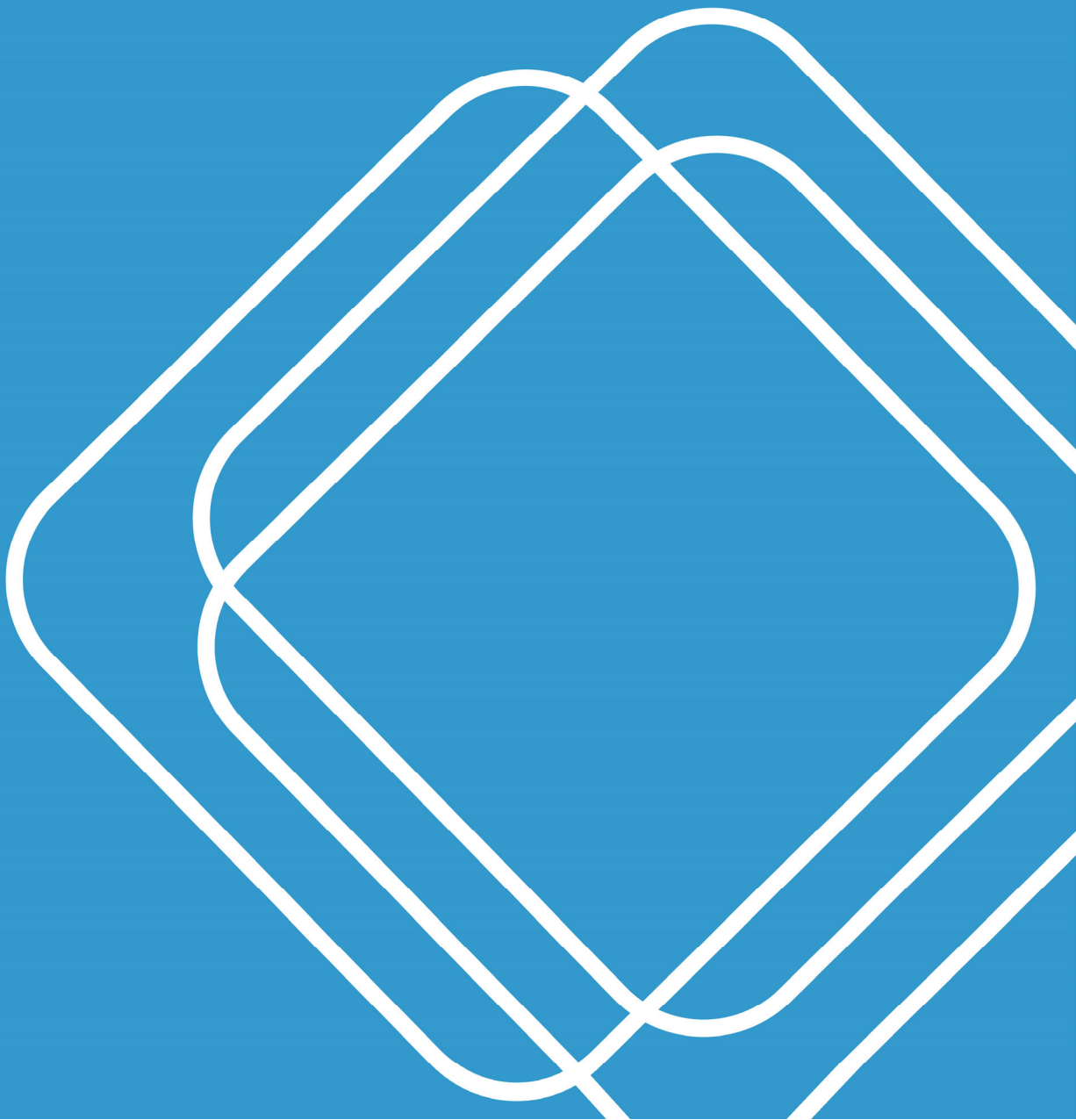
APPENDIX F

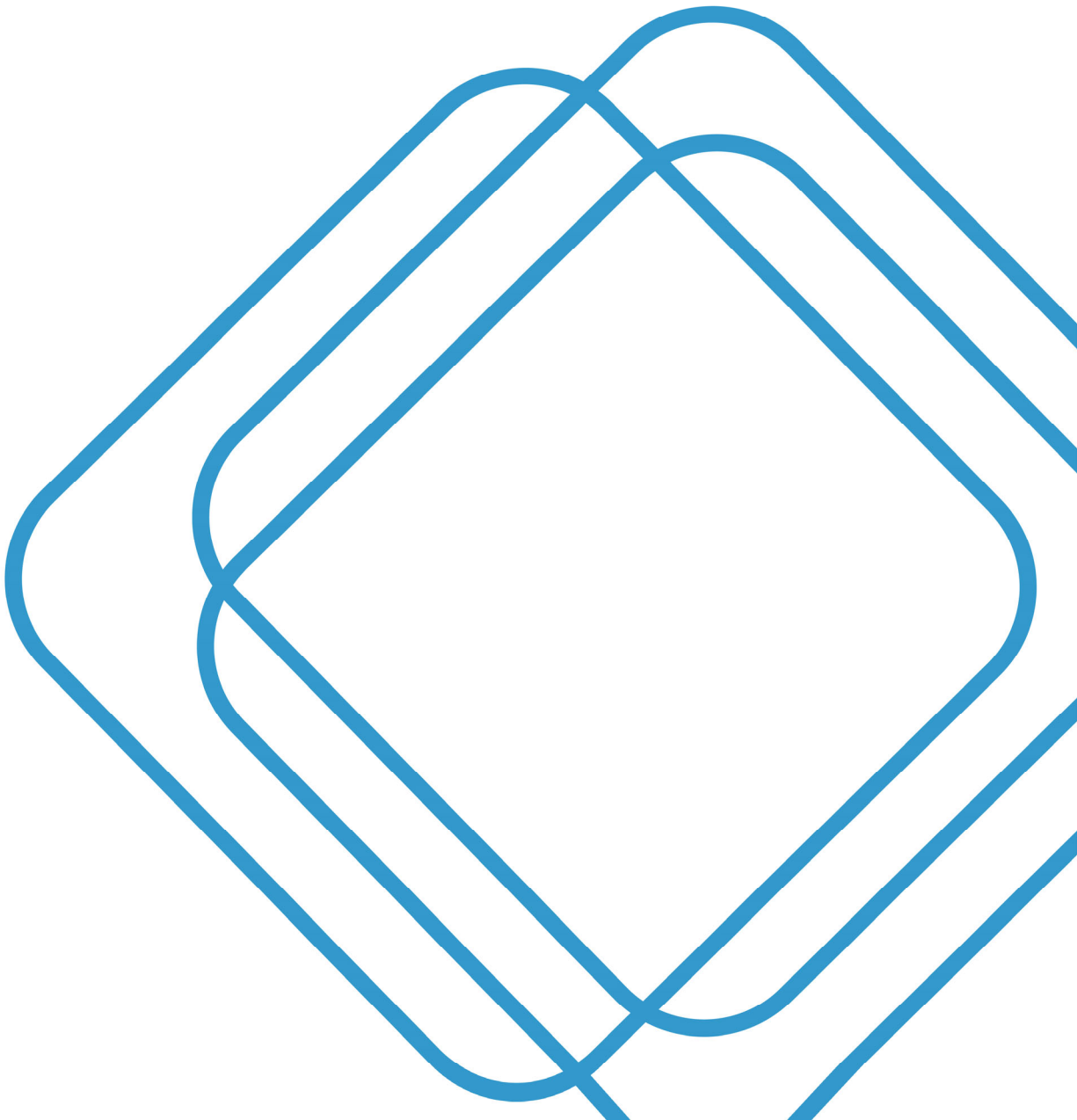
TRAFFIC AND TRANSPORT ASSESSMENT

SCT Consulting

PROPOSED SEGMENT FACTORY TRAFFIC AND TRANSPORT ASSESSMENT

25 SEPTEMBER 2019





Quality Assurance

Project:	Proposed Segment Factory Traffic and Transport Assessment		
Project Number:	SCT_00059		
Client:	EMM Consulting	**ABN:**	28 141 736 558
Prepared by:	SCT Consulting PTY. LTD. (SCT Consulting)	**ABN:**	53 612 624 058

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Revision	Revision Date	Details
0.1	14 June 2019	Table of Contents
1.0	11 July 2019	Preliminary Draft for EMM review
1.1	12 July 2019	Preliminary Draft for EMM review
1.2	18 July 2019	Preliminary Draft for EMM review
1.3	19 July 2019	Preliminary Draft for EMM review
2.0	19 July 2019	Preliminary Draft for Client review
3.0	4 September 2019	Updated Draft
4.0	9 September 2019	Draft Final Report
5.0	12 September 2019	Draft Final Report
6.0	18 September 2019	Final Report
7.0	25 September 2019	Updated Final Report

Contents

List of Figures

List of Tables

Annexures

1.0 Introduction

1.1 Snowy 2.0

Snowy Hydro Limited (Snowy Hydro) proposes to develop Snowy 2.0, a large-scale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). Snowy 2.0 is the largest committed renewable energy project in Australia and is critical to underpinning system security and reliability as Australia transitions to a decarbonised economy. Snowy 2.0 will link the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and a new hydro-electric power station will be built underground.

Snowy 2.0 has been declared to be State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) by the NSW Minister for Planning under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). CSSI is infrastructure that is deemed by the NSW Minister for Planning and Public Spaces to be essential for the State for economic, environmental or social reasons. An application for CSSI must be accompanied by an environmental impact statement (EIS).

Separate applications are being submitted by Snowy Hydro for different phases of Snowy 2.0, including Snowy 2.0 Exploratory Works (the Exploratory Works) and Snowy 2.0 Main Works (the Main Works).

The first phase of Snowy 2.0, the Exploratory Works (Application Number SSI 9208), includes an exploratory tunnel and portal and other exploratory and construction activities, primarily in the Lobs Hole area of the Kosciuszko National Park (KNP). Exploratory Works has been assessed in a separate EIS and is subject to an approval issued by the former NSW Minister for Planning on 7 February 2019. Construction for Exploratory Works has already commenced.

The second phase of Snowy 2.0, the Main Works (Application Number SSI 9687), covers the major construction elements of Snowy 2.0, including permanent infrastructure (such as the underground power station, power waterways, access tunnels, chambers and shafts), temporary construction infrastructure (such as construction adits, construction compounds and accommodation), management and storage of extracted rock material and establishing supporting infrastructure (such as road upgrades and extensions, water and sewage treatment infrastructure, and the provision of construction power). The EIS for the Main Works was submitted to the NSW Department of Planning, Industry and Environment (DPIE) in September 2019.

A separate application has also been submitted for a proposed factory that would manufacture precast concrete segments that would line the tunnels being excavated for Snowy 2.0 (Application Number SSI 10034). This Traffic and Transport Assessment supports the EIS for the proposed segment factory.

On 26 June 2019, Snowy Hydro referred the proposed segment factory (Reference Number 2019/8481) to the Commonwealth Minister for the Environment under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 13 August 2019 the proposed segment factory was determined, by the Acting Assistant Secretary Assessments and Waste Branch of the Commonwealth Department of the Environment and Energy (DEE) as delegate to the Minister to be 'not a controlled action' and therefore it does not require further assessment or approval under the EPBC Act.

1.2 The proposed segment factory

The tunnels for Snowy 2.0, including the exploratory tunnel for Exploratory Works and tunnels linking Tantangara and Talbingo reservoirs for the Main Works, would be excavated for the most part using tunnel boring machines (TBMs) and would be lined using precast concrete segments. These segments are proposed to be manufactured at the proposed segment factory to be located on the south-eastern side of Polo Flat (the site), which is an industrial area located to the east of Cooma.

The proposed segment factory would contain a building for the casting and curing of the segments, uncovered storage areas for raw materials and segments, vehicle parking areas and associated offices and workshops.

The main inputs for the segments include aggregate, sand, cement, water and rebar steel. Primary outputs comprise the segments which would be transported to the TBM launch sites for Exploratory Works and Main Works within KNP.

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people. Construction would take place six days a week (from Monday to Saturday) and for 10 hours per day.

The factory would operate over a period of about 3.5 years utilising a workforce of about 125 people. It would operate 24 hours a day, seven days a week.

The proposed segment factory would be constructed and operated by Future Generation Joint Venture (FGJV) which has been contracted by Snowy Hydro to construct Snowy 2.0.

At the completion of the construction of Snowy 2.0, the proposed segment factory would be decommissioned.

Further details of the proposed segment factory are provided in Chapter 2 of this report.

1.3 Location of the site

The site of the proposed segment factory is located on the south-eastern side of Polo Flat, predominantly on the southern part of the land owned by Snowy Hydro. The site is located to the east of Polo Flat Road and to the north of Carlaminda Road.

Figure 1.1 shows the location of the site in a regional context and industrial zone, whereas **Figure 1.2** shows the site in its local context.

The site contains the following land parcels:

– southern part of Lot 14 in Deposited Plan (DP) 250029 – also known as 9 Polo Flat Road, Polo Flat;

– Lot 3 in DP 238762 – also known as 33 Carlaminda Road, Polo Flat; and

– an unmade road corridor, directly south of the aforementioned lots.

Except for a few buildings located on the southern part of Lot 3 in DP 238762, the site is vacant and dominated by grassland. A third order watercourse flows in a north-westerly direction through the middle of the site.

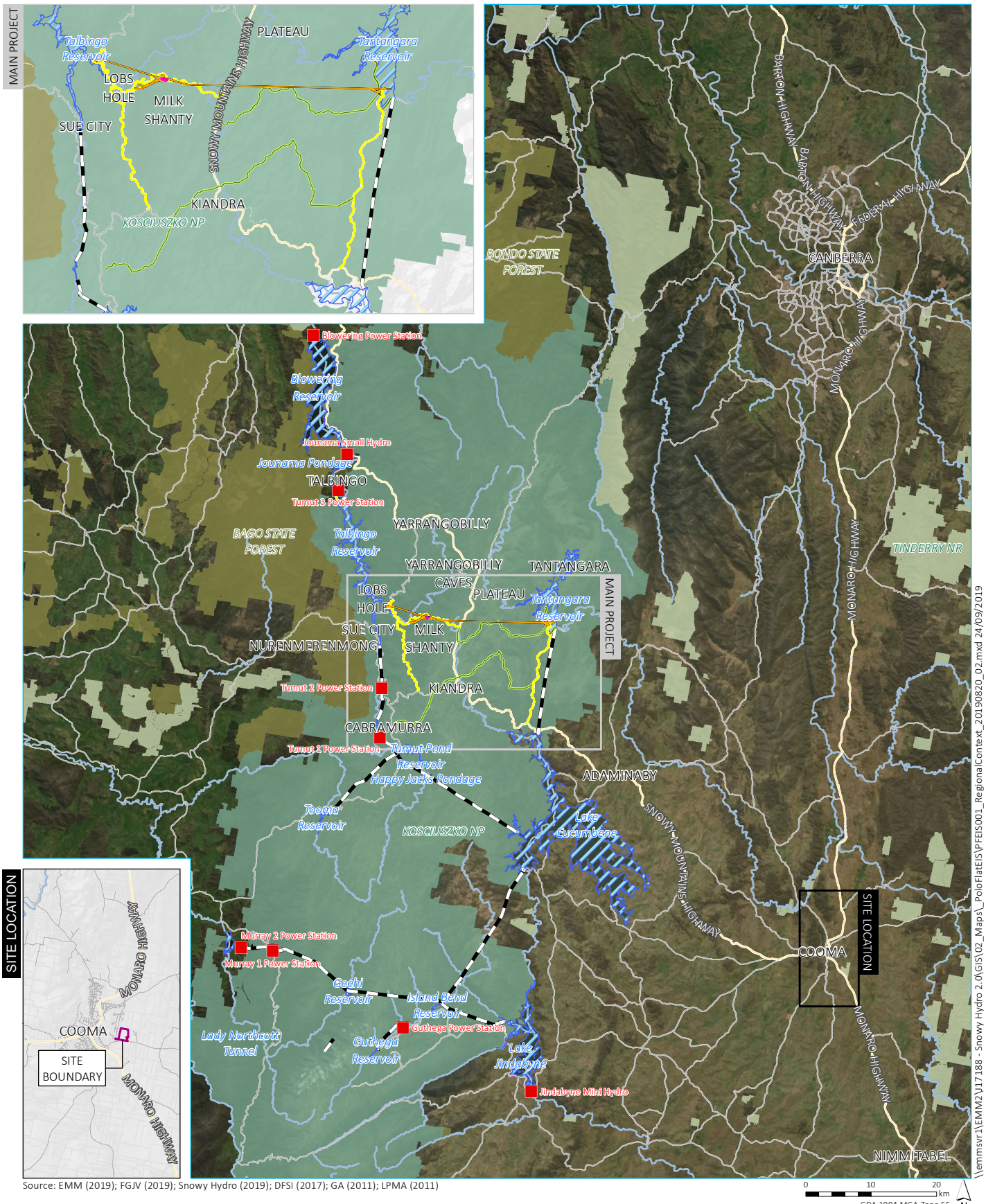
Lot 14 in DP 250029 is a large parcel of land which contains a private airfield predominantly located in the middle and northern part of the land. This airfield was originally established in 1921 and further developed in the late 1950s and 1960s to service the Snowy Scheme. It became the base for the Snowy Mountains Hydro-electric Authority's (the predecessor to Snowy Hydro) flying unit and aircraft. The land was sold by Snowy Hydro in 1998 where it continued to be used as a private airfield. Snowy Hydro purchased the land again in early 2019.

The site is surrounded by industrial development to the west and predominantly rural land to the south and east. To the north of the site is the remainder of Lot 14 in DP 250029 which contains the private airfield, and other industrial development. Snowy Hydro's private airfield contains a main north-south aligned runway, hangers and offices. It also contains an above ground fuel tank for the refuelling of planes and helicopters.

Lot 3 in DP 238762 contains a communications tower which was to cease use (ie transmission) in August 2019.

There is an isolated industrial operation located about 150 metres (m) to the south-east of the site, and an abattoir located about 350 m to the east.

The nearest residence is a rural residence located about 450 m to the south-south-east of the site. The nearest residences within Cooma are located about 1 km to the west of the site.



Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); GA (2011); LPMA (2011)

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KEY

Site boundary

Snowy 2.0 project elements
- Utilities
- Tunnels, portals, intakes
- Power station
- Permanent roads and surface infrastructure

Existing Snowy Scheme
- Existing power station
- Existing pipeline tunnel
- Scheme storage

- Main road
- Local road or track
- Watercourse
- Kosciuszko National Park
- NPWS reserve
- State forest

Location of the project area

Snowy 2.0
Traffic and Transport Assessment
Proposed Segment Factory
Figure 1.1

snowy 2.0

EMM creating opportunities

Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); GA (2011); LPMA (2011)

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KEY

- Site boundary
- Rail line
- Main road
- Local road or track
- Watercourse
- Cadastral boundary
- NPWS reserve

Location of site in local context

Snowy 2.0
Traffic and Transport Assessment
Proposed Segment Factory
Figure 1.2

snowy 2.0

EMM creating opportunities

1.4 Proponent

Snowy Hydro is the proponent for the proposed segment factory. Snowy Hydro is an integrated energy business – generating energy, providing price risk management products for wholesale customers and delivering energy to homes and businesses. Snowy Hydro is the fourth largest energy retailer in the NEM and is Australia's leading provider of peak, renewable energy.

As previously stated, the proposed segment factory would be constructed and operated by FGJV which has been contracted by Snowy Hydro to construct Snowy 2.0.

1.5 Purpose of this report

This Traffic and Transport Assessment supports the EIS for the proposed segment factory. It documents the methods used to determine potential traffic and transport impacts and sets out the initiatives built into the project design to avoid and minimise associated impacts to traffic and transport and the mitigation and management measures proposed to address any residual impacts not able to be avoided.

The specific objectives of this assessment are to:

– describe the existing traffic and transport environment including baseline performance of the network;

– describe the approach undertaken for the traffic assessment;

– describe the initiatives built into the project design to avoid and minimise associated traffic and transport impacts;

– describe the proposed construction and operational activities and the forecast performance of the network as a result of the proposed construction and operational activities;

– identify any mitigation and management measures proposed to address residual impacts not able to be avoided.

1.6 Assessment guidelines and requirements

This Traffic and Transport Assessment has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs), issued by the NSW Department of Planning, Infrastructure and Environment (DPIE) on 31 July 2019.

The SEARs must be addressed in the EIS. **Table 1.1** lists the matters relevant to this assessment and where they are addressed in this report.

Table 1.1 Relevant matters raised in SEARs

Requirement	Section addressed
An assessment of the impacts of the project on the capacity, condition, safety and efficiency of the local, National Park and State road network, including a road safety audit of the proposed haulage route.	Section 4 and Annexure C
A strategy to ensure vehicles transporting products from the site to the Kosciuszko National Park comply with strict vehicle hygiene protocols and minimise the risk of spreading weeds from the site.	See Biodiversity Development Assessment Report Section 7

2.0 Project description

2.1 Introduction

It is proposed to construct and operate a factory on a site at Polo Flat to supply precast concrete segments that would line the tunnels for Snowy 2.0.

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people. The operational phase would last about 3.5 years utilising a workforce of about 125 people.

The proposed segment factory would be decommissioned at the completion of operations.

2.2 Construction

2.2.1 Main activities

The main activities undertaken for the construction of the proposed segment factory comprise:

– demolition and removal of buildings and the decommissioned telecommunications tower located on southern part of site;

– clearing, removal of topsoil and vegetation (excavated topsoil would be stockpiled on site for later use if deemed suitable);

– earthworks to establish level surfaces;

– establishment of primary access road;

– installation of site services (power, water and communications);

– establishment of site surfaces (ie concrete, asphalt and cement soil); and

– construction of site facilities and buildings. including precast building, concrete batching plant (CBP), workshops, offices, parking areas, storage areas and associated facilities.

2.2.2 Earthworks

Excavation will be carried out at the site to provide level surfaces, establish access roads and create the required trenches for drainage.

Where possible excavated material would be reused onsite for filling and compaction (including benching areas of the site as required). Where there is a deficit of excavated material, additional material would be sourced from local quarries.

2.2.3 Traffic movements

Construction vehicle movements will comprise construction workers' light vehicles and heavy vehicles transporting equipment, building and construction materials, waste, and fill material if required.

2.2.4 Construction timeframe and hours

The construction phase of the segment factory would be about five months (estimated to commence in March 2020 subject to obtaining the required approvals). Construction would be undertaken from Monday to Saturday for 10 hours per day. Access to the site would generally start at 6 am for pre-starts and toolbox talks, and construction activities would commence at 7 am.

2.2.5 Workforce

A workforce of about 30 people would be required to construct the proposed segment factory.

2.3 Operations

2.3.1 General

The segments would be produced by casting concrete (made in the CBP) in reusable steel moulds which would then be cured in a chamber. Following curing, the segments would be temporarily stored onsite before being transported to the TBM launch sites within KNP.

The casting and curing would be undertaken in the precast building. Storage of the segments would predominantly be undertaken in uncovered storage areas.

Main inputs for the segments include aggregate, sand, cement, water and steel rebar.

Approximately 130,500 segments would be manufactured over the operational period.

2.3.2 Site layout

The layout of the proposed segment factory is shown in **Figure 2.1**. Details of the site layout are provided below.

2.3.2.1 General layout

The CBP and precast building (which contains a casting room and curing chamber) would be located at the southern end of the site. Open storage areas would be located predominantly to the north of the building on the northern part of the site.

Site offices and workshops would be located in the south-western corner of the site.

2.3.2.2 Ingress and egress

Vehicle ingress and egress to the site would be provided on a new access road which would connect to Polo Flat Road. The access road would be constructed on an existing informal service road located in the unmade road corridor immediately north of Carlaminda Road.

2.3.2.3 Raw materials storage

Cement silos and aggregate and sand storage areas for the CBP would be located adjacent to the CBP. Storage would be sized to hold approximately three days production.

Other raw materials include steel rebar and concrete admixtures which would be stored in, or adjacent to, the precast building.

2.3.2.4 Parking

Two large parking areas are proposed in the south-western corner of the site and to the north of the precast building. Parking in the south western area would be used for light vehicles, trucks and buses. Parking to the north of the precast building would be used for trucks.

2.3.2.5 Drainage

A diversion drain would be constructed around the eastern perimeter of the site to divert water from the third order watercourse. The drain diversion would be constructed to match the general width and depth of the existing watercourse.

A detention basin would be provided at the northern end of the site to collect surface flows. Overflows from the detention basin would be directed into the diversion drain.

Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); ESRI (2019); GA (2011); LPMA (2011)

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KEY

- Site boundary
- Indicative site layout
- Local road or track
- Cadastral boundary
- Precast yard, concrete plant, aggregates area, precast warehouse, segment storage
- Bus stop and parking
- Offices, guard house and first aid
- Mechanical and plant workshop with parking
- Trailer parking
- Storage area
- Emergency storage area
- Detention basin
- Drainage

Proposed layout

Snowy 2.0
Traffic and Transport Assessment
Proposed Segment Factory
Figure 2.1

snowy 2.0

EMM creating opportunities

2.3.3 Utility connections

The proposed segment factory would be connected to utility mains, including communications, electricity, water, wastewater and gas.

2.3.4 Segment inputs

As previously stated, main inputs for the precast concrete segments include aggregate, sand, cement, water and steel rebar. These main inputs would likely be sourced from locations in proximity to the site and/or from quarries near Canberra.

In addition to these main inputs, several accessories are also required to produce the segments, such as reinforcement cages, steel fibres, gaskets and inserts. These inputs would likely be sourced from Canberra.

2.3.5 Segment transport

Following casting, curing and storage, the segments would be transported to the TBM launch sites for the construction of the Exploratory Works and the Main Works within the KNP.

2.3.6 Traffic movements

Operational vehicle movements will comprise light vehicles (workers' vehicles and service vehicles) and heavy vehicles required for the transportation of the main inputs for the segments and for the transportation of the segments from the site to the TBM launch sites within KNP.

2.3.7 Staff and manpower

A workforce of about 125 people would be required to operate the proposed precast segment factory. As many local workers as possible would be sourced locally from within the Snowy Mountains Regional LGA and surrounding localities.

2.3.8 Hours of operation

It is proposed to operate the proposed segment factory 24 hours a day, seven days a week. It is estimated that the factory would operate for a period of about 3.5 years.

2.4 Decommissioning

As previously stated, at completion of the construction of Snowy 2.0, the proposed segment factory would be decommissioned, including removal of plant and equipment.

Snowy Hydro would retain the main structures such as the precast building, workshops and offices and seek to use these for an alternative industrial use. It is envisaged that Snowy Hydro would submit a separate application for approval for an alternative use of the site.

3.0 Existing traffic and transport environment

3.1 Study area

The study area, for the purposes of the Traffic and Transport Assessment, is defined by the roads that support the segment factory proposed for a site at Polo Flat and the roads that will be used to haul the precast concrete segments from point of manufacture at Polo Flat to the TBM launch sites for the Exploratory Works and Main Works within the KNP.

The location of the proposed segment factory and the local and regional road networks are shown in **Figure 1.1** and **Figure 1.2**.

The Polo Flat site is located within Cooma, the largest town within the Monaro region and the administrative centre for the Snowy Monaro Regional Council, with a population of 6,742 (ABS 2016). The town is served by Snowy Mountains and Monaro highways, that function as the main roads through the town centre with links to the wider road network.

Outside of Cooma, the study area contains many of the highest mountains in Australia, which during the snow season attracts an influx of visitors resulting in increased traffic volumes. Outside of the snow season, recreational visitors access the study area to visit the National Park facilities, but the traffic volumes generated during these periods are low and mostly limited to school holiday periods.

Snowy 2.0 is contained within the Snowy Monaro Regional local government area (LGA), with part of the study area extending into the Snowy Valleys LGA.

3.2 Existing transport context

3.2.1 Modes of travel

Approximately 6,686 (68%) and 4,341 people (73%) of the Snowy Monaro Regional and Snowy Valleys LGA populations travel to work by car as a driver or passenger (ABS 2016 Census data). This is higher than the NSW and Australia averages of 65% and 68% respectively. A very low percentage of the LGA populations (approximately 2% and 0.4%) travel to work by public transport, due in part to the limited availability of public transport options in the area.

3.2.2 Public transport

3.2.2.1 Southern NSW train services

There are no train services in the study area. The nearest train stations are at:

– Canberra with connections to Goulburn, the Southern Highlands and Sydney three times a day; and

– Wagga Wagga with connections to Melbourne and Sydney twice daily with interchange stops for coach services in Albury, Wagga Wagga, Griffith, Cootamundra, Canberra, Moss Vale and Bowral.

Both rail stations are over 140 km away from the study area via road.

3.2.2.2 Southern NSW coach services

A Southern NSW road coach service operates between Wagga Wagga train station interchange and Tumut on Monday, Wednesday and Friday, and from Cootamundra train station interchange to Tumut every Tuesday, Thursday and Sunday.

Coach services also operate daily between Canberra and Eden and between Canberra and Bombala every Monday, Wednesday and Friday. Both services stop at Cooma, in addition there are coach stops located within the town centres of Tumut and Cooma.

Selwyn Snow Resort has started a new coach service from Cooma to the resort that operates during the snow season. The coaches arrive at the resort between 6:00 and 6:30 am on a Friday, Saturday and Sunday, returning to Cooma in the evening.

There is also a bus service operated by Cooma Coaches which travels around Cooma on weekdays providing limited services during the morning and afternoon peaks. Other private coach/bus services include school buses that service local schools across the study area.

3.2.2.3 Council supported bus services

Community transport is also provided by Snowy Monaro Regional and Snowy Valleys councils for those on the Commonwealth Home Support Program that includes people with disabilities or who are disadvantaged because of isolation and lack of transport. These services require booking transport in advance, but provide access between Cooma, Berridale and Bombala to and from Canberra and Bega for medical and social appointments, and to other regional towns for shopping on a fortnightly and monthly basis.

3.2.3 Walking and cycling

The study area contains significant hiking and mountain biking trails throughout the KNP. The locations, uses and potential project impacts on these facilities are detailed at Appendix X.2 that assesses the potential impacts of the Main Works on KNP's recreational resources. Many of these trails lead to camp sites within the KNP that are not accessible by motor vehicle.

The local councils have also provided off-road walking and cycling trails. These include shared trails (for walking and mountain bikes) as the Snowy Mountains' region is fast becoming a popular mountain biking destination. Some trails are open during the weekend and some are open during mountain biking season (over the summer months).

Facilities within Cooma include:

– a cycleway beside Cooma Creek from Church Road to the Rotary Oval end of Murray Street to the Nijong Ovals (north of Cooma township) and from Barrack Street over the footbridge and beside Vulcan Street to Lambie Street; and

– a cycle route along Smith Street and Mittagang Road that starts from Massie Street (to the north of Cooma township) as an on-road cycle route and between Bowi Street and the northern end of Yallakool Road as an off-road cycleway (RMS' Cycle Finder website).

3.2.4 Road network

The Snowy Mountains and Monaro highways will be the main transport routes impacted by project generated traffic during both the construction and operational phases of the Snowy 2.0 project. The connecting local road network such as Polo Flat Road, Tantangara Road, Link Road and Lobs Hole Ravine Road which will be used to access individual worksites, were also assessed to determine the capacity of individual local roads to accommodate current baseline traffic and future project generated traffic.

Monaro Highway starts in Canberra crossing the ACT border into NSW to terminate at the intersection of Sharp Street/Bombala Street in Cooma. The Snowy Mountains Highway is a 333 km long state highway which connects the Princes Highway north of Bega, via Bemboka to the Monaro Highway south of Nimmitabel, then from the Monaro Highway at Cooma via Adaminaby, Kiandra, Tumut and Adelong to the Hume Highway near Hillas Creek.

3.2.4.1 Polo Flat Road

Polo Flat Road is a 4 km long fully sealed road, connecting Monaro Highway to the north and to the south. It runs through the middle of the Polo Flat industrial area. The road width varies from 6.0 to 8.6 m with speed limit capped at 80 km/h within the industrial area. The centre line of the road is marked.

There is a non-operational railway level crossing approximately 645 m south of Monaro Highway to the north. The railway level crossing is controlled by give way signs. The railway is usually operated by a local historic railway group, however it is not running trains at present due to the need to upgrade railway infrastructure.

There is a railway bridge on Polo Flat Road near its intersection with Baron Street, with low clearance of 4.1 m. Polo Flat Road is an approved 25/26 m B-Double route.

3.2.4.2 Saleyards Road

Saleyards Road is a 209 m long fully sealed road, connecting Monaro Highway to the south and Polo Flat Road to the north. It is a two-lane two-way local road with a road width varying from 10 to 13 m. It provides a bypass route from Monaro Highway to Polo Flat Road for heavy vehicles more than 4.1 m in height.

Saleyards Road is an approved 25/26 m B-Double route.

3.2.4.3 Yareen Road

Yareen Road is a 1.6 km long fully sealed local road, connecting Monaro Highway to the west and Polo Flat Road to the east. There are residential dwellings on both sides of the road. The road width varies from 7.3 to 8.8 m with a speed limit of 60 km/h. The centre line is marked.

The road is impacted by a non-operational railway level crossing approximately 93 m west of Monaro Highway which is controlled by flashing lights and stop signs. This forms part of the by the same railway as described at Section 3.2.4.1.

Yareen Road is an approved 19 m B-Double route with travel conditions: no travel is permitted between 7:00 am to 9:00 am and 3:00 pm to 5:00 pm on school days.

3.2.4.4 Monaro Highway

The Monaro Highway is a 285 km long north-south highway connecting Canberra and Cooma where it joins the Snowy Mountains Highway at the intersection of Sharp Street/Bombala Street in Cooma. It continues further south, crossing the Victoria border and eventually joining the Princes Highway, near the Cann River. The Monaro Highway is the major access for most traffic to and from Canberra.

Within the study area, Monaro Highway is a two-lane two-way highway with road width varying from 7.4 to 10.3 m. The speed limit is generally between 80 km/h and 100 km/h in the rural area, reducing to 60 km/h on the approaches to Cooma. When entering school zones, speed limit reduces to 40 km/h between 8:00 and 9:30 am and between 2:30 and 4:00 pm.

Within the study area, Monaro Highway is generally an approved 25/26 m B-Double route apart from a section of road between Murray Street and Snowy Mountains Highway which is not permitted to carry B-Double vehicles.

Monaro Highway intersects with Polo Flat Road at its northern end as a priority-controlled intersection, providing access for majority of traffic to the industrial area.

3.2.4.5 Snowy Mountains Highway

The Snowy Mountains Highway is a 333 km long state highway which connects from the Princes Highway north of Bega, via Bemboka to the Monaro Highway south of Nimmitabel, then from the Monaro Highway at Cooma via Adaminaby, Kiandra, Tumut and Adelong to the Hume Highway near Hillas Creek.

Within the township of Cooma, there is a higher concentration of residential developments, and as such, the road environment is representative of an urban local road network, with a lower speed environment ranging between 50-60km/hr with roundabouts controlling the major intersections. The physical traits of the road reserve also differ with Cooma, with widened road reserves catering for on-street parking, kerb and guttering, footpaths and street lighting installed at short intervals.

The Snowy Mountains Highway from Cooma to Adaminaby is outside the KNP area and is approximately 50 km long. It runs west from Cooma, then north-west after the intersection with Kosciuszko Road 6 km west of Cooma. It is a two-lane two-way highway with a road width varying from 6.6 to 7.2 m. The speed limit is generally 100 km/h, but it is reduced to 80 km/h when approaching Adaminaby.

Within the KNP area, the Snowy Mountains Highway has a two-lane two-way sealed carriageway, generally varying between 6 to 8 m wide. The speed limit generally is 100 km/h on the rural sections, 60 km/h when approaching the townships of Cooma and Tumut, and 80 km/h when approaching Adaminaby.

During the winter snow season, traffic volumes along Snowy Mountains Highway increases with visitors destined for the snow fields within KNP. With Cooma serving as the main rest stop for visitors during the snow season, drivers can experience congestion along the main road of Sharp Street (an extension of Snowy Mountains Highway and Monaro Highway), especially with the increased turnovers of the on-street parking adjacent to the roundabout controlled intersections.

The road is an approved B-Double route for 25/26 m long B-Double vehicles to Talbingo from the north and to Adaminaby from the south and is approved throughout its length within the KNP for 19 m long vehicles.

3.2.4.6 Tantangara Road

Tantangara Road is a local road running in a north-south direction from the Snowy Mountains Highway to Tantangara Reservoir. It is a two-lane two-way road with a speed limit of 100 km/h generally as there is no speed limit posted. Some bends have lower advisory speed limit warning signs. It is an unsealed road with a general trafficable width of at least 6 m on most sections. Some sections of the road surface have frequent corrugations and loose gravel. Large potholes which retain water are also present on many sections. All intersections are of a basic T-junction and lack additional turning lanes and other traffic capacity or safety improvements. Tantangara Road is currently not an approved B-Double route.

