Design Report

Thredbo Golf Course Subdivision

Civil Engineering Design

Client: Kosciuszko Thredbo Pty Ltd

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1. Introduction

This report has been prepared by CLM Civil Engineering on behalf of Kosciusko Thredbo Pty Ltd. The purpose of this report is to inform the design parameters which have been relied upon for the preparation of the Civil Engineering Design, to accompany the subdivision proposal at the Thredbo Golf Course.

2. Outstanding Items

This report, and the accompanying Civil Engineering Design has been prepared to address the following requests from the Department of Planning and Environment.

Item	Request for Information	Response
1	Provision of Pedestrian Path along new access road.	The Civil Engineering Design demonstrates a proposed concrete footpath along the proposed road up to CH110. At the intersection with Crackenback Dr, the footpath has been continued along the back of kerb of Crackenback Dr, to provide a footpath connection to the Community Centre located on Lot 500 DP1118419. From CH10-CH60, the footpath connects to the proposed footpath, and reconfigured golf course layout. At CH110, the footpath connects to a path from the 9th Green, providing a return path of travel to the carpark for golfers. The footpath also connects to pathway which connects to the existing 'Thredbo River Track' and the pedestrian footbridge connecting to Lot 772 DP1119757. Footpath extension along the proposed Road from CH110-430 has not been proposed. It is noted that the Thredbo River Track extends to the southern extent of the proposed subdivision.
2	Prepare service trench and stormwater infrastructure sectional plans	Sheet 3 of the Civil Engineering Design demonstrates the proposed Typical Section of Road 1, which includes the provision of services. Stormwater has been allocated for the eastern verge and will be typically located below the kerb. Reticulated Water, Gas, Electricity and Telecommunications has been allocated for the western verge.
3	The driveway design and construction of driveways servicing lots 9-11 and lots 12-15, including provision for non-motorists to safely access the parcels from the new road	The Civil Engineering Design demonstrates two concrete driveways which will service Lots 9-11 and 12-15. Both driveways are proposed at 4m width, which would permit a motor vehicle and pedestrian to pass one another. The provision for two vehicles to pass one another has not determined as necessary. Refer to Section 4. Driveway Design of this report.

4	Vehicle Turning Templates for the intersection and both cul-de-sacs demonstrating appropriate sized design vehicles for emergency services, waste collection and buses, including the bus stop necessary to service the development.	Swept Path Analysis has been provided for: • 5.2m Passenger Vehicle traversing the carpark. • 8.8m Medium Rigid Vehicle negotiating the U-Turn Bay. • 8.8m Medium Rigid Vehicle negotiating the Culdesac • 8.8m Medium Rigid Vehicle negotiating the intersection. An 8.8m Medium Rigid Vehicle has been nominated as the design vehicle and represents a Category 1 Fire Appliance, Waste Collection Vehicle and Thredbo Coaster Bus.
5	Road Cross Sections to be provided at intervals not exceeding ten (10) metres along the full length of the accessway.	Cross Sections at 10m spacing have been provided for Road 1.
6	Plans and elevations detailing provision of the increased setback between the Thredbo Community Centre / Early Childhood Centre site and landscaping of the setback.	The entire carpark and its proximity to the Community Centre has been reconfigured. Accessible pedestrian access provides a buffer, including landscaping between the carpark and Community Centre.
7	Road pavement design details suitable for anticipated service life, axle loadings including anticipated dwelling construction loadings, extreme cold conditions, and geotechnical conditions, along with consequent roadwork cut and fill diagrams, details of volumes of imported materials and methods to dispose of any excess spoil generated by accessway earthworks.	Refer to Section 6. Preliminary Pavement Design. Refer to Sheet 3 and Sheet 48 of Civil Engineering Plans.
8	Detailed design plans for parking spaces in accordance with AS 2890.1:2004 to provide clearances for through traffic while loading and unloading vehicles safely.	Carparking has been designed in accordance with AS/NZS 2890.1:2004, AS2890.5:2020 and AS2890.6:2022. Refer to 5. Carparking.
9	Plans provided are to include: 1. Design warrants for plan and cross-section design 2. Maximum batter slopes 3. Table drain widths 4. Road shoulder design 5. Kerbs and gutters 6. Traffic calming devices if applicable 7. Line marking 8. Carriageway set back distances to speed signposting 9. Light poles 10. Hydrant locations and parking regulatory signage 11. Demonstrating reference to and compliance with applicable	Refer to sections 3 to 7 of this Design Report.

