backhoe bucket
W	washbore	EX	excavator bucket
CT	cable tool	DZ	dozer blade
HA	hand auger	R	ripper tooth
D	diatube		
B	blade / blank bit		
V	V-bit		
T	TC-bit		

* bit shown by suffix e.g. ADV

coring
NMLC, NQ, PQ, HQ

SUPPORT

borehole logs		*excavation logs*	
N	nil	N	nil
M	mud	S	shoring
C	casing	B	benched
NQ	NQ rods		

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

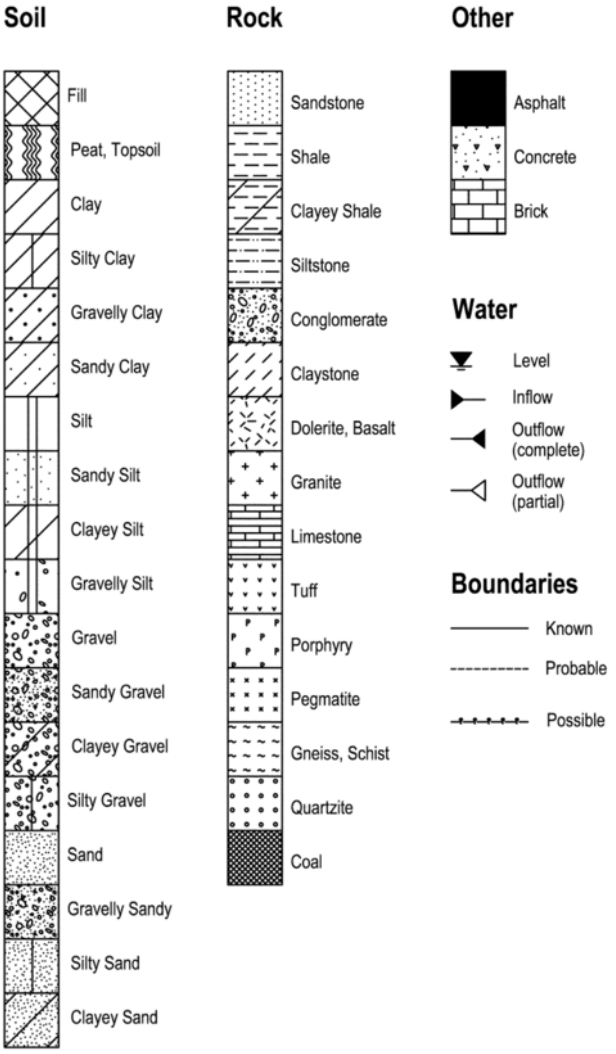
CONSISTENCY

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



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 (%)

= sum of intact core pieces > 2 x diameter x 100
total length of core run drilled

DEFECTS:

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

shape		*roughness*	
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

Soil and Rock Explanation Sheets (2 of 2)

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 – ≤200
Soft	>12 – ≤25	Hard	> 200
Firm	>25 – ≤50	Friable	–
Stiff	>50 – ≤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:	
	coarse grained	*fine grained*
Trace	≤ 15%	≤ 5%
With	>15% – ≤30%	>5% – ≤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.
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SC	Sand-clay mixtures.
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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 (>2mm) fragments.
Sandstone	... sand sized (0.06 to 2mm) grains.
Siltstone	... silt sized (<0.06mm) 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 <1mm). Feels like fine to coarse sandpaper.
Very Rough	Many large surface irregularities, amplitude generally >1mm. 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.

Borehole Log

BH no:	**BH1**
sheet:	1 of 1
job no.:	6751

client:	Kosciuszko Thredbo Pty Ltd	**started:**	29.11.2021
principal:		**finished:**	29.11.2021
project:	Proposed new Snowrunner	**logged:**	AT
location:	Friday Flat, Thredbo NSW	**checked:**	MAB
equipment:	HA/DCP	**RL surface:**	1373 m approx.
diameter:	75mm **inclination:** -90° **bearing:** --- **E:** **N:**	**datum:**	AHD

drilling information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description (soil type: plasticity or particle characteristics, colour, secondary and minor components.)	moisture condition	consistency/ density index	hand penetro-meter kPa (100 200 300 400)	structure and additional observations
HA/DCP	N	None Observed					SM/MLS	TOPSOIL, Sandy Silt/ Silty SAND matrix, fine to medium grained, low plasticity fines, dark brown, grass roots.	D	VD		TOPSOIL.
					0.2			Hand Auger reached practical refusal @ 0.2m on weathered granite bedrock. DCP sounding bouncing @ 0.2m. Borehole No: BH1 terminated at 0.2m				GRANITE BEDROCK.
				1372.5	0.5							
				1372.0	1.0							
				1371.5	1.5							