3.2.4.7 Link Road

Link Road is a two-way rural road varying from 5.3 to 6.6 m wide between Elliott Way to the west and Snowy Mountains Highway to the east. This road provides connection between the Snowy Mountains Highway and Cabramurra (Snowy Hydro's town), which is accessible via the Link Road and Goat Ridge Road. It also provides access to the Selwyn Snow Resort during the winter season, which is accessible via Snowy Mountains Highway, the Link Road and Kings Cross Road. The road is approximately 15 km long and is fully sealed. Link Road is an undulating road with numerous bends with lower advisory speed limit signs on approaches. The signposted speed limit is 80 km/h, except in the vicinity of the NPWS ticket booth which is normally 60km/hr, but 40km/hr in snow season.

All intersections on Link Road are basic T-intersections, except for its intersection with Snowy Mountains Highway where an auxiliary right turn (AUR) and auxiliary left turn (AUL) is provided on the major road to allow left and right turning movements to access Link Road. Link Road is not an approved B-Double route.

3.2.4.8 Lobs Hole Ravine Road

The northern section is 23km long, single lane and gravel. The southern section of Lobs Hole Ravine Road is approximately 14 km of narrow, single lane, unsealed road linking between Link Road to the future project worksite within the Lobs Hole-Ravine Reserve. The road has narrow sections along cliff edges and the road width varies from 3.0 to 4.6 m.

The existing road alignment will be substantially widened to dual lane in each direction and reconstructed for use by the project construction traffic. All internal intersections are proposed to be of a basic T-junction. Lobs Hole Ravine Road is not an approved B-Double route.

3.2.5 Key intersections

3.2.5.1 Monaro Highway/Polo Flat Road (north end)

The current configuration of the Monaro Highway/Polo Flat Road (north end) intersection is a basic T-junction with a rural auxiliary left-turn treatment (AUL) on the major road to allow left turning movements for cars and trucks to access the minor road.

Figure 3.1 Intersection of Monaro Highway/Polo Flat Road (north end), facing west

Source: EMM Consulting

3.2.5.2 Monaro Highway/Saleyards Road (south of Polo Flat Road)

The current configuration of the Monaro Highway/Saleyards Road intersection is a basic T-junction with a rural basic BAR/BAL treatment (ie parallel widened shoulder) to allow turning movements for cars and trucks.

Figure 3.2 Intersection of Monaro Highway/Saleyards Road, facing south east

Source: EMM Consulting

3.2.5.3 Monaro Highway/Yallakool Road

The current configuration of Monaro Highway/Yallakool Road intersection is a basic T-junction. This intersection is located within 100 m of the Polo Flat Road intersection along Monaro Highway.

Figure 3.3 Intersection of Monaro Highway/Yallakool Road, facing north

Source: Google map

3.2.5.4 Sharp Street/Bombala Street

The current configuration of Sharp Street/Bombala Street intersection is a single lane roundabout with 13 m diameter island. All approaches to the intersection are two-lane two-way roads including Snowy Mountains Highway and Monaro Highway that runs in an east-west direction as a B-Double route. The intersection is located in the Cooma township with large number of angled on-street parking provided on all approaches to service the local centre.

Figure 3.4 Intersection of Sharp Street/Bombala Street, facing north

Source: Google map

3.2.5.5 Sharp Street/Vale Street

The current configuration of the Sharp Street/Vale Street intersection is a single lane roundabout with 13 m diameter island. All approaches to the intersection are two-lane two-way roads including Snowy Mountains Highway that runs in an east-west direction as a B-Double route. The intersection is located in the Cooma township with large number of angled on-street parking provided on Vale Street and Sharp Street to service the local centre.

Figure 3.5 Intersection of Sharp Street/Vale Street, facing north

Source: Google map

3.2.5.6 Snowy Mountains Highway/Kosciuszko Road

The current configuration of the Snowy Mountains Highway/ Kosciuszko Road intersection is a T-junction with both rural auxiliary left-turn (AUL) and right-turn (AUR) treatments provided along the major road to allow left and right turning movements for cars and trucks to access the minor arm of Snowy Mountains Highway.

Figure 3.6 Intersection of Snowy Mountains Highway/Kosciuszko Road, facing south

Source: Google map

3.2.5.7 Snowy Mountains Highway/Tantangara Road

The current configuration of the Snowy Mountains Highway/Tantangara Road intersection is a basic T-junction. Tantangara Road has widened road shoulders to allow for turning vehicles. In addition, there is wide sealed shoulder on the inside radius of the Snowy Mountains Highway.

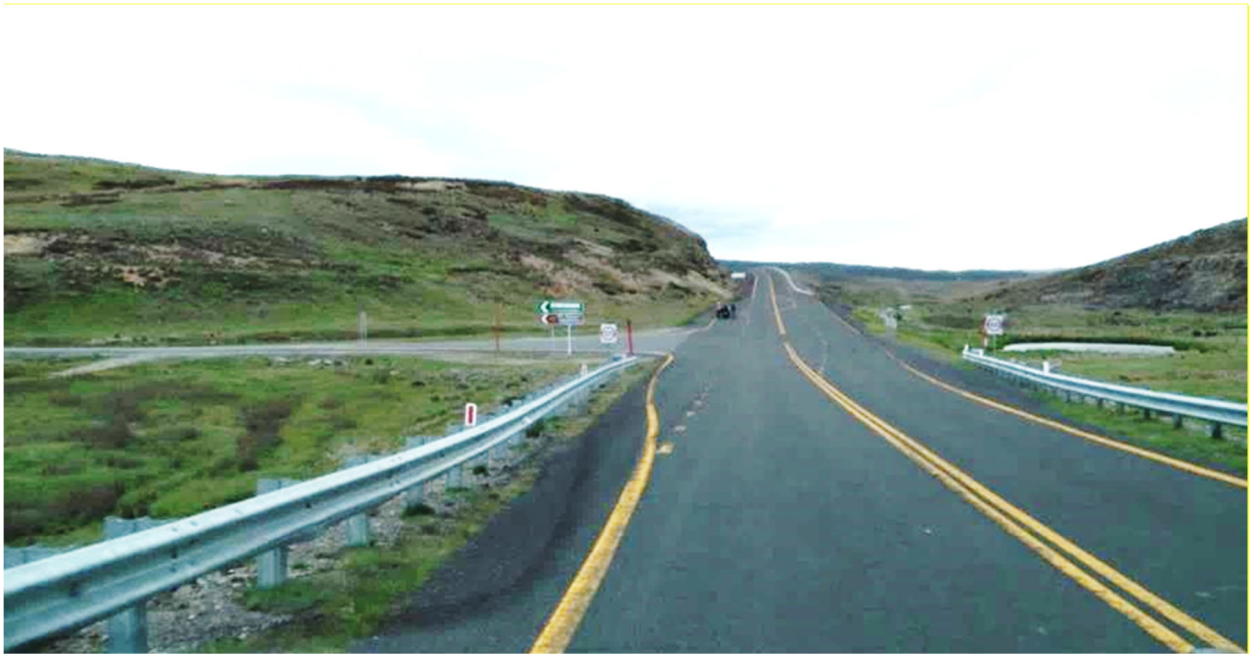
Figure 3.7 Intersection of Snowy Mountains Highway/Tantangara Road, facing west

Source: EMM Consulting

3.2.5.8 Snowy Mountains Highway/Link Road

The current configuration of the Snowy Mountains Highway/Link Road intersection is a T-junction with an auxiliary left-turn (AUL) and a channelised right-turn (CHR) on the major road of Snowy Mountains Highway to allow left and right turning movements to access Link Road.

Figure 3.8 Intersection of Snowy Mountains Highway/Link Road, facing north



Source: EMM Consulting

3.2.5.9 Link Road/Lobs Hole Ravine Road

The current configuration of Link Road/Lobs Hole Ravine Road intersection is a T-junction. The minor road has an unsealed surface up to the edge of the though traffic lane on the major road.

Figure 3.9 Intersection of Link Road/Lobs Hole Ravine Road, facing west

Source: EMM Consulting

3.3 Existing traffic volumes

3.3.1 Overview

Existing RMS daily traffic counts (AADT) have been supplemented with more recent intersection and tube counts undertaken specifically for this project.

Tube counts were undertaken at 16 locations during investigations for the Exploratory Works EIS and at ten further locations (each for one week) for the Main Works EIS (as shown at **Annexure A**). These one-week tube counts are taken to be representative of typical 24-hour volumes for each of the defined roads.

Intersection counts were undertaken (also shown at **Annexure A**) at thirteen locations for the Main Works EIS which cover the morning and afternoon peaks providing information on peak hourly intersection turning movements and heavy vehicle traffic proportions.

Intersection counts for some locations were also undertaken on weekdays and weekends in June, July and August 2019 during the start of the snow season as well as winter school holidays.

It should be noted that:

– traffic counts have been undertaken both outside the winter school holiday periods as well as during winter school holiday periods to capture seasonal peaks associated with winter holiday recreational traffic in the KNP resort area (i.e. Mount Selwyn);

– intersection traffic counts were taken during the week and for limited duration (generally one day); and

– tube counts were undertaken for much longer periods (up to four months in the KNP area).

3.3.2 Daily traffic volumes

Historic daily traffic volumes for the main project access routes have been determined from published RMS daily traffic surveys for the years where the data is available (which is generally between 2010 and 2018) and are summarised in **Table 3.1**. To establish base 2018 daily traffic volumes if RMS statistics are not available, it is

standard practice in most rural areas of NSW to add +1% annual (linear) traffic growth to the most recent annual survey.

Table 3.1 Historic daily traffic volumes

Station ID	Road	2010	2011	2015	2017	2018	Average % of heavy vehicle
08158	Snowy Mountains Highway (400 m east of Adaminaby)	797	798	776	-	799[1]	-
08080	Snowy Mountains Highway (100 m east of Pine Valley)	3,454	3,637	-	4,065	3,976	-
6113	Monaro Highway (400 m east of Cooma)	-	-	5,140	5,367	5,525	12%[2]
08082	Monaro Highway (1.54 km north of Bunyan)	4,301	4,344	4,370	4,685	4,773	-
6114	Monaro Highway (1.94 km south of Bredbo)	-	-	4,778	5,180	5,148	12%[2]

Note: 1. +1% annual (linear) traffic growth has been adopted, which gives a growth factor x 1.01 from the 2017 volumes; x 1.03 from the 2015 volumes; x 1.07 from the 2011 volumes; and x 1.08 from the 2010 volumes.
2. Average proportion of heavy vehicles on the Snowy Mountains Highway are assumed based on 2010 and 2011 statistics; results on the Monaro Highway are assumed based on 2015, 2017 and 2018 statistics.

Source: RMS Traffic Volume Viewer (RMS 2018)

Baseline daily (two-way) traffic volumes for the main project access routes have also been determined from tube counts undertaken in 2018 and 2019 and are summarised in **Table 3.2**.

Table 3.2 Baseline daily total traffic volumes

Road	Location	Non-winter period[1]			Winter holiday period[2]		
		Light vehicles	Heavy vehicles	% Heavy vehicles	Light vehicles	Heavy vehicles	% Heavy vehicles
Polo Flat Road	Polo Flat North	1,036	806	44%	Not available		
Polo Flat Road	Polo Flat South	1,102	1,067	49%	Not available		
Monaro Highway	East of Polo Flat	4,198	683	14%	10,553 (Friday of Queen's Birthday Weekend 2019)		
Monaro Highway	South of Cooma	1,524	971	39%	Not available		
Monaro Highway	Cooma (west of Polo Flat Road)	4,888	1,509	24%	Not available		
Snowy Mountains Highway	SMEC Offices	4,261	586	12%	Not available		
Snowy Mountains Highway	West of Cooma	3,499	477	12%	9,311 (Sunday of Queen's Birthday Weekend 2019)		
Snowy Mountains Highway	North of Yarrangobilly Caves intersection	385	70	15%	Not available		
Link Road	Between Kings Cross Road and Snowy Mountains Highway	316	44	12%	1,382 (Sunday of Queen's Birthday Weekend 2019)		
Link Road	Between Kings Cross Road and Lobs Hole Ravine Road	206	22	10%	Not available		

Note: 1. Non-winter holiday period data were collected in March/April of 2019.
2. Winter holiday period data were collected in June/July/August of 2019.

Source: EMM Consulting

3.3.3 Seasonal traffic variation

The main roads through the Cooma area including the Snowy Mountains Highway and Kosciuszko Road routes towards the Adaminaby/Kiandra and Jindabyne/Thredbo areas, have significantly higher daily and peak hourly traffic volumes during the winter peak snow season periods, especially on weekends and during public holiday or school holiday periods, in particular when there are heavy snowfalls and good skiing conditions.

There were heavy snowfalls and good skiing conditions in all the NSW snow resorts during the June 2019 Queen's Birthday long weekend, from Friday to Monday and the daily traffic volumes on all the key approach routes to four intersections in the Cooma and Kiandra areas were recorded by 24-hour camera intersection traffic surveys at the following locations:

– intersection of Monaro Highway/Polo Flat Road (north end) – east of Cooma;

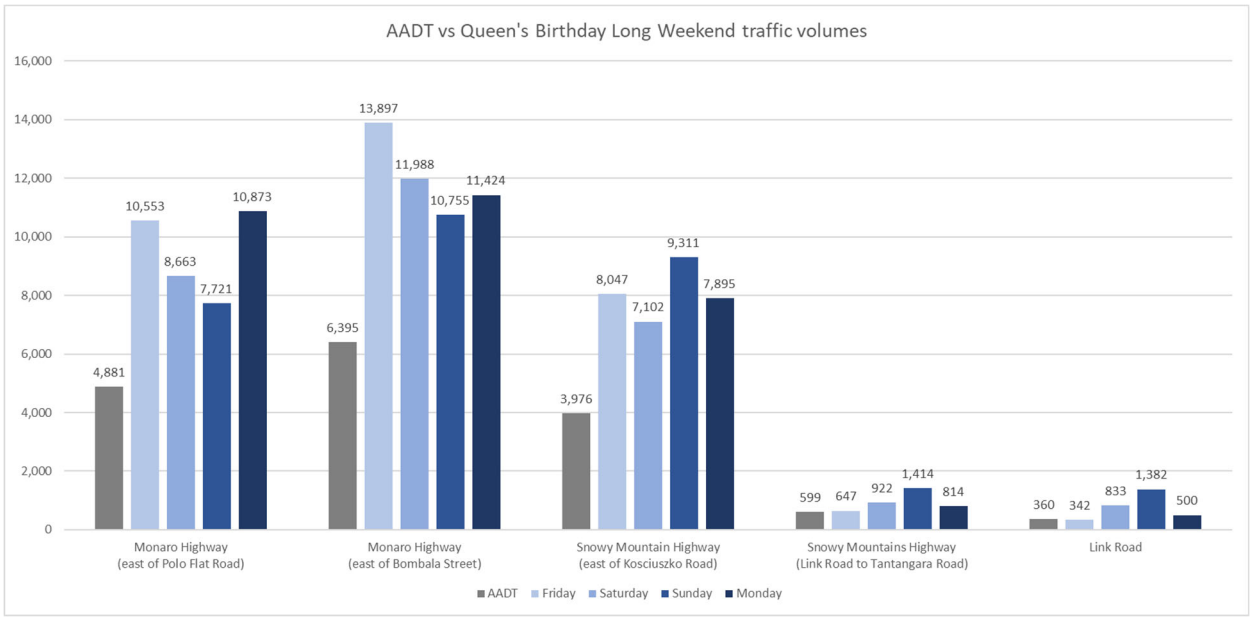
– intersection of Sharp Street/Bombala Street – centre of Cooma;

– intersection of Snowy Mountains Highway/Kosciuszko Road – west of Cooma; and

– intersection of Snowy Mountains Highway/Link Road – at Kiandra.

From these intersection camera surveys, the 24-hour daily traffic volumes were determined for the key approach routes and these winter peak daily traffic volumes were compared with the average year baseline daily traffic volumes for the relevant road in **Figure 3.10**.