	Australian Standards and relevant guidelines.	
10	Location and design of accessible parking provision and travel paths throughout the development, including through the golf course, showing path of travel around the course.	2x Accessible Parking Spaces have been nominated in the northeastern corner of the off-street carpark. The parking spaces have been designed to comply with the slope requirements of AS2890.6:2022. An accessible path of travel has been accommodated from the accessible parking spaces to the community centre in accordance with AS 1428.1:2021. An accessible path of travel has not been accommodated throughout the golf course, as natural topography does not permit compliant gradients to be achieved.
11	Details of the bus stop to be constructed at the western end of the access road and particulars of the location and construction details of any bus shelter, detailing compliance with road design standards, safety features, street furniture and access requirements under the Commonwealth Government's Disability Standards for Accessible Public Transport 2002.	Refer to Traffic Consultant Report.

3. Road Design

Road 1 has been designed to a public road standard, with a design speed of 40km/h. The adopted design guideline for the design is Austroads Guide to Road Design (AGRD). The design requirements adopted for Road 1 based on a design speed of 40km/h are:

- Minimum Stopping Sight Distance: 40m ± Grade Correction (Table 5.5 AGRD03-21[1])
- Minimum Crest Curve K Value: 3.5 (Table 8.7 AGRD03-21)
- Minimum Sag Curve K Value: 3.0 (Figure 8.9 AGRD03-21)
- Minimum Vertical Curve Length: 20m (Table 8.10 AGRD03-21)
- Horizontal Curve Radius: 50m Typical (Equation 5 AGRD03-21)

The vertical geometry of Road 1 has been assessed for compliance against Austroads Guide to Road Design Requirements. Compliance has been checked for the K-Value and sight distance of vertical curves. The sight distance assessment has been carried out based on the vertical geometry at the road centreline, to demonstrate compliance. The results of the assessment are provided below.

Curve CH	Required K Value	Design K Value	Required Sight Distance	Provided Sight Distance	Complies	Comment
S:72.78	3.00	8.75	N/A	N/A	YES	Sag Curve, design criteria is governed by comfort criteria (K Value) only. Street lighting ensures sight distance requirements are met through sag.
C:111.83	3.52	14.11	39.72	78.97	YES	Crest Curve, stopping sight distance criteria met.
S:274.80	3.00	7.06	N/A	N/A	YES	Sag Curve, design criteria is governed by comfort criteria (K Value) only. Street lighting ensures sight distance requirements are met through sag.
C:374.90	7.17 (ASD) & 3.52 (SSD)	7.28	39.72	40.03	YES	Crest Curve, Approach sight distance criteria met for approach to culdesac head. Sight stopping distance criteria met for northbound traffic.

Road 1 has been designed at a width of 6.1m between the Kerb Lines. This width is consistent with existing roads in the Thredbo Village and provides sufficient width to allow 2x 3.0m wide lanes. 3.0m lane widths are suitable for use on low-speed roads with low truck volumes and provides a form of traffic calming for through traffic. The following roads were considered in determining a suitable road width in the context of the Thredbo Village streetscape.