REFER TO EXPLANATION SHEETS FOR DESCRIPTION OF TERMS AND SYMBOLS USED

Borehole Log - Revision 10

A: 2.06 / 56 Delhi Road, North Ryde NSW 2113 P: 02 9878 6005 W: assetgeoenviro.com.au

Borehole Log

BH no:	**BH2**
sheet:	1 of 1
job no.:	6751

client:	Kosciuszko Thredbo Pty Ltd	**started:**	29.11.2021
principal:		**finished:**	29.11.2021
project:	Proposed new Snowrunner	**logged:**	AT
location:	Friday Flat, Thredbo NSW	**checked:**	MAB
equipment:	HA/DCP	**RL surface:**	1373 m approx.
diameter:	75mm **inclination:** -90° **bearing:** --- **E:** **N:**	**datum:**	AHD

drilling information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description (soil type: plasticity or particle characteristics, colour, secondary and minor components.)	moisture condition	consistency/ density index	hand penetro-meter kPa (100 200 300 400)	structure and additional observations
HA/DCP	N	None Observed					MLC	TOPSOIL, Sandy, silty CLAY, low plasticity fines, fine to medium grained sand, brown, grass roots.	D	MD		TOPSOIL.
										VD		
DCP					0.35			GRANITE, CW-XW, blocky mixed with clayey sand matrix, medium to coarse sand, trace of granite fragments up to 70mm in size, brown.				GRANITE, variably weathered (CW-XW).
					0.45			Borehole No: BH2 terminated at 0.45m				
				1372.5	0.5							
				1372.0	1.0							
				1371.5	1.5							

REFER TO EXPLANATION SHEETS FOR DESCRIPTION OF TERMS AND SYMBOLS USED

Borehole Log - Revision 10

A: 2.06 / 56 Delhi Road, North Ryde NSW 2113 P: 02 9878 6005 W: assetgeoenviro.com.au

Borehole Log

BH no:	**BH3**
sheet:	1 of 1
job no.:	6751

client:	Kosciuszko Thredbo Pty Ltd	**started:**	29.11.2021
principal:		**finished:**	29.11.2021
project:	Proposed new Snowrunner	**logged:**	AT
location:	Friday Flat, Thredbo NSW	**checked:**	MAB
equipment:	HA/DCP	**RL surface:**	1372 m approx.
diameter:	75mm **inclination:** -90° **bearing:** --- **E:** **N:**	**datum:**	AHD

drilling information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description (soil type: plasticity or particle characteristics, colour, secondary and minor components.)	moisture condition	consistency/ density index	hand penetro-meter kPa (100 200 300 400)	structure and additional observations
HA/DCP	N	None Observed		1371.5	0.5		CLM	FILL, Silty CLAY with traces of sand, fine to medium grained sand, low to medium plasticity, trace of fines and grass roots, granite fragments, dark brown.	D	D / VD / L		FILL.
					0.65			Hand Auger reached practical refusal @ 0.65 on inferred weathered Granite bedrock. Borehole No: BH3 terminated at 0.65m				GRANITE BEDROCK or BOULDER.
				1371.0	1.0							
				1370.5	1.5							

A: 2.06 / 56 Delhi Road, North Ryde NSW 2113 P: 02 9878 6005 W: assetgeoenviro.com.au

Borehole Log

BH no:	**BH4**
sheet:	1 of 1
job no.:	6751

client:	Kosciuszko Thredbo Pty Ltd	**started:**	29.11.2021
principal:		**finished:**	29.11.2021
project:	Proposed new Snowrunner	**logged:**	AT
location:	Friday Flat, Thredbo NSW	**checked:**	MAB
equipment:	HA/DCP	**RL surface:**	1372 m approx.
diameter:	75mm **inclination:** -90° **bearing:** --- **E:** **N:**	**datum:**	AHD

drilling information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material description (soil type: plasticity or particle characteristics, colour, secondary and minor components.)	moisture condition	consistency/ density index	hand penetro-meter kPa (100 200 300 400)	structure and additional observations
HA/DCP	N	None Observed					MLC/CLM	TOPSOIL/FILL, Silty, clayey SAND grading to Silty CLAY with traces of sand, fine ot medium grained sand, low plasticity fines, trace of granite fragments and grass roots, dark brown to dark grey/dark brown.	<Wp	S/L		FILL.
										F/MD		
										St/VD		
										VSt/VD		
				1371.5	0.5					VSt/D		
										VSt		
DCP					0.72			Hand Auger reached practical refusal @ 0.72m on very stiff to hard clay.	<Wp/D?			ALLUVIUM / FILL?
				1371.0	1.0					St		
										H		
								DCP sounding bouncing @ 1.3m on inferred Granite bedrock or boulder. Borehole No: BH4 terminated at 1.3m				GRANITE BEDROCK.
				1370.5	1.5							