Figure 3.10 AADT vs Queen's Birthday long weekend traffic volumes



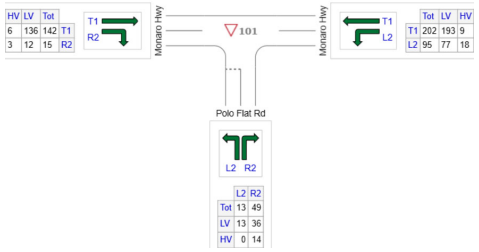
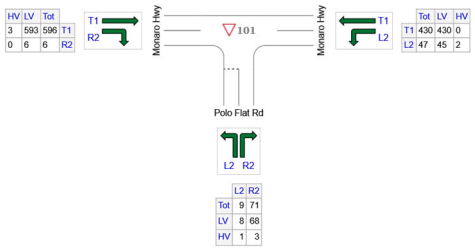
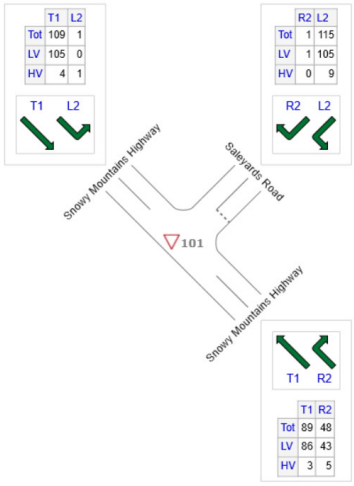
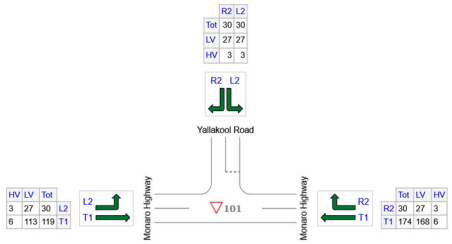
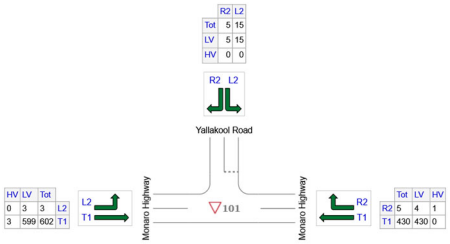
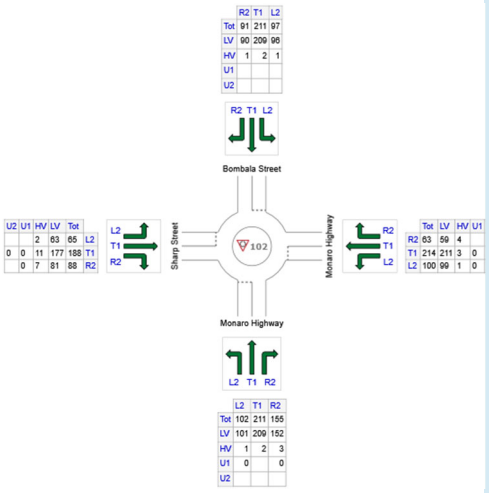
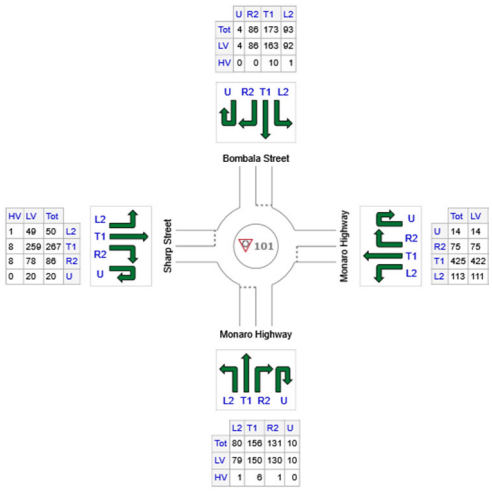
Source: EMM Consulting, June 2019

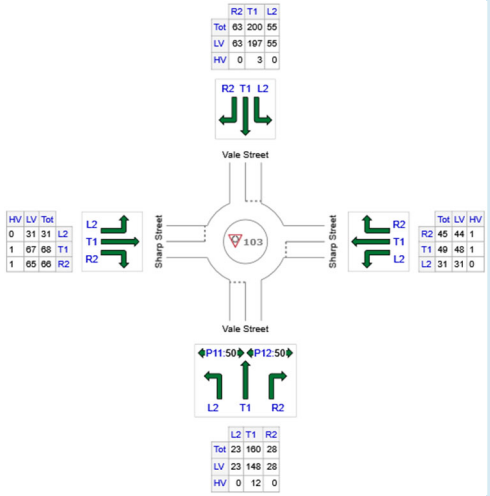
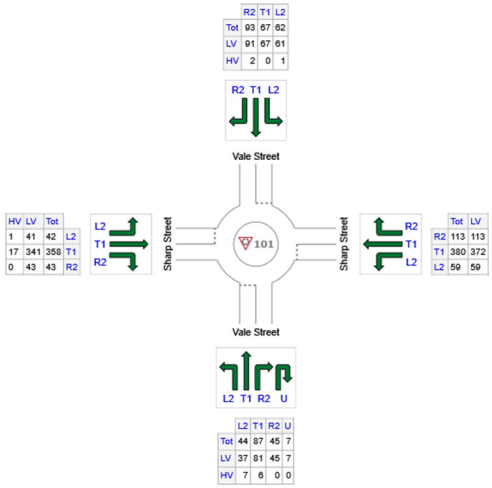
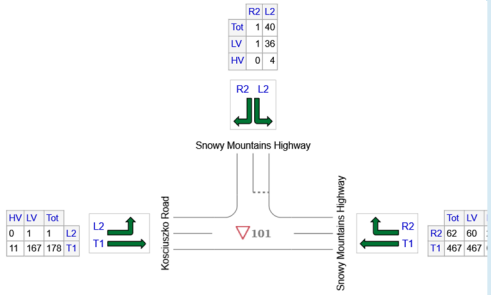
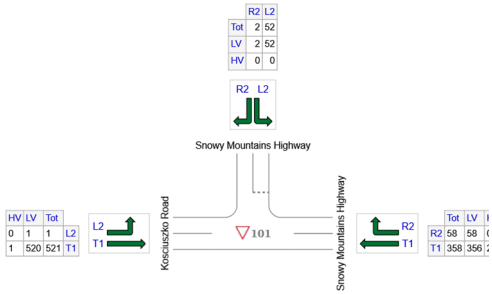
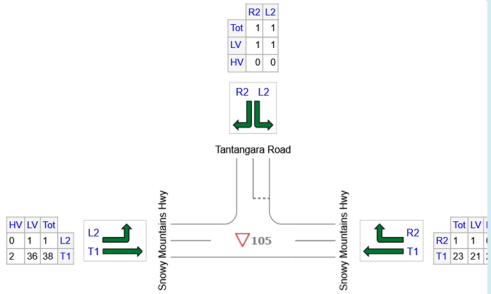
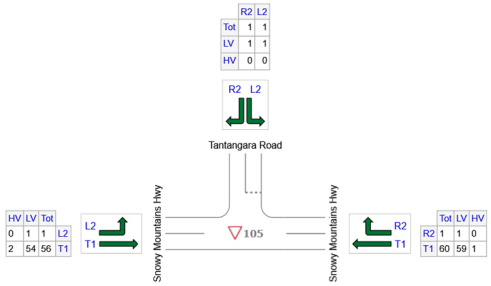
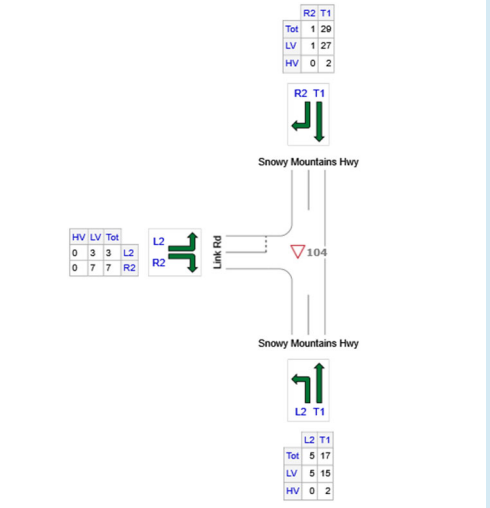
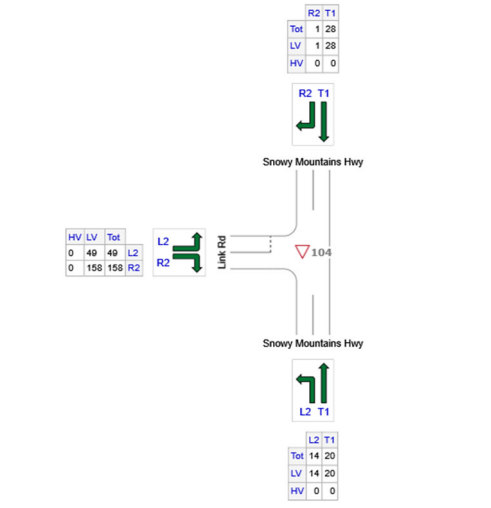
The main roads within Cooma and the major corridors of Snowy Mountains Highway and Kosciuszko Road towards Adaminaby/Kiandra and Jindabyne/Thredbo, experience significantly increased daily and peak hourly traffic volumes during the winter peak snow season periods, as well as on weekends, public holiday and school holiday periods.

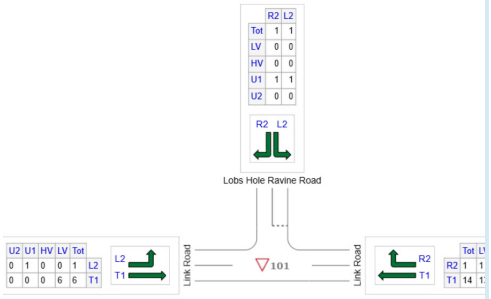
3.3.4 Intersection traffic volumes

Weekday peak hour traffic volumes during non-winter period as well as weekend peak hour traffic volumes during winter holiday period for a number of critical intersections along the main project access routes have been determined from intersection traffic counts undertaken in 2019 and are summarised in **Table 3.3**. It is noted that the peak hour of the weekday during the non-winter periods (namely weekday PM peak) as well as the peak hour during the winter peak (typically Friday PM peak) were selected to assess the worst hourly conditions for the intersections.

Table 3.3 Weekday peak hour intersection traffic volumes

Intersection	Non-winter period[1]	Winter holiday period[2]
Monaro Highway/Polo Flat Road (north end)		
Monaro Highway/Saleyards Road (south of Polo Flat Road)		Not available
Monaro Highway/Yallakool Road		
Sharp Street/Bombala Street		

Intersection	Non-winter period[1]	Winter holiday period[2]
Sharp Street/Vale Street		
Snowy Mountains Highway/Kosciuszko Road		
Snowy Mountains Highway/Tantangara Road		
Snowy Mountains Highway/Link Road		

Intersection	Non-winter period[1]	Winter holiday period[2]
Link Road/Lobs Hole Ravine Road		Not available

Note: T1=through movement, L2=left turn movement, R2=right turn movement, LV=light vehicles, HV=heavy vehicles
1. Non-winter holiday period data were collected in March/April of 2019.
2. Winter holiday period data were collected in June/July/August of 2019.

Source: SCT Consulting

3.4 Network assessment criteria

The three key traffic assessments undertaken for the purpose of this study are crash data review, road conditions and safety implications and intersection capacity assessment, which are summarised in **Table 3.4**.

Table 3.4 Assessment and criteria

Assessment	Criteria
Crash Review	Crash data analysis (Section 3.5)
Road Conditions/Safety Assessment	Safe intersection sight distance (Section 3.6 and 4.4) Road width (Section 3.6 and 4.4)
Intersection Capacity Assessment – Critical Intersections	Austroads intersection warrants (Section 3.7 and 4.5) Level of Service (Section 3.7 and 4.5) Degree of Saturation (Section 3.7 and 4.5)

Based on these parameters, the performance of the existing road network can be established to quantify and benchmark any potential impacts caused as a result of traffic generated by the project.

3.4.1 Safe Intersection Sight Distance

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections identifies that a Safe Intersection Sight Distance (SISD) should be provided along a major road at any intersection, this is to ensure that vehicle entering the road has sufficient sight distances of oncoming vehicles. As such, SISD is dependent on the travel speed of oncoming vehicles on the main road, road alignment and types of vehicles.

Austroads provides the following formula to determine the SISD:

$$SISD = \frac{D_T \times V}{3.6} + \frac{V^2}{254 \times (d + 0.01 \times a)}$$

Whereby,

SISD = Safe Intersection Sight Distance

D_T = decision time (sec) = observation time (3 sec) + reaction time (sec)

V = operating (85th percentile) speed (km/h)

d = coefficient of deceleration

a = longitudinal grade in %

3.4.2 Intersection Level of Service

Operational performance is typically measured through an assessment of the throughput of vehicles across a traffic network, with average delay per vehicle used to assess the performance of an individual intersection. The average delay per vehicle measure is linked to a Level of Service (LoS) index which characterises the intersection's operational performance. **Table 3.5** provides a summary of the LoS performance bands of intersections.

Table 3.5 Level of Service definition

Level of Service	Average Delay (seconds per vehicle)	Roundabout	Give Way/Stop Signs
A	Less than 14.5	Good operation	Good operation
B	14.5 to 28.4	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28.5 to 42.4	Satisfactory	Satisfactory, but accident study required
D	42.5 to 56.4	Operating near capacity	Near capacity and accident study required
E	56.5 to 70.4	At capacity. Roundabouts require other control method	At capacity, requires other control method
F	>70.5		

Source: Roads and Maritime Guide to Traffic Generating Developments (2002)

Degree of saturation (DoS) is used as a measure of the capacity of the intersection. This is determined by the ratio of the volume of vehicles that can pass through the intersection against the capacity provided by the green time, if applicable, and number of available traffic lanes. i.e. vehicle/capacity = DoS.

3.4.3 Austroads intersection warrants

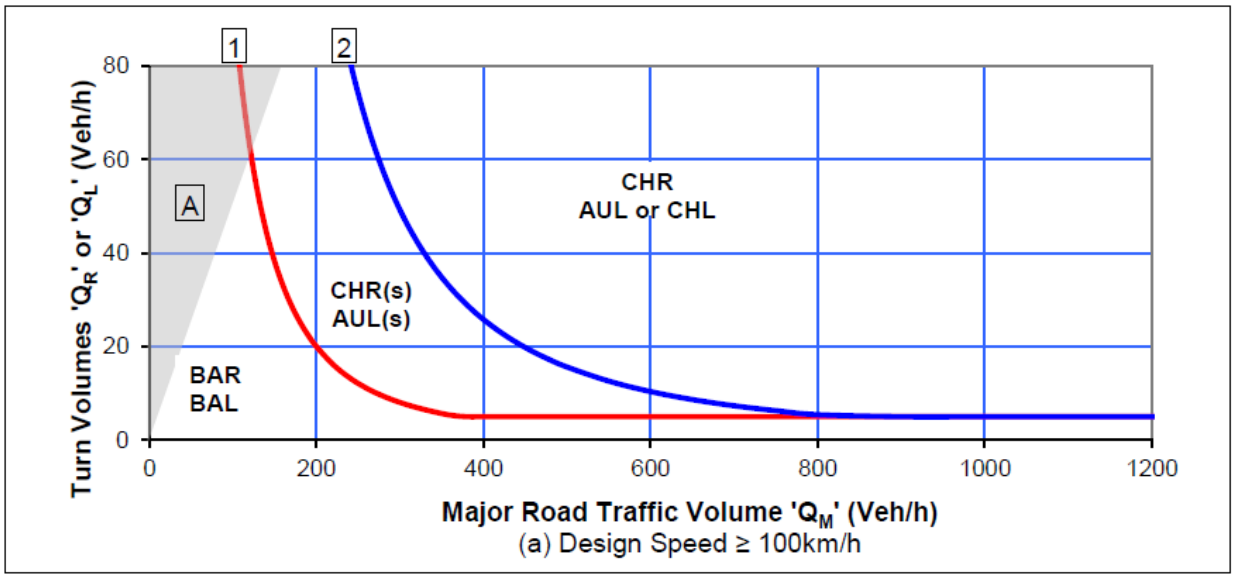
Rural intersection operations are assessed from the combination of the peak hourly through and turning traffic movements that are occurring at each intersection. This determines the need for additional intersection turning lanes in accordance with the current Austroads (2017) Part 4 intersection design standards and the Austroads (2017) warrant design charts shown in **Figure 3.11**.

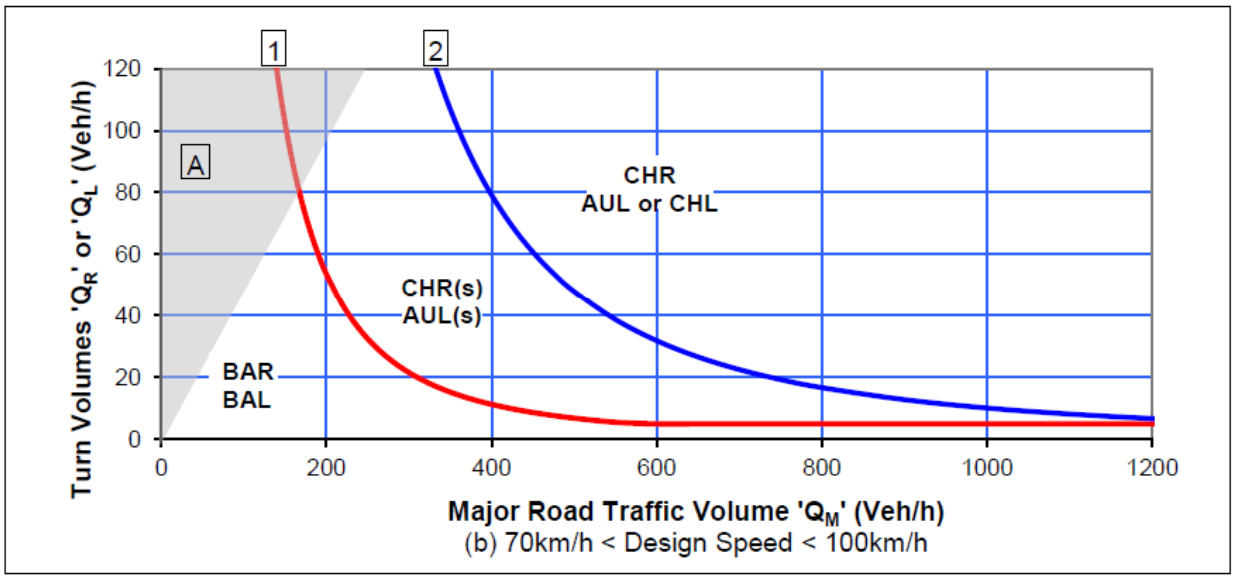
There are separate design charts for roads with design speeds either 100 km/h and greater, or lower than 100 km/h. For design speeds 100 km/h or greater, additional left or right turn traffic lanes are only required where the major road peak hourly traffic volume exceeds 120 vehicles per hour and the minor road traffic also exceeds the level shown in the top warrant chart in **Figure 3.11**.

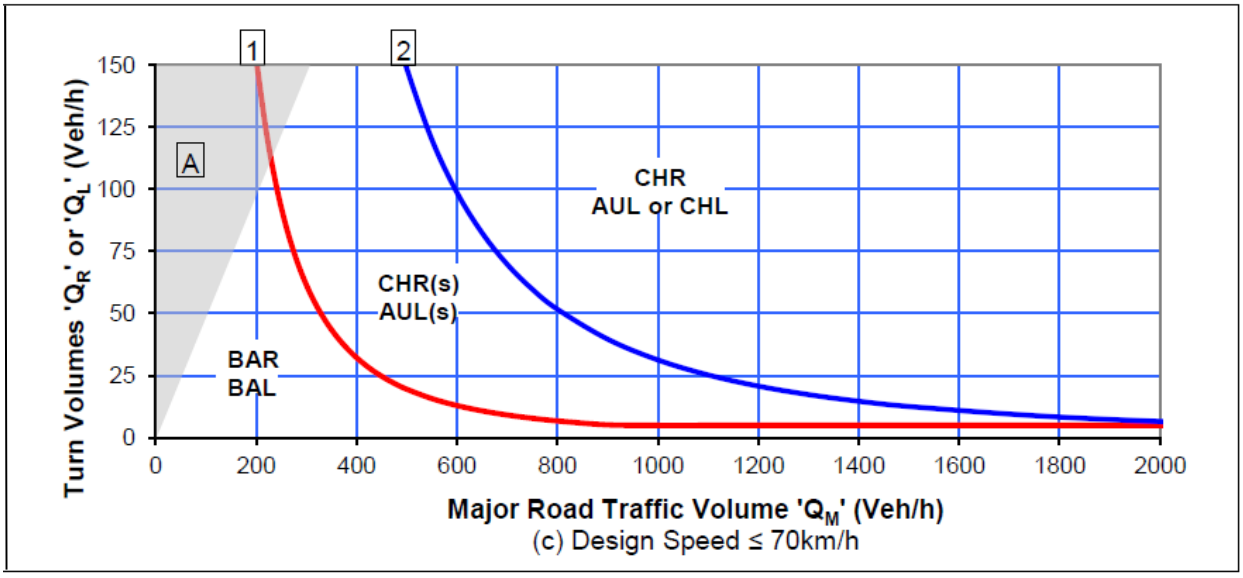
For design speed lower than 100 km/h, additional left or right turn traffic lanes are only required where the major road peak hourly traffic volume exceeds 170 vehicles per hour and the minor road traffic also exceeds the level shown in the lower warrant chart in **Figure 3.11**.