- Crackenback Dr: 7.2m Width Invert to Invert at intersection with Road 1
- Cascades Close: 4.2m Width Back of Edge Strip to Invert
- Ramshead Lane: 4.1m Width Back of Edge Strip to Invert
- Digging Terrace: 5.9m Width between Edge of Bitumen

Road 1 has been designed with one-way crossfall, and kerb and gutter drainage control on the eastern side only. The eastern kerb and gutter is primarily proposed to be a concrete dish drain/layback profile, which is mountable to vehicles and is not at risk of damage due to snow plough maintenance. A portion of upright kerb and gutter is proposed for the kerb returns of Road 1 and Crackenback Drive, for drainage control, and for the eastern shoulder for CH10-60, to prevent vehicles from crossing the eastern pathway to access/egress the off-street carparking spaces. The

[1] Guide to Road Design Part 3: Geometric Design

western shoulder of Road 1 is proposed to be a concrete edge strip, flush with the pavement level and adjacent verge.

The horizontal geometry of Road 1 has been assessed for compliance against Austroads Guide to Road Design Requirements. Compliance has been checked for horizontal radius, side friction factor, sight distance and corresponding vehicle speeds. The results of the assessment are provided below.

Curve CH	Radius	Sight Distance Offset	Design Operating Speed	Complies	Comment
50	100m	1.99m	55km/h	YES	Sight Line for Horizontal Curve is contained within road carriageway.
90	100m	*	61km/h	YES	Stopping Sight Distance length is less than horizontal curve length, sight distance offset calculation is not applicable. Sight line for 40m SSD remains within road carriageway.
145	100m	1.99m	55km/h	YES	`Sight Line for Horizontal Curve is contained within road carriageway.
235	33m	*	34km/h	ON MERIT	Stopping Sight Distance length is less than horizontal curve length, sight distance offset calculation is not applicable. Sight line for 40m SSD remains within road carriageway. Design Operating Speed <40km/h is desired considering the start of the residential development area. Approach to horizontal curve is a straight, consistent grade, allowing drivers to approach the horizontal curve with sufficient warning to reduce their speed accordingly for the horizontal curve.
275	71	*	54km/h	YES	Stopping Sight Distance length is less than horizontal curve length, sight distance offset calculation is not applicable. Sight line for 40m SSD remains within road carriageway.
310	57	*	48km/h	YES	Stopping Sight Distance length is less than horizontal curve length, sight distance offset calculation is not applicable. Sight line for 40m SSD remains within road carriageway.
370	100	*	61km/h	YES	Stopping Sight Distance length is less than horizontal curve length, sight distance offset calculation is not applicable. Sight line for 40m SSD remains within road carriageway.
400	25	*	32km/h	ON MERIT	Stopping Sight Distance length is less than horizontal curve length, sight distance offset calculation is not applicable. Sight line for 40m SSD remains within road carriageway. Design Operating Speed <40km/h is desired considering the approach to culdesac. Approach Sight Distance is provided on approach to the culdesac, ensuring motorists can view the road surface on approach to the horizontal curve/culdesac, and safely reduce their speed to negotiate the culdesac..

The intersection of Road 1 and Crackenback Drive has been designed to maintain the existing concrete dish drain on the southern side of Crackenback Drive. This has been opted for as it provides the most practical drainage control for the intersection, considering the longitudinal slope of Crackenback Dr, and the one-way crossfall of Road 1, and the elimination of a potential sag point on the western side of Road 1 which would overtop Road 1 in a concentrated manner in the event of overflow and/or blockage.

A U-Turn Bay has been provided at CH260, to provide a turning area for vehicles which have entered Road 1 for a purpose other than to access one of the proposed residential properties (i.e. community centre, day care, golf services). Typically, U-Turn bays are located on the departure side of the road, to permit two separate turning manoeuvres to be undertaken, and to reduce the potential conflict with through traffic. A U-Turn bay on the approach side of the road has been proposed for this development, to prevent any encroachment onto proposed Lots 1 and 2, and reduce the development potential of these future lots, and to also locate the U-Turn Bay on an area which has flatter slopes to minimise the extent of earthworks and disturbance footprint.