REFER TO EXPLANATION SHEETS FOR DESCRIPTION OF TERMS AND SYMBOLS USED

Borehole Log - Revision 10

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Excavation Log

EX no:	**TP3**
sheet:	1 of 1
job no.:	6262

client:	EVT / Kosciuszko Thredbo Pty Ltd	**started:**	4.10.2020
principal:		**finished:**	4.10.2020
project:	Proposed Snowmaking Pipeline Replacement	**logged:**	MAB
location:	Thredbo	**checked:**	WND
equipment:	Kubota U17-3 Excavator	**RL surface:**	
dimensions:	0.9 x 0.9m **E:** **N:**	**datum:**	

excavation information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetro-meter kPa 100 200 300 400	structure and additional observations
EX	N	None observed			0.5 1.0			Mixture of cobbles and small boulders to 300mm size and Clayey SAND, medium to coarse grained, grey/brown	M	D		FILL (roadway), gravel over geofabric at top side of test pit FILL appears well compacted
					1.4 1.5 2.0			Excavation No: TP3 terminated at 1.4m				

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Excavation Log

EX no:	**TP4**
sheet:	1 of 1
job no.:	6262

client:	EVT / Kosciuszko Thredbo Pty Ltd	**started:**	4.10.2020
principal:		**finished:**	4.10.2020
project:	Proposed Snowmaking Pipeline Replacement	**logged:**	MAB
location:	Thredbo	**checked:**	WND
equipment:	Kubota U17-3 Excavator	**RL surface:**	
dimensions:	0.9 x 0.9m **E:** **N:**	**datum:**	

excavation information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material (soil type: plasticity or particle characteristics, colour, secondary and minor components.)	moisture condition	consistency/ density index	hand penetro-meter kPa (100 200 300 400)	structure and additional observations
EX	N	None observed					GP	GRAVEL, fine to medium grained, over geofabric	M	D		FILL
					0.1		CL	CLAY, medium plasticity, dark brown to orange-brown, some cobbles to 200mm	<Wp	H		COLLUVIUM?
					0.5							
					1.0							
					1.2		CL	CLAY, medium plasticity, orange-brown	=Wp	VSt		
					1.4			Excavation No: TP4 terminated at 1.4m				
					1.5							
					2.0							

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Excavation Log

EX no:	**TP5**
sheet:	1 of 1
job no.:	6262

client:	EVT / Kosciuszko Thredbo Pty Ltd	**started:**	4.10.2020
principal:		**finished:**	4.10.2020
project:	Proposed Snowmaking Pipeline Replacement	**logged:**	MAB
location:	Thredbo	**checked:**	WND
equipment:	Kubota U17-3 Excavator	**RL surface:**	
dimensions:	0.9 x 0.9m **E:** **N:**	**datum:**	

excavation information | **material information**

method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	USCS symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetro-meter kPa (100 200 300 400)	structure and additional observations
EX	N	None observed					ML	SILT, medium plasticity, dark grey, grass roots	M	F		TOPSOIL
					0.2		CL	CLAY, medium plasticity, brown, some cobbles and small boulders to 500mm size	>=Wp	St	× 100	COLLUVIUM?
					0.5							
											× 100	
					1.0							
					1.2		SC	Clayey SAND, medium to coarse grained, light grey/brown	M	D		RESIDUAL (COMPLETELY WEATHERED GRANITE)
					1.4			Excavation No: TP5 terminated at 1.4m				
					1.5							
					2.0							