Junctions on major roads are classified as either as Basic Treatments (BA), which are basic road connections without any additional capacity to cater for turning movements, Auxiliary Treatments (AU), whereby short auxiliary lanes are provided to improve safety or channelised treatments, whereby conflicted movements are separated by raised or painted medians and/or islands. Based on these classifications, the guideline offers the warrants for intersection improvements based on the traffic volumes.

Figure 3.11 AUSTROADS warrants for turn treatments on major roads at unsignalised intersections







Source AUSTROADS Guide to Traffic Management Part 6 – Intersections, Interchanges and Crossings, Figure 2.25

3.5 Crash review

The general traffic safety conditions of Snowy Mountains Highway, Monaro Highway and Cooma have been reviewed for the most recent five-year accident history (years 2013 to 2017 inclusive) using the Transport for NSW (TfNSW) interactive accident history database (TfNSW 2018). Only reported accidents are recorded within the TfNSW interactive accident history database. The categorised accident history is provided in **Table 3.6** and illustrated in **Annexure B**.

Most reported accidents occur at off-road left and right bends on the Snowy Mountains Highway. There are also several accidents caused by struck animals on the highway. Rear-end collisions and cross traffic accidents become more frequent in Cooma. Accidents reported during daytime are slightly more than those at night.

Table 3.6 Summary of accident history on the Snowy Mountains Highway and Cooma township from 2013 to 2017

Location	Degree of crash	Total number of crashes	Total injury crashes
Polo Flat Road	Minor	2	4
	Moderate	2	
	Serious	0	
	Fatal	0	
Saleyards Road	Minor/Moderate/Serious/Fatal	0	0
Sharp Street East of Bombala Street to Monaro Highway at Polo Flat Road (north)	Minor	2	10
	Moderate	6	
	Serious	2	
	Fatal	0	
Monaro Highway South of Polo Flat Road (south)	Minor	1	4
	Moderate	3	
	Serious	0	
	Fatal	0	
Sharp Street West of Bombala Street to Snowy Mountains Highway at Chapman Street	Minor	1	7
	Moderate	3	
	Serious	2	
	Fatal	1	
Township of Cooma	Minor	9	55
	Moderate	32	
	Serious	13	
	Fatal	1	
Snowy Mountains Highway from Cooma to Adaminaby	Minor	4	16
	Moderate	6	
	Serious	5	
	Fatal	1	
Snowy Mountains Highway from Adaminaby to Snowy Monaro LGA boundary	Minor	8	30
	Moderate	14	
	Serious	7	
	Fatal	1	
Snowy Mountains Highway from Snowy Monaro LGA boundary to Talbingo	Minor	2	10
	Moderate	4	
	Serious	4	
	Fatal	0	

Source: TfNSW Centre for Road Safety – Interactive crash statistics – LGA view

The number of reported crashes on the local roads and other minor roads connected to the Snowy Mountains Highway is too low to present statistically significant data. The total numbers of reported accidents on these roads from 2013 to 2017 are summarised in **Table 3.7**.

Table 3.7 Total number of crashes on local roads from 2013 to 2017

Location	Number of reported crashes
Tantangara Road	0
Link Road	1
Lobs Hole Ravine Road	0

Source: TfNSW Centre for Road Safety – Interactive crash statistics – LGA view

3.6 Road conditions/safety assessment

A detailed safety review (a road safety audit) has been undertaken by Safe Systems Solutions for the proposed haulage route that is to be used for the transport of precast concrete segments that will be manufactured at the Polo Flat site and used to line the various tunnels that make up Snowy 2.0 Main Works. The haulage route commences at the point of vehicular access/egress at the segment factory at Polo Flat and ends at the perimeter of the Snowy 2.0 Main Works construction site within KNP at Link Road, taking in sections of Monaro Highway, Sharp Street and Snowy Mountains Highway. The key findings of the road safety audit (safety items identified with medium or higher level of risks only) are summarised in **Table 3.8**.

The full road safety audit is included in **Annexure C**.

Table 3.8 Summary of issues identified from road safety audit

Item #	Location	Key audit findings	Risk assessment		
			Frequency	Severity	Level of risk
a ii	Polo Flat Rd – Rail bridge	Along Polo Flats Road, near the Baron Street intersection, there is an existing timber rail bridge. There is a low clearance for the bridge structure of 4.1 m. Also, the timber piers are unprotected. A heavy vehicle (HV) colliding with either the top of the rail bridge or one of the timber piers could potentially collapse the structure. It is assumed that this is a non - active rail bridge.	Improbable	Serious	Medium
b ii	Sharp Street (Cooma Town Centre) - Pedestrians	The strip shopping centre environment increases the likelihood of pedestrian jay-walking. A crash involving a pedestrian and fully-laden Heavy Vehicle has the potential to result in serious/fatal outcomes – even in a low speed environment.	Improbable	Serious	Medium
b iii	Sharp Street (Cooma Town Centre) - Cooma Creek Bridge	The Cooma Creek Bridge has non-standard features including: a. The vertical face of the concrete barrier. This is a rigid, fixed object. Should an errant vehicle collide with this vertical edge, there would be rapid deceleration increasing the impact force on the occupants. b. The concrete barrier tapers from kerb height (approx. 100 mm) to approx. 500 mm. Should a vehicle leaving Cooma mount the barrier on the bridge, then travel along the concrete barrier system (one side of the vehicle on the barrier and the other on the road pavement) this could potentially lead to a roll - over crash. The existing bridge containment appears to be pedestrian parapet and would be unlikely to contain an errant HV. A HV that loses control at this site, could drive through the containment system and fall into the creek below.	Improbable	Serious	Medium
c i	Intersection of Snowy Mountains Hwy/Kosciuszko Rd	Southbound, the Snowy Mountain Highway continues straight onto Kosciusko Road. To continue on the Snowy Mountains Highway, a vehicle needs to turn right using the Channelised Right Turn facility. This right turn has restricted sight lines due to the crest of the road. This restricted sight line increases the likelihood of HVs not seeing an oncoming vehicle and therefore the likelihood of cross-traffic type crashes. In addition, the Channelised Right Turn facility appears to have a short deceleration lane with inadequate space for additional storage. As HV will be turning right here as part of the haul route, inadequate deceleration lanes and lack of storage could lead to rear - end type crashes.	Improbable	Serious	Medium
c ii	Intersection of Snowy Mountains Hwy/Tantangara Rd	At the Tantangara Road intersection, the sight lines are restricted due to the horizontal and vertical geometry along Snowy Mountains Highway. This may mean a HV exiting the minor road may not be able to see a vehicle travelling on Snowy Mountains Highway and the vehicle would need to brake to let the HV in or manoeuvre around the HV. This could lead to a collision with the HV or with oncoming traffic. Also, a HV turning right into Tantangara Road needs to hold up the through-traffic lane. This increases the risk of a rear-end crash.	Improbable	Serious	Medium
e i	Link Road	There is an absence of linemarking on Link Road – due to the reduced carriageway width. Linemarking plays a key role in delineating a road environment, particularly highlighting where the edge of the road ends and where opposing traffic lanes are separated. Lack of delineation increases the risk of run off road crashes and head on crashes.	Improbable	Serious	Medium

Item #	Location	Key audit findings	Risk assessment		
			Frequency	Severity	Level of risk
f i	General – steep drop offs	Along the haul route there are a several examples where steep drop-offs are unshielded. An errant vehicle travelling at these locations may leave the carriageway and descend down steep batters and potentially rolling over or colliding with fixed hazards (trees)	Improbable	Serious	Medium
f ii	General – road geometry	Along the haul route, substandard horizontal and vertical geometry exists. While there are several examples of “Curve Warning” with advisory speed signs along the route, there is further improvement potential along the route where these warning signs could be implemented. The winding nature of this route means there is horizontal and vertical geometry that restricts sights lines. Warning signs inform drivers of the upcoming restricted sight line environment and enables them to adjust their driving to suit conditions. Without these signs, there is an increased potential for run off road crashes to occur.	Improbable	Serious	Medium
f iii	General – road pavement	With the introduction of more HVs, the condition of the road pavement would be expected to deteriorate more rapidly. Roads in poor condition can lead to potholes, reduced grip and traction and an increased risk for vehicle loss of stability. The road pavement condition impacts on the likelihood of a crash occurring.	Improbable	Serious	Medium
f iv	General – barrier systems	There are a variety of containment systems implemented along the haul route. It is unclear from the site inspection whether the containment systems are graded to be able contain Heavy Vehicles in the highspeed environment. If the containment system fails, an errant HV could break through the barrier and be exposed to significant roadside hazards (large drop offs, bodies of water, fixed objects etc.).	Improbable	Serious	Medium
f v	General – overtaking opportunities	There is an approximately 75 km length along Snowy Mountains Highway where there are no dedicated overtaking lanes. This significant length increases the likelihood of vehicles overtaking by using the oncoming traffic lane. Overtaking in this manner increases the likelihood of head-on collisions.	Improbable	Serious	Medium
f vi	General – wildlife	During the site inspection, high levels of dead wildlife was observed lying on the shoulders/adjacent the live carriageway. Colliding with animals in high speed environments can lead to further collisions with run - off road crash types typically occurring. If an animal is left on the live carriageway, HVs may run over the animal causing instability or choose to swerve to avoid the animal potentially leading to head-on crashes.	Improbable	Serious	Medium

Source: Safe Systems Solutions, September 2019

3.6.1 Safe intersection sight distance review

A safe intersection sight distance review was undertaken for the key intersections listed in **Table 3.9** in accordance with the Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.

Table 3.9 Summary of issues identified from SISD review

Intersections	SISD review (requirements)	SISD issues
Monaro Highway/Polo Flat Road (north end)	This intersection satisfies the required sight distances for vehicles exiting from Polo Flat Road.	N/A
Monaro Highway/Saleyards Road	This intersection satisfies the required sight distances for vehicles exiting from Saleyards Road.	N/A
Monaro Highway/Yallakool Road	This intersection would satisfy the required sight distances for vehicles exiting from Polo Flat Road.	N/A
Snowy Mountains Highway/Kosciuszko Road	Although this intersection does not satisfy the required sight distance. There are auxiliary lanes provided on the departures of the left and right-tuning vehicles exiting onto Snowy Mountains Highway and Kosciuszko Road from the minor arm.	N/A
Snowy Mountains Highway/Tantangara Road	Minimum sight distance of heavy vehicles with 100 km/hr design speed on a flat grade is 290 m.	Sight distance of eastbound and westbound traffic along Snowy Mountains Highway from Tantangara Road is approximately 80 m and 170 m, respectively Reducing the speed limit to 60km/h may be explored to improve driver awareness of the increased traffic movements adjacent to this intersection.
Snowy Mountains Highway/Link Road	Minimum sight distance of heavy vehicles with 100 km/hr design speed with 5% downhill grade is over 300 m.	Sight distance of southbound traffic along Snowy Mountains Highway from Link Road is only approximately 190 m. Reducing the speed limit on Snowy Mountains Highway to 80 km/hr requires 180 m sight distance. Existing curves would limit drivers to this speed.
Link Road/Lobs Hole Ravine Road	The existing sight distance of westbound traffic along Link Road is deemed to satisfy the requirements for minimum distances.	Reducing the speed limit on Link Road may be explored to improve driver awareness of the increased traffic movements adjacent to this intersection.

Source: SCT Consulting

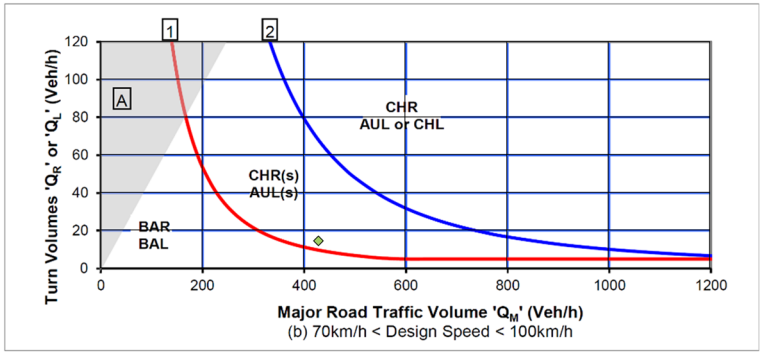
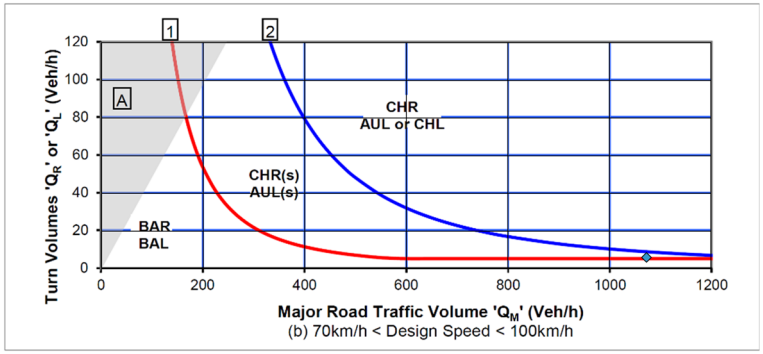
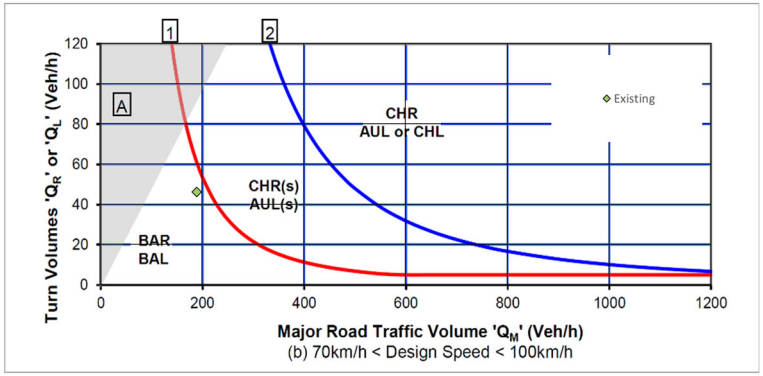
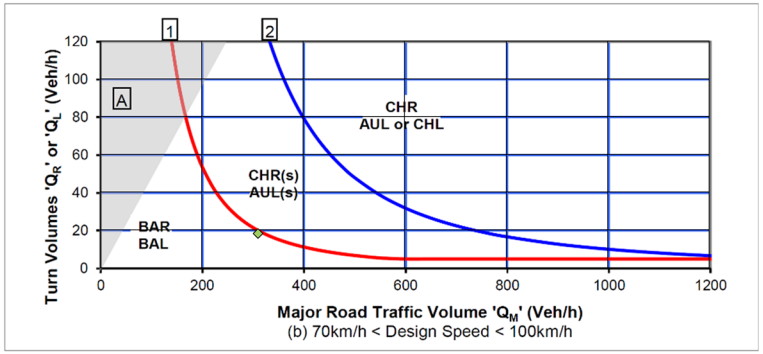
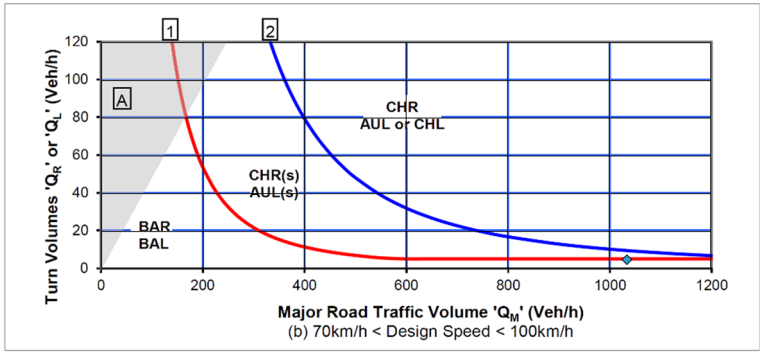
3.7 Existing intersection capacity assessment