The U-Turn Bay has been assessed as an intersection for the purpose of providing safe intersection sight distance for traffic utilising the U-Turn Bay. 80m of sight distance is calculated as required to be provided for eastbound/northbound traffic travelling along Road 1. Approximately 140m (CH270-

410) of sight distance is available along the centreline of Road 1, before being constrained by vertical geometry. In order to achieve 80m sight distance from a point 3.5m setback from the U-Turn bay holding line, the sight line is required to encroach approximately 1.8m into Lot 19 at the eastern boundary.

The cul-de-sac at the end of Road 1 has been designed to comply with the requirements of Planning for Bushfire Protection. The cul-de-sac incorporates a 12.0m radius at the edge of bitumen/lip of kerb, to provide sufficient radius for a fire appliance, garbage truck and bus to undertake the turning movement. The cul-de-sac does not incorporate a 30.0m radius for the approach to the cul-de-sac as the road pavement would encroach into Lot 14 and 16 and provide an extensive pavement area before the head of the cul-de-sac. Excess pavement area at the cul-de-sac head would encourage parking within the cul-de-sac (despite regulatory signs) and potentially obstruct emergency services. The 12.0m approach radius is sufficient to cater for the turning movements of all design vehicles and will encourage slower speeds on approach to the cul-de-sac, improving safety for all road users.

4. Driveway Design

Driveway Design for Driveway 1 and Driveway 2 has been undertaken in accordance with AS/NZS 2890.1:2004. The driveway width for both instances has been adopted as 4.0m, to facilitate pedestrian and vehicular traffic passing one another. The provision has not been made for the passing of two vehicles, as it has not been deemed as necessary as per the following assessment.

Driveway 1 will provide access to Lots 12-15; however, Lot 14 will only partially be serviced by the Driveway as it is also benefitted by frontage to the cul-de-sac. Preliminary yield for the future development of each lot is indicated below:

- Lot 12: 10 beds
- Lot 13: 14 beds
- Lot 14: 10 beds (assumed that half will utilise Driveway 1, and half will access from Cul-de-sac)
- Lot 15: 8 beds

The preliminary yield has been considered against the NSW Guide to Traffic Generating Developments requirements for casual accommodation, to adopt a conservative approach to assessing peak vehicle movements. The traffic generating rates for Motel units has been adopted, which nominates 3 vehicle trips per day per unit, and 0.4 vehicle trips per peak hour per unit. Making a conservative assumption of the preliminary yield, and assuming 1 bed is equivalent to 1 motel unit, the peak hourly traffic on Driveway 1 is expected to be 21 vehicle trips. As per Clause 3.2.2. of AS/NZS 2890.1:2004, the provision for two vehicles to pass on the driveway is typically required when the peak hourly traffic exceeds 30 vehicle trips. As such, the 4.0m driveway width proposed is considered sufficient.

Similarly, Driveway 2 will provide access to Lots 9-11 however, Lots 9 and 11 will only partially be serviced by the Driveway as they are also benefitted by frontage to the cul-de-sac. Preliminary yield for the future development of each lot is indicated below:

- Lot 9: 10 beds (assumed that half will utilise Driveway 2, and half will access from Cul-de-sac)
- Lot 10: 12 beds
- Lot 11: 12 beds (assumed that half will utilise Driveway 2, and half will access from Cul-de-sac)

Adopting the traffic generating rates for Motel units, and assuming 1 bed is equivalent to 1 motel unit, the peak hourly traffic on Driveway 2 is expected to be 10 vehicle trips. As per Clause 3.2.2. of AS/NZS 2890.1:2004, the provision for two vehicles to pass on the driveway is typically required when the peak hourly traffic exceeds 30 vehicle trips. As such, the 4.0m driveway width proposed is considered sufficient.