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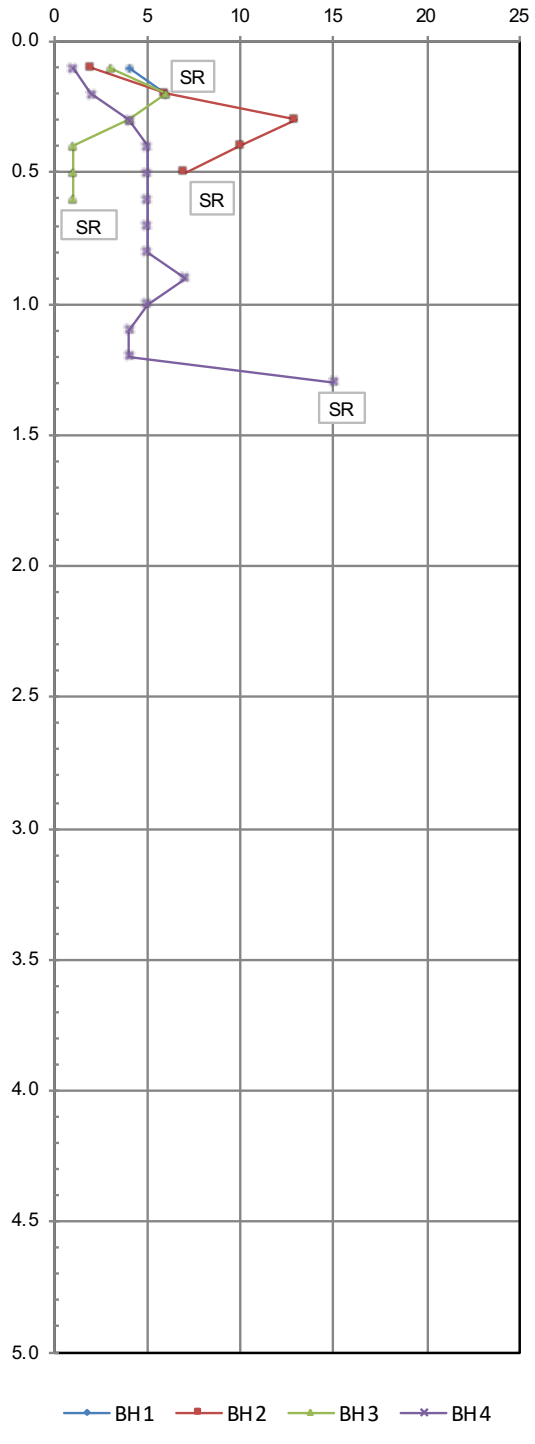
Dynamic Cone Penetrometer

Sheet:	1 of 1
Job No:	6751

client:	Kosciuszko Thredbo Pty Ltd	**started:**	29.11.2021
principal:		**finished:**	29.11.2021
project:	Proposed new Snowrunner	**logged:**	AT
location:	Friday Flat, Thredbo NSW	**checked:**	MAB
equipment:	9kg hammer, 510mm drop, cone tip		
standard:	AS1289.6.3.2-1997		

Depth (m)	Test Results (blows / 100mm)				
	BH1	BH2	BH3	BH4	BH5
0.00 – 0.10	4	2	3	1	
0.10 – 0.20	6	6	6	2	
0.20 – 0.30	SR	13	4	4	
0.30 – 0.40		10	1	5	
0.40 – 0.50		7	1	5	
0.50 – 0.60		SR	1	5	
0.60 – 0.70			SR	5	
0.70 – 0.80				5	
0.80 – 0.90				7	
0.90 – 1.00				5	
1.00 – 1.10				4	
1.10 – 1.20				4	
1.20 – 1.30				15	
1.30 – 1.40				SR	
1.40 – 1.50					
1.50 – 1.60					
1.60 – 1.70					
1.70 – 1.80					
1.80 – 1.90					
1.90 – 2.00					
2.00 – 2.10					
2.10 – 2.20					
2.20 – 2.30					
2.30 – 2.40					
2.40 – 2.50					
2.50 – 2.60					
2.60 – 2.70					
2.70 – 2.80					
2.80 – 2.90					
2.90 – 3.00					
3.00 – 3.10					
3.10 – 3.20					
3.20 – 3.30					
3.30 – 3.40					
3.40 – 3.50					
3.50 – 3.60					
3.60 – 3.70					
3.70 – 3.80					
3.80 – 3.90					
3.90 – 4.00					
4.00 – 4.10					
4.10 – 4.20					
4.20 – 4.30					
4.30 – 4.40					
4.40 – 4.50					
4.50 – 4.60					
4.60 – 4.70					
4.70 – 4.80					
4.80 – 4.90					
4.90 – 5.00					

Plot (blows / 100mm vs depth)



Notes:
RL = ground surface level (m) AHD
TD = target depth, PR = practical refusal (15+ blows per 100mm), SR = "solid" refusal (no further penetration and "solid" ringing sound from slide hammer)

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Appendix C

Site Photos & Images of Footing System

Photo 1

Overview of existing site condition

Photo 2

Continuation of Photo 1


SUREFOOT
CONCRETE FREE FOOTING SYSTEM
RESIDENTIAL


650


1200 × 730


886 × 587


316 × 248

Typical Operators Hut

Typical footing excavation for Operators Hut