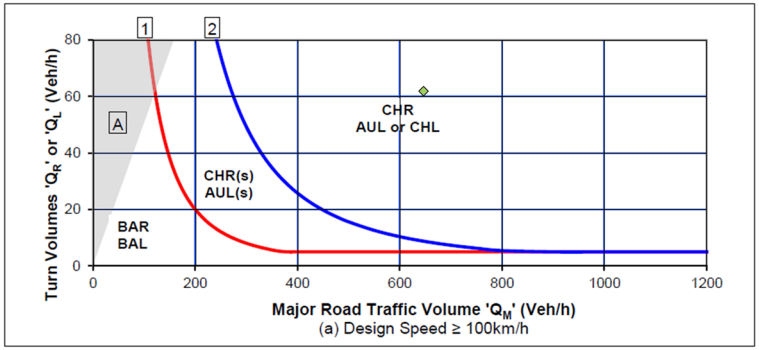
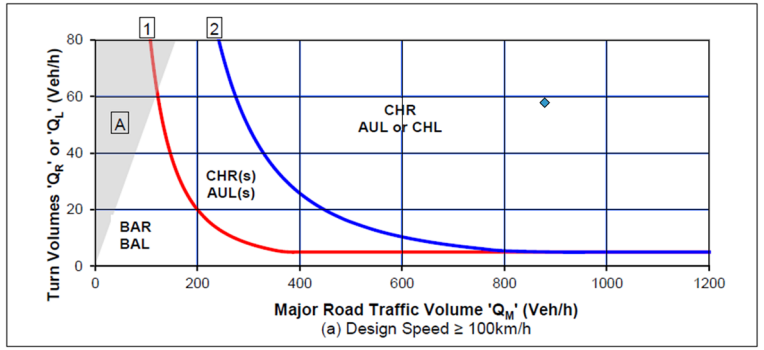
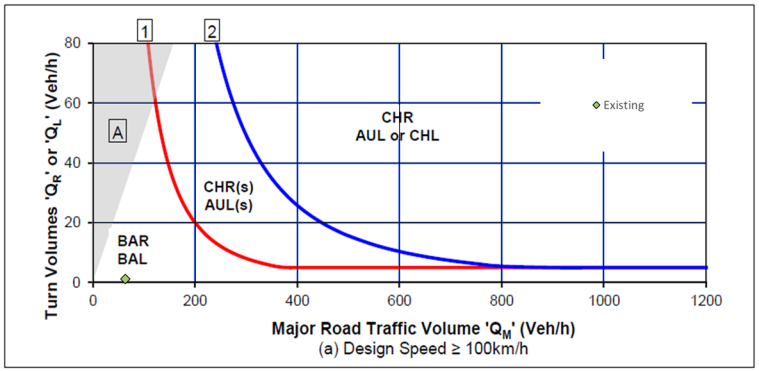
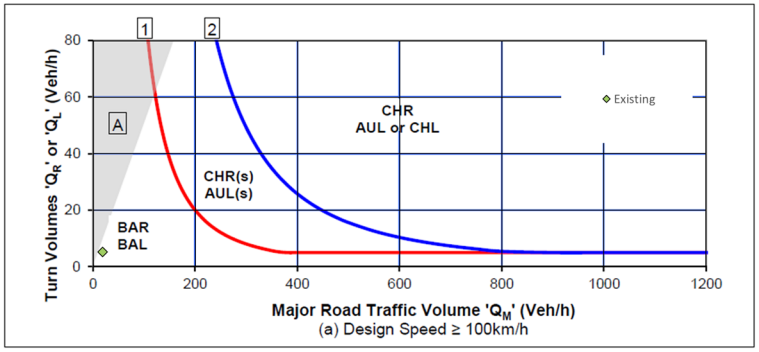
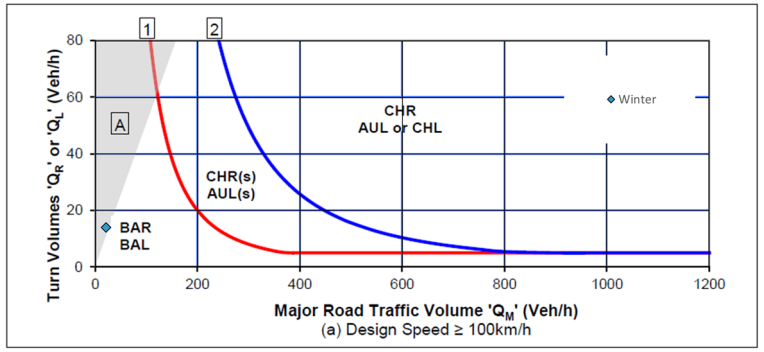
3.7.1 Austroads intersection warrants

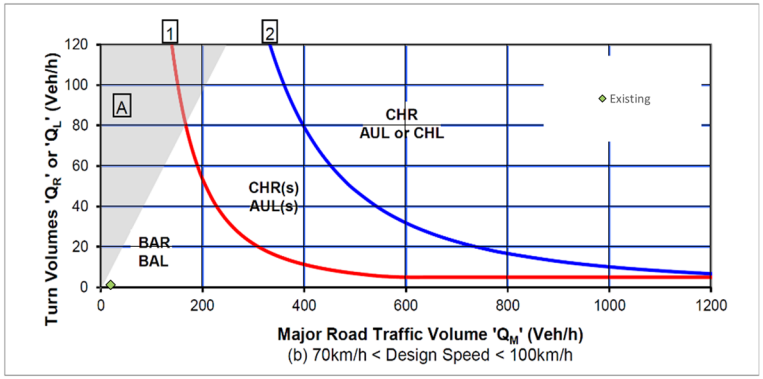
Intersection warrants review according to Austroads (2017) Part 4 intersection design standards and the Austroads (2017) warrant design charts was undertaken for critical priority intersections within the study area under existing traffic conditions, as summarised in

Table 3.10. Existing turning traffic volumes on the major road at each intersection are represented by the green diamond for non-winter traffic volumes and blue diamond for winter peak traffic volumes.

Table 3.10 Critical intersection warrants

Intersection	Non-winter period[1]	Winter holiday period[2]
Monaro Highway/Polo Flat Road (north end)		
Monaro Highway/ Saleyards Road		N/A
Monaro Highway/ Yallakool Road		

Intersection	Non-winter period[1]	Winter holiday period[2]
Snowy Mountains Highway/ Kosciuszko Road		
Snowy Mountains Highway/ Tantangara Road		N/A
Snowy Mountains Highway/Link Road		

Intersection	Non-winter period[1]	Winter holiday period[2]
Link Road/Lobs Hole Ravine Road		N/A

Note: 1. Non-winter holiday period data were collected in March/April of 2019.
2. Winter holiday period data were collected in June/July/August of 2019.

Source: SCT Consulting

Based on the Austroads warrants for turn treatments on major roads at unsignalised intersections under existing traffic conditions, two of the intersections are currently over capacity and should require channelised right turning lane or auxiliary left turning lanes:

– Monaro Highway/Polo Flat Road (north end); and
– Monaro Highway/Yallakool Road.

3.7.2 SIDRA intersection modelling

Intersection capacity assessment using SIDRA has been undertaken for critical intersections across the study area.

Critical intersections that have been assessed in Cooma and Polo Flat:

– Monaro Highway/Polo Flat Road (north end);
– Monaro Highway/Saleyards Road;
– Monaro Highway/Yallakool Road;
– Sharp Street/Bombala Street;
– Sharp Street/Vale Street.

Critical intersections that have been assessed in KNP and surrounds:

– Snowy Mountains Highway/Kosciuszko Road;
– Snowy Mountains Highway/Tantangara Road;
– Snowy Mountains Highway/Link Road; and
– Link Road/Lobs Hole Ravine Road.

3.7.2.1 Calibration and validation

Default SIDRA model parameters, namely 'Gap Acceptance' and 'Follow-up headway' factors, were adjusted, as per *Roads and Maritime Traffic Modelling Guidelines 2003*, in order to match the SIDRA outputs with the queue lengths surveyed during the winter peak hours for the critical intersections. These factors were then retained for the assessment of the construction traffic scenarios during the non-winter peak period. This approach was agreed with Roads and Maritime.

For all the intersections within the KNP, vehicles turning into and out of the side streets were able to manoeuvre with minimal delays, mainly due to the low volume of traffic that is typically present within the national park. Even during the peak snow periods, the intersection of Link Road and Snowy Mountains Highway was observed to operate with minimal delays, with most vehicles approaching Snowy Mountains Highway from Link Road able to enter the highway without halting to a stationary stop at the intersection. There was however one instance a motorist remained stationary at the intersection for a short period, even though there were no oncoming vehicles on Snowy Mountains Highway, which resulted in three vehicles queueing behind the stationery vehicle. However, this queue soon dissipated with minimal delay.

Queuing at the intersection of Snowy Mountains Highway and Kosciuszko Road were observed to be minimal, with most vehicles utilising the auxiliary exit lane when turning left onto Snowy Mountains Highway.

Intersections within Cooma town centre, namely Sharp Street/Bombala Street and Sharp Street/Vale Street displayed steady queuing along Sharp Street during the winter peak period, which were mainly due to the delays caused by on-street parking manoeuvres along both the approach and exit lanes of the intersections. During instances where there were no parking manoeuvres, there were minimal queues observed along Sharp Street approaches of the intersections.

Video surveys of the closely spaced intersections of Yallakool Road and Polo Flat Road showed three manoeuvres during the peak hour whereby vehicles would exit onto Monaro Highway from either Yallakool Road or Polo Flat Road to enter either of the minor roads. Although it was observed that these vehicles did not experience any extensive delays, the potential for extensive delays if these manoeuvres are increased was noticed.

3.7.2.2 Queue calibration

To ensure the models are representative of the existing queues during the winter peak seasons, the 95th percentile queue output from SIDRA were compared against the surveyed maximum queue for the corresponding peak hours as shown in **Table 3.11**.

Table 3.11 Baseline intersection queueing calibration

Intersection	Approach	Surveyed	SIDRA	Difference
Monaro Highway/Polo Flat Road (north)	West	1	0.1	- 0.9
	South	3	4.3	+ 1.3
	East	0	0	0
	North	-	-	-
Monaro Highway/Yallakool Road	West	0	0	0
	South	-	-	-
	East	1	0.1	- 0.9
	North	1	0.2	- 0.8
Sharp Street/Bombala Street	West	11	10.9	- 0.1
	South	12	11.3	- 0.7
	East	20	18.7	- 1.3
	North	7	6.9	- 0.1
Sharp Street/Vale Street	West	9	7.2	- 1.8
	South	5	4.1	- 0.9
	East	11	8.7	- 1.3
	North	6	5.1	- 0.9
Snowy Mountains Highway/Kosciuszko Road	West	0	0	0
	South	-	-	-
	East	1	0.3	- 0.7
	North	1	0.0	- 1.0
Snowy Mountains Highway/Link Road	West	3	1.1	- 1.9
	South	0	0	0
	East	-	-	-
	North	0	0	0

Source: SCT Consulting

For the remainder of the intersections not listed in **Table 3.11**, there were no persistent queues observed at the sites with most vehicles able to undertake their manoeuvres little to no delays.

3.7.2.3 Critical intersection performance

SIDRA modelling was undertaken using the calibrated parameters and the peak hour intersection performance for winter and non-winter periods are summarised in **Table 3.12**.

Table 3.12 Baseline intersection performance summary

Intersection	Non-winter period[1]			Winter holiday period[2]		
	Delays (s)[3]	Degree of Saturation	Level of Service	Delays (s)[3]	Degree of Saturation	Level of Service
Monaro Highway/Polo Flat Road (north end)	13.2	0.167	A	95.1	0.862	F
Monaro Highway/Saleyards Road	4.1	0.114	A	-	-	-

Intersection	Non-winter period[1]			Winter holiday period[2]		
	Delays (s)[3]	Degree of Saturation	Level of Service	Delays (s)[3]	Degree of Saturation	Level of Service
Monaro Highway/Yallakool Road	8.2	0.111	A	21.6	0.328	B
Sharp Street/Bombala Street	17.9	0.653	B	33.4	0.882	C
Sharp Street/Vale Street	13.4	0.607	A	24.0	0.728	B
Snowy Mountains Highway/Kosciuszko Road	14.9	0.254	B	19.9	0.282	B
Snowy Mountains Highway/Tantangara Road	7.8	0.022	A	-	-	-
Snowy Mountains Highway/Link Road	7.8	0.017	A	7.8	0.237	A
Link Road/Lobs Hole Ravine Road	6.8	0.008	A	-	-	-

Note: 1. Non-winter holiday period data were collected in March/April of 2019.
2. Winter holiday period data were collected in June/July/August of 2019.
3. Delays of the worst movement reported.

Source: SCT Consulting

Table 3.12 shows that during the weekday peak hours, the intersections operate at Level of Service B or better with spare capacity, as evidenced by the Degree of Saturation.

All the intersections perform with lesser spare capacity, with increased traffic flows during the winter holiday peak hour, but still operate at LoS C or better.

However, the intersection of Monaro Highway and Polo Flat Road is operating at Level of Service F, during the winter peak periods under existing conditions. Despite operating at Level of Service C during the winter peak periods under existing conditions, the intersection of Sharp Street/Bombala Street in Cooma is also considered as failing by RMS as the degree of saturation exceeds 0.85.

4.0 Potential impacts of project traffic

4.1 Overview of project activities

The main activities that would be undertaken for the construction of the proposed segment factory are:

– demolition and removal of buildings and decommissioned telecommunications tower on southern part of site;

– clearing, removal of topsoil and vegetation (topsoil excavated would be stockpiled on site for later use);

– undertaking earthworks to establish level surfaces;

– establishment of primary access road;

– installation of site services (power, water and communications);

– establishment of site surfaces (ie concrete, asphalt and cement soil); and

– construction of site facilities and buildings. including precast building, CBP, workshops, offices, parking areas, storage areas and associated facilities.

The construction phase of the proposed segment factory would last about 5 months utilising a workforce of about 30 people.

Once operational, approximately 14,500 precast reinforced concrete tunnel rings (containing approximately 130,500 segments) would be manufactured over the operational period and transported to the construction sites within KNP.

The proposed segment factory would operate over a period of about 3.5 years utilising a workforce of about 125 people. Most of this workforce would be sourced locally from Cooma and surrounding localities.

4.2 Assessment scenarios

Four scenarios have been considered to understand the likely impacts of the project on the surrounding road network:

1. 2022 Baseline (No Project) under non-winter peak conditions;
2. 2022 Baseline (No Project) under winter peak conditions;
3. 2022 with proposed segment factory works (With Project) under non-winter peak conditions; and
4. 2022 with proposed segment factory works (With Project) under winter peak conditions (for 4 intersections only).

A worst-case traffic and transport scenario was developed in consultation with Roads and Maritime Services (RMS) for the purpose of determining potential traffic and transport impacts for the segment factory and Main Works EISs. The worst-case scenario comprised:

– the ‘With Project’ scenario;

– during the construction stage of Main Works (as the amount of additional traffic to be generated during the operational stage would be less than the levels of traffic generated during the construction stage of the Main Works);

– assessing the cumulative impact of both the segment factory and the Main Works; and

– using the busiest year for the project – 2022.

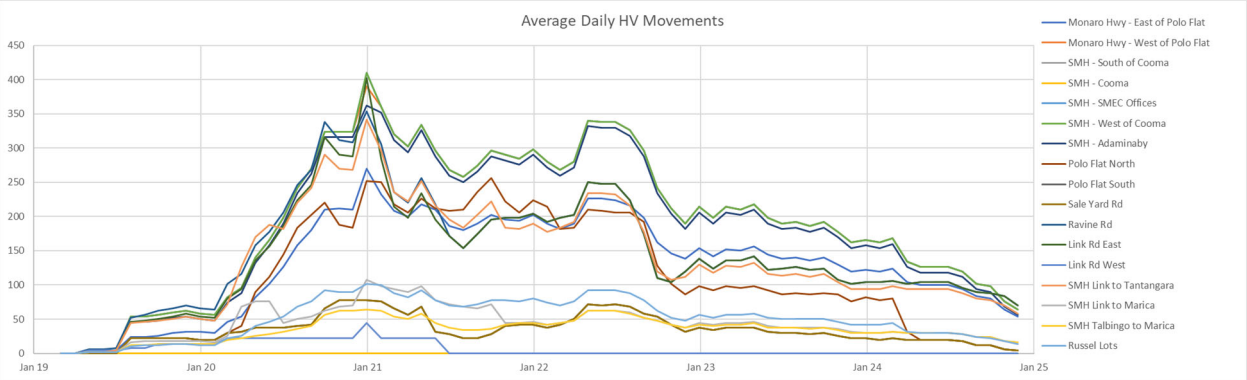
Baseline traffic volumes for 2022 were determined by applying a 1% per annum increase to the baseline traffic data collected in 2019.

Four intersections were also assessed for winter peak conditions as agreed with RMS. They are: Snowy Mountains Highway/Kosciuszko Road, Sharp Street/Bombala Street, Sharp Street/Vale Street and Monaro Highway/Polo Flat Road (north end).

4.3 Construction and operation traffic volumes

Construction vehicle movements will comprise construction worker's light vehicles and heavy vehicles transporting equipment, building and construction materials, waste, and fill material if required. The forecast monthly construction vehicle volume profile for both the segment factory works and Main Works, expected on different parts of the external road network is presented in **Figure 4.1**.

Figure 4.1 Segment factory and Main Works average daily heavy vehicle traffic movements



Source: FGJV, August 2019

Operational vehicle movements will comprise light vehicles (worker's vehicles and service vehicles) and heavy vehicles required for the transportation of the main inputs for the segments (primarily aggregate, sand, cement and steel rebar) and for the transportation of the segments from the site to the TBM launch sites within KNP.

4.3.1 Project mid-block traffic volumes

Average and peak daily heavy and light traffic movements have been determined at critical locations of the study area road network as illustrated in **Annexure D**. A summary of estimated daily light and heavy traffic generation during the peak month in 2022 of the proposed segment factory works is shown in **Table 4.1**.