5. Carparking

The off-street carparking on the eastern side of Road 1 has been designed to AS/NZS 2890.1:2004. The applicable user class has been identified as User Class 2 as per Table 1.1 of AS/NZS 2890.1:2004, which includes uses of town centre parking, sports facilities, entertainment centres. The on street carparking on the western side of Road 1 has been designed to AS 2890.5:2020. The applicable classification of parking has been identified as 'Medium' as per Table 3.2 of AS 2890.5:2020, which includes uses of town centre and sports facilities.

- The off-street parking spaces have been designed at 2.5m width, with an aisle width of 5.8m, to meet the requirements of User Class 2 as per Figure 2.2 of AS/NZS 2890.1:2004.
- The off-street carpark has been nominated as one-way circulation, to allow sufficient space within the parking aisle to permit through traffic, and the loading/unloading of parked vehicles. Clause 4.10 of AS/NZS 2890.1:2004 specifies an additional length of 2.0m for the *unloading/loading of prams, strollers, bulky parcels and the like* be added to designated parking spaces. Whilst no spaces are proposed to be formally dedicated for unloading/loading, an encroachment 2.0m into the parking aisle for unloading/loading still retains an aisle width of 3.8m, exceeding the minimum 3.0m width for one-way traffic flows as per clause 2.5.2.
- The on-street parking spaces have been designed at 2.5m width, 5.4m depth and a 1.85m safety buffer. The on-street carparking spaces have been aligned with the edge of the proposed 10m wide road corridor, retaining the 1.95m verge as a safety buffer to through traffic.
- The on-street parking spaces are proposed to be constructed of reinforced concrete pavement, with a concrete infill between the parking spaces and edge strip. A reinforced concrete pavement has been proposed to provide a visual representation of a mixed spaces for pedestrians and vehicles, as opposed to using differing materials such as asphalt for parking and concrete verge, which would give the impression of a footpath immediately between the through road and the parking spaces.
- The accessible parking spaces have been designed at 2.4m width, 5.4m depth with a 2.4m wide adjacent shared zone.

6. Preliminary Pavement Design

In order to provide an indicative volume of quantities, a preliminary pavement design has been calculated. A design traffic load of $3x10^5$ DESA was adopted, consistent with AusSPEC design traffic loads for a Local Street for a 25 year design life.

The Geotechnical Investigation Report prepared by Alliance Geotechnical provides DCP testing for 6 locations, with the upper 300mm of each DCP test providing a DCPI of 5.67 to 10. The corresponding CBR value based on the DCPI ranges from 13 to 26. For the purpose of the preliminary pavement design, a CBR value of 7 was adopted, to account for any uncertainty in the material properties considering the extent of earthworks to achieve subgrade level.

The preliminary pavement design consists of a 300mm pavement, which includes 40mm Asphaltic Cement wearing surface, 100mm Approved DGB20 Material and 160mm Approved DGS20 Material. The Final Pavement Design will be subject to in-situ CBR tests at the time of detailed designed.

7. Design Volumes

The proposed design includes bulk earthworks to ensure suitable integration of the proposed road, car park, golf course and access paths. A earthworks plan is provided in the plan set as Sheet 48. The indicative quantity of earthworks is indicated as:

	Volume (m^3)	Area (m^2)	Average Depth (m)
Cut Material	13,693	19,830	0.691
Fill Material	5,470	12,278	0.445
Net Total	8,223 (Spoil)	32,108	

The volume report indicates a volume of 8,223m^3 of excess material (spoil) to be exported off-site as part of the works. The total volume calculation does not include volumes associated with road pavement construction, as the final pavement volumes will be subject to geotechnical engineering testing and reporting and will form part of the construction drawings. The indicative pavement volume and additional excess material to be exported is 1244m^3, based on an assumed 300mm pavement depth.

There is the opportunity to reuse some excess material on-site as part of the works associated with the golf course, or at other project locations by Kosciuszko Thredbo Pty Ltd. The quality of the excess material will govern whether it is suitable for reuse on-site or off-site as controlled fill, with any material to be exported for reuse to be certified as VENM (Virgin Extract Natural Material) in accordance with EPA Requirements.