Table 4.1 Daily traffic volumes of proposed segment factory works

Road	Location	Proposed segment factory traffic	
		Light vehicles	Heavy vehicles
Polo Flat Road	Polo Flat North	194	216
Polo Flat Road	Polo Flat South	266	0
Monaro Highway	East of Polo Flat	26	84
Monaro Highway	Cooma (west of Polo Flat)	196	132
Snowy Mountains Highway	SMEC Offices	110	132
Snowy Mountains Highway	West of Cooma	30	132
Snowy Mountains Highway	North of Yarrangobilly Caves intersection	0	0
Link Road	Between Kings Cross Road and Ravine Road	0	0
Link Road	Between Ravine Road and Snowy Mountains Highway	16	84

Source: FGJV, August 2019

4.3.2 Projected intersection traffic volumes

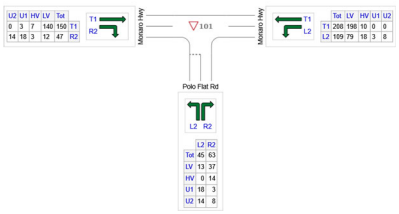
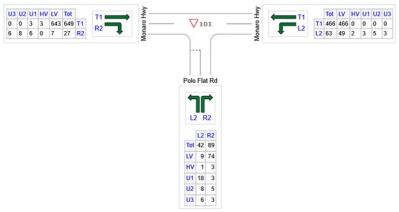
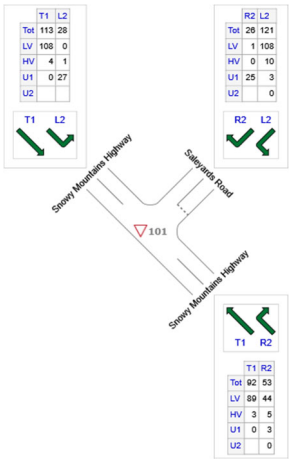
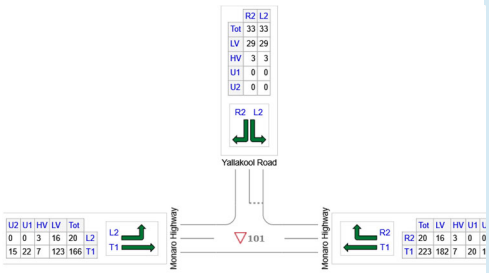
For the purpose of assessing the impacts of project traffic on key intersections, the daily project traffic volumes were converted to peak hour traffic volumes:

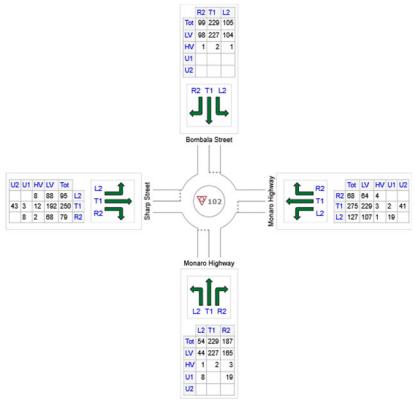
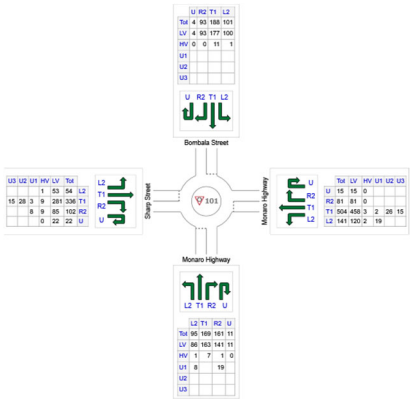
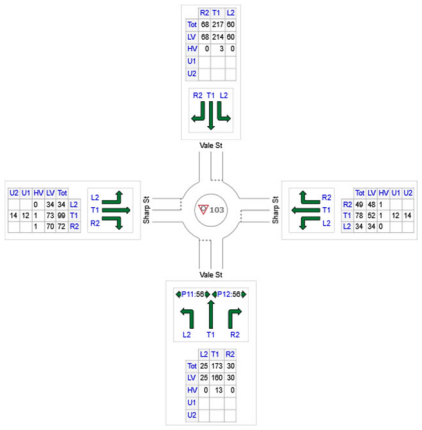
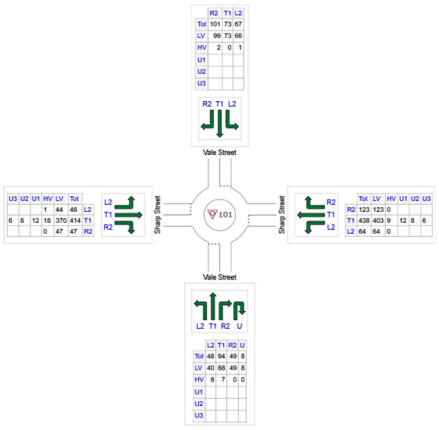
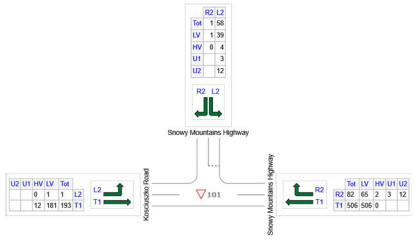
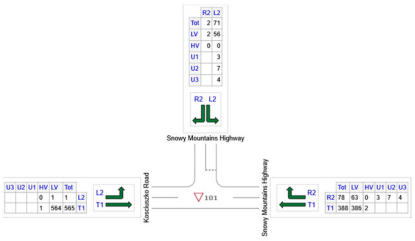
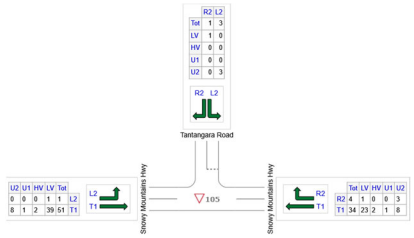
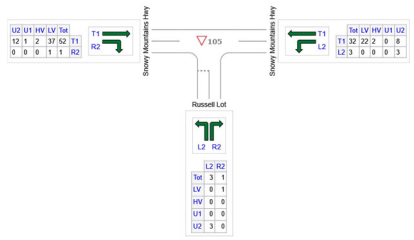
– by assuming that peak hour (1-hour) project traffic volumes are 10% of estimated daily project traffic volumes; and

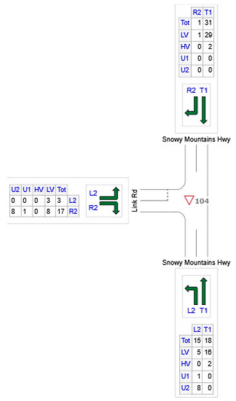
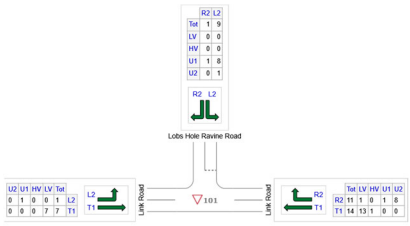
– by assuming that the mid-block project traffic flows were representative of one-way trips.

Estimated peak hour light and heavy traffic generation during the peak month in 2022 have been identified. A summary of the total (baseline and project) intersection turning volumes under non-winter peak period and winter peak period are summarised in **Table 4.2**.

Table 4.2 2022 peak hour projected total (baseline + project) intersection traffic volumes

Intersection	Non-winter period[1]	Winter holiday period[2]
Monaro Highway/Polo Flat Road (north end)		
Monaro Highway/Saleyards Road		Not required
Monaro Highway/Yallakool Road		Not required

Intersection	Non-winter period[1]	Winter holiday period[2]
Sharp Street/Bombala Street		
Sharp Street/Vale Street		
Snowy Mountains Highway/Kosciuszko Road		
Snowy Mountains Highway/Tantangara Road		Not required
Snowy Mountains Highway/Rock Forest		Not required

Intersection	Non-winter period[1]	Winter holiday period[2]
Snowy Mountains Highway/Link Road		Not required
Link Road/Lobs Hole Ravine Road		Not required

Note: T1=through movement, L2=left turn movement, R2=right turn movement, LV=light vehicles, HV=heavy vehicles
1. Non-winter holiday period baseline traffic was estimated based on data collected in March/April of 2019.
2. Winter holiday period baseline traffic was estimated based on data were collected in June/July/August of 2019.

Source: SCT Consulting

4.4 Traffic impacts along key road network sections

As shown in **Table 4.1**, it is forecast that the proposed segment factory would be expected to generate the largest number of heavy vehicles at Polo Flat Road (north of the proposed site) as well as Snowy Mountains Highway between Cooma and Link Road. During the peak month of project traffic, it is expected up to 216 heavy vehicles movements (108 vehicles in each direction) per day in a 24-hour period could be travelling on these sections of Polo Flat Road (north) and Snowy Mountains Highway each day.

For the traffic associated with the proposed segment factory, the largest increase of light vehicles is also expected on Polo Flat Road and Snowy Mountains Highway. A peak of 266 project related light vehicle movements (133 trips in each direction) per day (over a 24-hour period) are anticipated on Polo Flat Road (south end).

As assessed in the Exploratory Works EIS, this level of daily increase of light and heavy vehicles as a result of proposed segment factory – approximately 410 total vehicles (up to 820 Passenger Car Units (PCU) assuming a PCU factor of 2.9 for heavy vehicles) in a day will not have any significant impacts to the mid-block capacity of the study network given the network is currently operating at very low volume/capacity ratios with significant amount of spare capacity.

4.4.1 Polo Flat Road

The combination of baseline traffic (less than 2,000 vehicles per day) and project traffic (less than 450 vehicles per day) is not expected to cause any capacity issues on Polo Flat Road. Polo Flat Road as a local collector road serving the industrial area of Polo Flat is unlikely to be materially impacted by the winter holidays traffic.

4.4.2 Snowy Mountains Highway

Although the Snowy Mountains Highway is the main project traffic route, the traffic volume increase due to the project is less than the normal traffic variation during peak winter days when an increase of over 5,000 vehicles per day travelling in both directions could occur between Cooma and Kosciuszko Road.

Due to the increase of both light and heavy vehicle traffic along Snowy Mountains Highway, the number of incidents could also increase especially where road-widths may be considered inadequate, where sightlines are limited and on sections of road with sharp curves.

4.5 Traffic impacts at intersections

4.5.1 Austroads intersection warrants

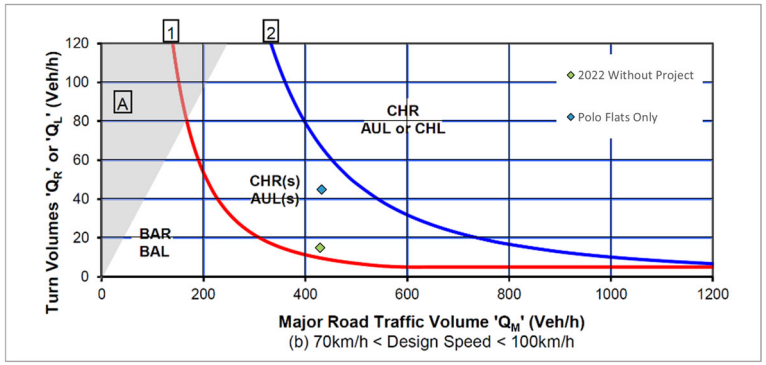
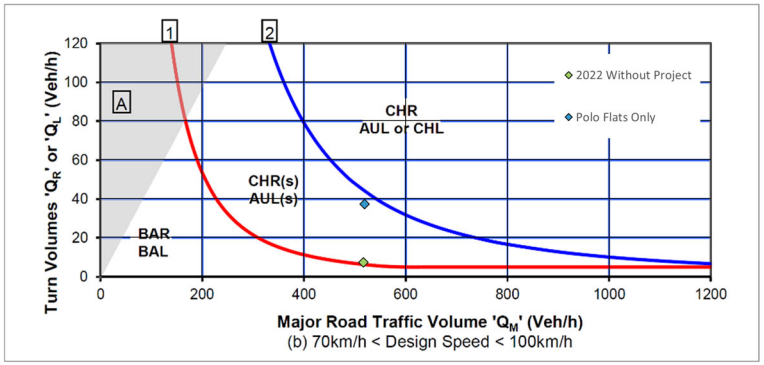
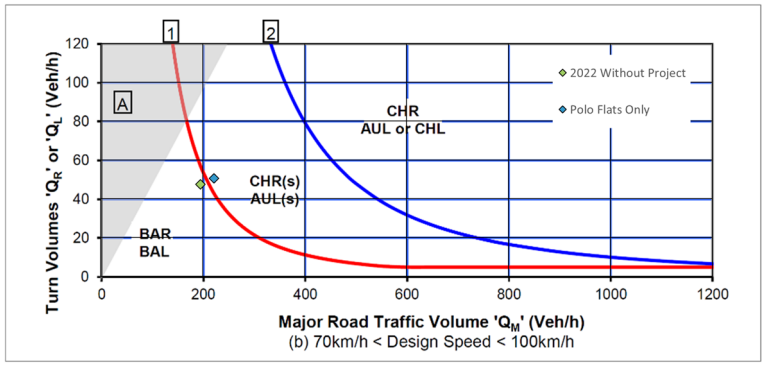
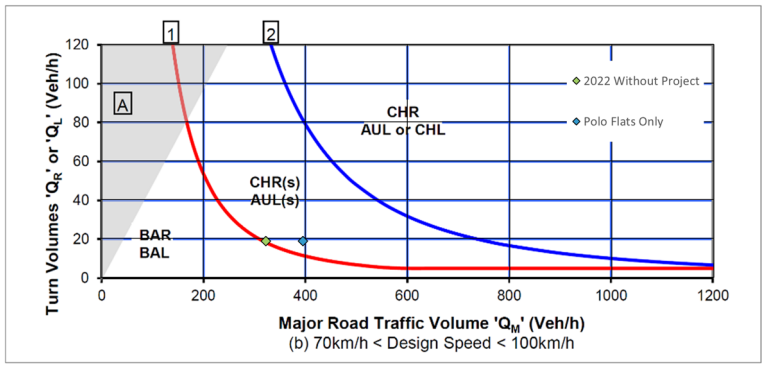
An intersection warrants review was undertaken for those intersections considered critical for this project. This was undertaken in accordance with Austroads (2017) Part 4 intersection design standards. The Austroads (2017) warrant design charts was applied to critical priority intersections within the study area under future traffic conditions (baseline traffic + background traffic growth + project traffic volumes) and the results are summarised in **Table 4.3**. Baseline and project traffic volumes at each of the key priority intersections (roundabouts in Cooma excluded) are represented:

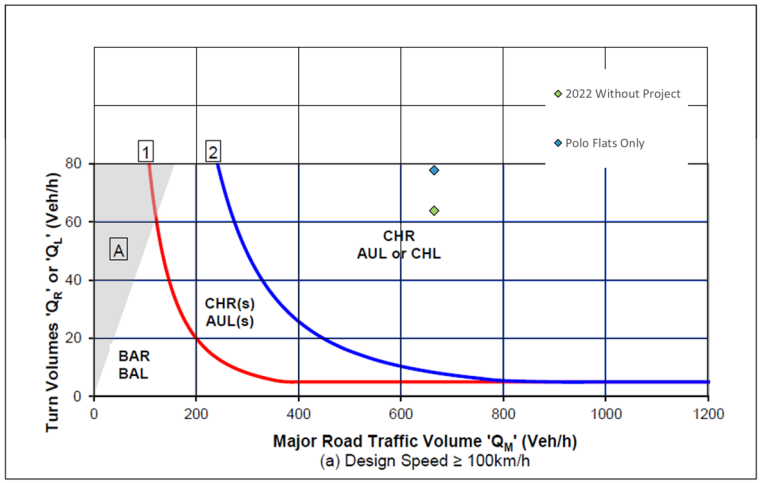
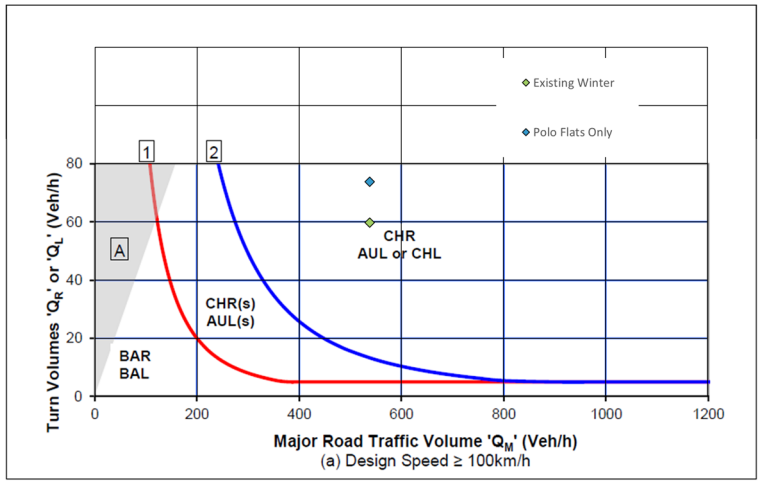
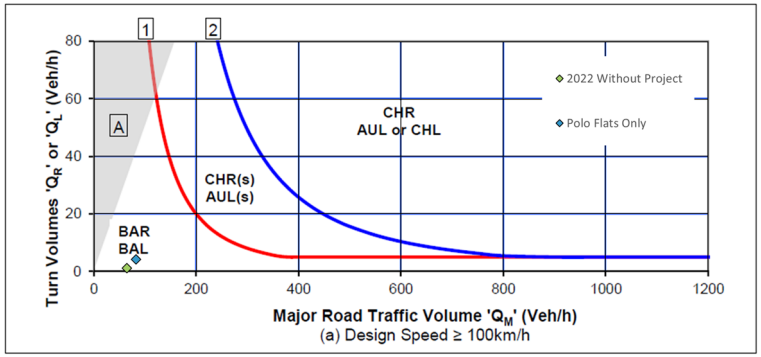
– Green diamond for 2022 baseline traffic volumes on the major road at each intersection; and

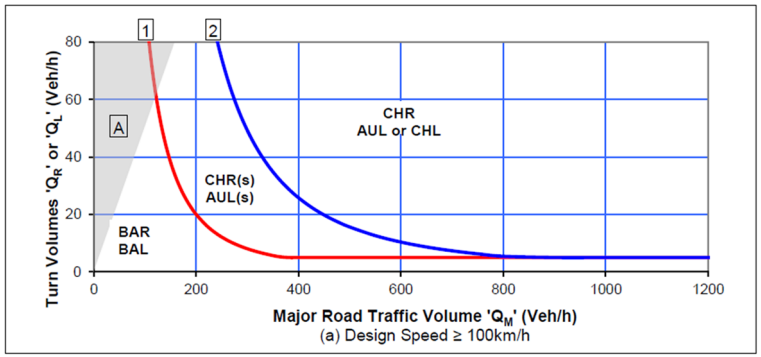
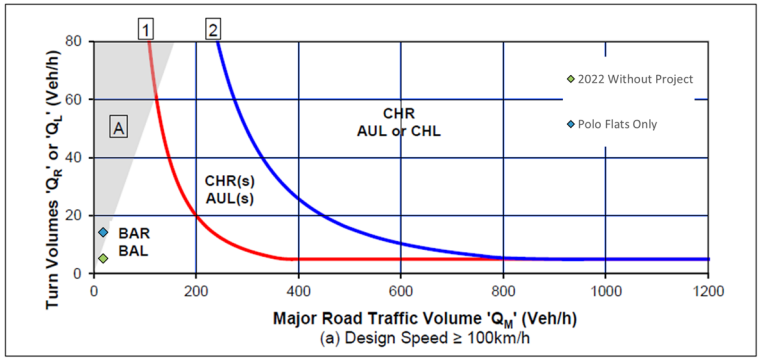
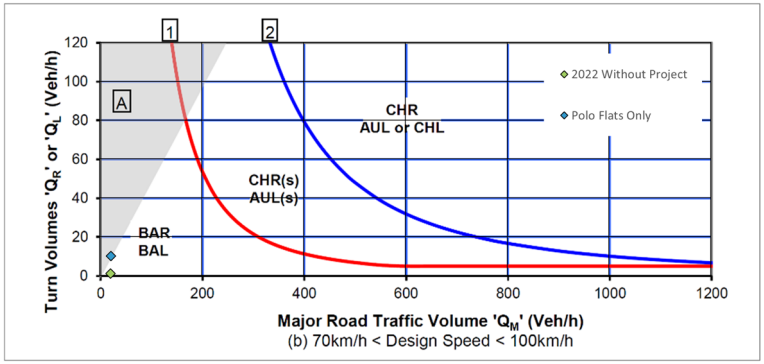
– Blue diamond for combined baseline traffic volumes and construction (light and heavy) vehicles associated with proposed segment factory works only.

It should be noted that site access proposed from Snowy Mountains Highway at Rock Forest will be a new priority intersection.

Table 4.3 Critical intersection warrants

Intersection	Non-winter period[1]	Winter holiday period[2]
Monaro Highway/Polo Flat Road (north end)		
Monaro Highway/ Saleyards Road		Not required
Monaro Highway/Yallakool Road		Not required

Intersection	Non-winter period[1]	Winter holiday period[2]
Snowy Mountains Highway/ Kosciuszko Road		
Snowy Mountains Highway/ Tantangara Road		Not required

Intersection	Non-winter period[1]	Winter holiday period[2]
Snowy Mountains Highway/Rock Forest access		Not required
Snowy Mountains Highway/Link Road		Not required
Lobs Hole Ravine Road/Link Road		Not required

Note: 1. Non-winter holiday period baseline traffic was estimated based on data collected in March/April of 2019.
2. Winter holiday period baseline traffic was estimated based on data were collected in June/July/August of 2019.Source: SCT Consulting

Based on the Austroads intersection warrants review for turn treatments on major roads at unsignalised intersections, the following intersection warrant upgrades are required due to increased traffic volumes:

– Monaro Highway/Yallakool Road; and

– Monaro Highway/Polo Flat Road (north end).

It should be noted that the intersections of Monaro Highway/Yallakool Road and Monaro Highway/Polo Flat Road (north end) require upgrades even without the construction vehicles, based on the forecast growth of the corridor and that the haulage route along Monaro Highway between Polo Flat and Cooma does not add any turning movements by construction vehicles at the intersection with Yallakool Road.

4.5.2 SIDRA intersection modelling

Intersection capacity assessment using SIDRA has been undertaken for key intersections across the study area, with the performance summarised in **Table 4.4** for non-winter peak period and in **Table 4.5** for winter peak. It should be noted that site access proposed at Rock Forest from Snowy Mountains Highway will be new priority intersection.

The following assumptions were also agreed with RMS in undertaking the future year SIDRA modelling:

– all modelling parameters used for base year calibration and validation remained the same; and

– construction heavy vehicles were assigned as 65% 'Heavy Vehicles' and 35% 'Large Trucks' as identified as SIDRA, to account for the larger construction vehicles.

Table 4.4 Future intersection performance summary (Non-winter peak)

Intersection	Scenarios	Performance		
		Delays (s)[1]	Degree of Saturation	Level of Service
Monaro Highway/Polo Flat Road (north end)	2022 No Project	13.6	0.176	A
	2022 Proposed segment factory only	19.2	0.315	B
Monaro Highway/Saleyards Road	2022 No Project	8.5	0.118	A
	2022 Proposed segment factory only	8.8	0.163	A
Monaro Highway/Yallakool Road	2022 No Project	8.3	0.114	A
	2022 Proposed segment factory only	9.4	0.143	A
Sharp Street/Bombala Street	2022 No Project	19.6	0.693	B
	2022 Proposed segment factory only	55.7	0.945	D
Sharp Street/Vale Street	2022 No Project	14.1	0.632	A
	2022 Proposed segment factory only	15.6	0.665	B
Snowy Mountains Highway/Kosciuszko Road	2022 No Project	15.3	0.262	B
	2022 Proposed segment factory only	16.0	0.261	B
Snowy Mountains Highway/Tantangara Road	2022 No Project	7.8	0.022	A
	2022 Proposed segment factory only	9.4	0.034	A
Snowy Mountains Highway/Rock Forest Access	2022 No Project	-	-	-
	2022 Proposed segment factory only	9.0	0.037	A
Snowy Mountains Highway/Link Road	2022 No Project	7.8	0.017	A
	2022 Proposed segment factory only	8.9	0.034	A
Link Road/Lobs Hole Ravine Road	2022 No Project	6.9	0.008	A
	2022 Proposed segment factory only	7.9	0.022	A

1. Delays of the worst movement reported.

Source: SCT Consulting

SIDRA modelling has confirmed that critical intersections within the study area will continue to operate satisfactorily with overall intersection LoS C or better, when considered under non-winter baseline traffic and all scenarios of project (light and heavy) vehicles traffic. The only exception is the intersection of Sharp Street / Bombala Street where the degree of saturation could be expected to exceed 0.85 and LoS D, when considered in 2022 with project traffic.

Table 4.5 Future intersection performance summary (Winter peak)

Intersection	Scenarios	Performance		
		Delays (s)[1]	Degree of Saturation	Level of Service
Monaro Highway/Polo Flat Road (north end)	2022 No Project	137.5	0.967	F
	2022 Proposed segment factory only	742.3	1.739	F
Sharp Street/Bombala Street	2022 No Project	42.7	0.936	D
	2022 Proposed segment factory only	159.7	1.135	F
Sharp Street/Vale Street	2022 No Project	24.0	0.728	B
	2022 Proposed segment factory only	32.3	0.844	C
Snowy Mountains Highway/Kosciuszko Road	2022 No Project	20.8	0.290	B
	2022 Proposed segment factory only	21.9	0.290	B

1. Delays of the worst movement reported.

Source: SCT Consulting

SIDRA modelling has confirmed that the following intersections are expected to operate unsatisfactorily (either Level of Service D or worse or Degree of Saturation 0.85 or over), when considered under winter baseline traffic and all scenarios of construction (light and heavy) vehicles traffic:

– Sharp Street/Bombala Street; and

– Monaro Highway/Polo Flat Road (north end).

4.5.3 Safe intersection sight distance review

As discussed in **Section 3.6.2**, the intersection of Snowy Mountains Highway with Tantangara Road does not achieve minimum SISD requirements. Given the expected increase of construction traffic at this intersection, mitigation measures such as localised speed reduction on the approaches to this intersection should be considered to mitigate the risks – refer to **Section 5.1**.

4.6 Public transport

As identified in **Section 3.2.2**, there are no regular mass transport systems currently in operation within the vicinity of proposed segment factory works. No impact will result from activities associated with proposed segment factory works.

4.7 Emergency vehicles

Access for emergency vehicles will be unaffected as there are no plans to close any of the roads to emergency vehicles. In addition, consultations with emergency service providers would be required as part of the finalisation of the Construction Traffic Management Plan of the project.

5.0 Mitigation Measures

5.1 Framework

This report has identified potential traffic and transport impacts of the proposed segment factory on the capacity, condition, safety and efficiency of the local, national park and State road network and proposed mitigation measures to address potential impacts.

A Road Safety Audit was also undertaken of the haul route between the site of the proposed segment factory at Polo Flat and the construction sites within KNP. Further investigations and further discussions are required with road authorities to determine the audit outcomes that should be undertaken as part of this project. The Road Safety Audit is contained at **Annexure C** of this Traffic and Transport Assessment.

Snowy Hydro, as the owner and proponent of the proposed segment factory, would be responsible for overseeing its construction and operation to ensure it is delivered in line with the conditions of approval, if granted. Snowy Hydro has appointed FGJV to construct and operate the segment factory in compliance with this EIS and the conditions of approval, if granted.

An environmental protection license would be obtained for scheduled activities undertaken at the site and environmental management plans (EMPs) would be prepared and implemented for activities relating to construction and operational impacts. The mitigation measures outlined in this EIS will be incorporated into the detailed design and construction of the proposed segment factory and into the EMPs.

The project is continuing to engage with roads authorities (SMRC and RMS) to determine the most appropriate measures to address traffic performance issues identified during the consideration of project activities as well as intersection capacity assessment undertaken in this Traffic and Transport Assessment.

5.2 Summary of mitigation measures

A summary of mitigation measures is detailed in **Table 5.1**.

Table 5.1 Mitigation measures

Area	Impact/risk	ID#	Mitigation measures
Transport	Site distances	TRA01	Reduced speed areas at locations where minimum site distances cannot be achieved.
	Intersections	TRA02	Intersection upgrades where either background traffic growth or the addition of project related traffic will result in unsatisfactory intersection performance.
	Road damage	TRA03	Road maintenance measures to restore any damage that may result due to project related traffic.
	Traffic controls	TRA04	Traffic controls for locations associated with pavement widening, such as those associated with intersection upgrades, that require temporary occupation of traffic lanes or for works adjacent to the road.
	Community notification	TRA05	Community consultation, notifying communities, visitors and emergency services of any disruptions to traffic and access restrictions required by the project.
	Management plan	TRA06	The EMP would set out guidelines, general requirements and procedures to be used when construction and operational activities impact on existing traffic arrangements.

Source: SCT Consulting, August 2019

These mitigation measures will be incorporated into the detailed design and construction of the proposed segment factory, and into the EMP or sub-plans as relevant.

Further information on the application of each of the mitigation measures is set out in Sections 5.2.1 to Section 5.2.5 below.

5.2.1 Reduced speed areas

At locations where minimum sight distances cannot be achieved due to the existing road alignments, posted speed limits adjacent to the intersections will be reduced to satisfy the sight distance requirements and maintain safe maneuvering conditions for motorists. The locations of these intersections and the proposed speeds are summarised in **Table 5.2**.

Table 5.2 Proposed speed reduction locations

Location	Proposed Speed
Snowy Mountains Highway/Tantangara Road	60 km/hr
Snowy Mountains Highway/Rock Forest Access	80 km/hr
Link Road/Lobs Hole Ravine Road	60 km/hr
Link Road/Snowy Mountain Highway	80 km/hr
Monaro Highway through Polo Flat Road and Yallakool Road intersections	60 km/hr

Source: SCT Consulting, August 2019

Advance warning signs would also be used in areas as required to alert drivers and increase driver awareness of any sub-standard or changed traffic condition.

5.2.2 Intersection upgrades

The intersections to be considered for upgrades include:

– the intersections of Monaro Highway/Yallakool Road and Monaro Highway/Polo Flat Road based on forecast growth of the corridor specified by RMS, even without the consideration of project vehicles during typical (non-winter) traffic conditions;

– the existing roundabout intersections of Sharp Street/Bombala Street in Cooma to provide adequate performance during non-winter and winter peak conditions, when considered together with construction traffic. It should be noted this roundabout is expected to fail (i.e. performs poorly) under existing winter peak traffic conditions (during the peak hours on the weekends of the ski season) regardless of project traffic; and

– two new (BAR/BAL) intersections; required to provide access to the project worksites at:

  - Snowy Mountains Highway/Rock Forest access; and
  - Polo Flat Road/New Road to proposed segment factory.

5.2.3 Road maintenance

Prior to construction commencing, an independent and qualified expert will be required to survey and prepare a Road Dilapidation Report for the main roads used during construction. Prior to operations commencing, a Road Dilapidation Report should be prepared for the main transport route. I each case, the report would assess the current condition of the road surfaces the construction vehicles would traverse, including the external road network, and describe mechanisms to restore any damage that has occurred as a result of its use by traffic and transport related to the project.

The Road Dilapidation Report will be submitted to the relevant road authority for review prior to the commencement of heavy vehicle movements.

In addition, routine defect identification and rectification of the newly constructed internal road network will be managed as part of the project maintenance procedure. Once appropriate vehicle type and size for construction are determined the internal access roads, will be designed in accordance with the relevant vehicle loading requirements to ensure maintenance in accordance with the requirements of the local road authority.

5.2.4 Traffic control

Any road works associated with pavement widening, such as those associated with intersection upgrades, that require temporary occupation of traffic lanes or working adjacent to the road, will require preparation and approval of Traffic Control Plans (TCP), identifying required traffic control measures as specified in AS1742-2002 (e.g. signage,

traffic controllers and speed limits) and RMS 'Traffic Control at Worksites Manual Version 5' to ensure safety of all road users and to warn road users in advance of the change in traffic conditions.

5.2.5 Community consultation

Affected communities, visitors and emergency services will need to be notified in advance of potential traffic disruptions as a result of construction activities, including access to areas of KNP impacted by project activities. Communication protocols would be required and may include:

– driver warning signs;

– variable message signs;

– web notifications; and

– public notices in local publications.

Communication protocols would be developed in conjunction with the preparation of EMPs (as discussed further at Section 5.3) and would detail the methodology, frequency and response measures proposed to relay information to the community and to ameliorate community concerns.

5.3 Environmental Management Plan

Traffic management would be required for the duration of the construction of both the segment factory and Main Works and to manage residual impacts for the operation of the segment factory and the construction of the Main Works. Traffic management provisions would be detailed in one or more Environmental Management Plans (EMP) that would detail the guidelines, general requirements and procedures to be used when construction and operational activities would have a potential impact on existing traffic arrangements. Implementation of the measures would ensure that delays and disruptions are managed with appropriate measures and identify/respond to any changes in road safety as a result of construction works.

The EMP would include:

– signage requirements (e.g. temporary speed restrictions, changes to the road environment, traffic management controls deployed);

– lane possession and approval process during periods of online construction (e.g. linemarking and temporary barriers); and

– communications protocols, providing advanced notice of construction works and any major or prolonged impacts (e.g. leaflets and local media), and real-time information regarding current impacts (e.g. variable message signs, radio traffic news). Protocols could include a project hotline where the community can query the project or report any traffic or safety concerns.

Some of the principles the EMPs would encompass would include:

– minimisation of potential effects of any major sources of delay, any works which would significantly reduce the performance of the road network in the project area would be scheduled for periods of typically lower traffic volumes where possible e.g. avoid peak snow seasons; and

– the use of signage to clearly indicate the traffic controls in use. This could also include temporary speed restrictions and passing constraints if required to maintain road safety levels. In some instances, lane closures would be implemented to remove road traffic from construction zones altogether. Where practical, this would occur outside of peak periods to maintain peak period network capacity.

The EMPs would be developed in consultation with the emergency services to ensure that procedures are in place to maintain safe, priority access for emergency vehicles through construction zones and their ability to respond to an incident, when possible.

Overall, the EMPs would set out the guidelines, general requirements and procedures proposed to minimise, mitigate and communicate the impacts of the construction of the project on the capacity, performance and safety of the local road network and traffic systems.

6.0 Conclusion

6.1 The project

Snowy 2.0 is a large-scale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Scheme. The key construction element for the project is the excavation and tunneling for underground infrastructure including the power station, power waterway and its associated infrastructure.

The tunnels for Snowy 2.0, including the exploratory tunnel for Exploratory Works and underground tunnels linking Tantangara and Talbingo reservoirs for the Main Works, would be excavated, for the most part, using TBMs and would be lined using precast concrete segments. These segments are proposed to be manufactured at the segment factory proposed for a site on the south-eastern side of Polo Flat, an industrial area located to the east of Cooma.

The construction and operation of the segment factory will generate a demand for worker's LV and during the construction phase HVs transporting construction equipment and materials and during the operation phase transporting inputs for the manufacture of the precast concrete segments and their transport from the site to the TBM launch site within the KNP.

The main roads impacted by project traffic will be the roads that support the segment factory proposed for a site at Polo Flat and the roads that will be used to haul the precast concrete segments from point of manufacture at Polo Flat to the TBM launch sites for the Exploratory Works and Main Works within the KNP.

The construction phase of the proposed segment factory would last about five months utilising a workforce of about 30 people. Construction would take place six days a week (from Monday to Saturday) and for 10 hours per day.

The factory would operate over a period of about 3.5 years utilising a workforce of about 125 people. It would operate 24 hours a day, seven days a week. The proposed segment factory would be constructed and operated by FGJV which has been contracted by Snowy Hydro to construct Snowy 2.0. At the completion of the construction of Snowy 2.0, the proposed segment factory would be decommissioned.

6.2 Current traffic conditions

Under current traffic conditions, SIDRA intersection assessment of the key locations along Snowy Mountains Highway and Monaro Highway shows that the intersections operate with spare capacity during the non-winter peak period. As such they do not require any intersection upgrades. However, with increased traffic flows during the winter holiday peak hour, all intersections perform with lesser spare capacity with the intersection of Monaro Highway/Polo Flat Road (north) operating at LoS F.

Based on the Austroads intersection warrants review for turn treatments on major roads at unsignalised intersections, the following intersection warrant upgrades are required due to increased traffic volumes:

– Monaro Highway/Yallakool Road; and

– Monaro Highway/Polo Flat Road (north end).

6.3 Future traffic conditions with background traffic growth and project traffic

With the forecast increase of 1% per annum for the background traffic growth up to 2022 (without the consideration of any project traffic), the closely spaced Monaro Highway intersections with Yallakool Road and Polo Flat Road (north end) were assessed to no longer satisfy the non-signalised basic turn arrangements of the intersections and that auxiliary turn lanes are warranted at the intersection.

SIDRA modelling has confirmed that critical intersections within the study area will continue to operate satisfactorily with overall intersection LoS C or better, when considered under non-winter baseline traffic and all scenarios of project (light and heavy) vehicles traffic. The only exception is the intersection of Sharp Street / Bombala Street where the degree of saturation could be expected to exceed 0.85 and LoS D, when considered in 2022 with project traffic.

However, with the consideration of background traffic growth (under winter-peak traffic conditions) as well as project traffic, the following intersections are deemed to operate unsatisfactorily (LoS D or DoS over 0.85):

– Sharp Street/Bombala Street; and

– Monaro Highway/Polo Flat Road (north end).

6.4 Intersection upgrades

The intersections to be considered for upgrades include:

– the intersections of Monaro Highway/Yallakool Road and Monaro Highway/Polo Flat Road based on forecast growth of the corridor specified by RMS, even without the consideration of project vehicles during typical (non-winter) traffic conditions;

– the existing roundabout intersections of Sharp Street/Bombala Street in Cooma to provide adequate performance during non-winter and winter peak conditions, when considered together with construction traffic. It should be noted this roundabout is expected to fail (i.e. performs poorly) under existing winter peak traffic conditions (during the peak hours on the weekends of the ski season) regardless of project traffic; and

– two new (BAR/BAL) intersections; required to provide access to the project worksites at:

  - Snowy Mountains Highway/Rock Forest access; and
  - Polo Flat Road/New Road to proposed segment factory.

6.5 Recommendations

This report has identified potential traffic and transport impacts of the proposed segment factory on the capacity, condition, safety and efficiency of the local, national park and State road network and proposed mitigation measures to address potential impacts.

Recommendations have been made for:

– identified reduced speed areas where minimum sight distances cannot be achieved;

– intersection improvements and upgrades to accommodate the combined impact of assumed 2022 traffic volumes and estimated project traffic (including traffic volumes associated with winter peak traffic conditions;

– addressed road maintenance and requirements for traffic controls and community consultation; and

– set out the requirements for traffic management plans.

Snowy Hydro is continuing to engage with the roads authorities (SMRC and RMS) to determine the most appropriate measures to address traffic performance issues identified during the consideration of project activities as well as intersection capacity assessment undertaken in this Traffic and Transport Assessment.

Discussions with the agencies will include a further analysis of the Road Safety Audit (as contained at Annexure C of this Traffic and Transport Assessment) that was undertaken of the proposed haul route between the site of the proposed segment factory at Polo Flat and the construction sites within KNP. Further investigations and further discussions are required with road authorities to determine the audit outcomes that should be undertaken as part of this project.

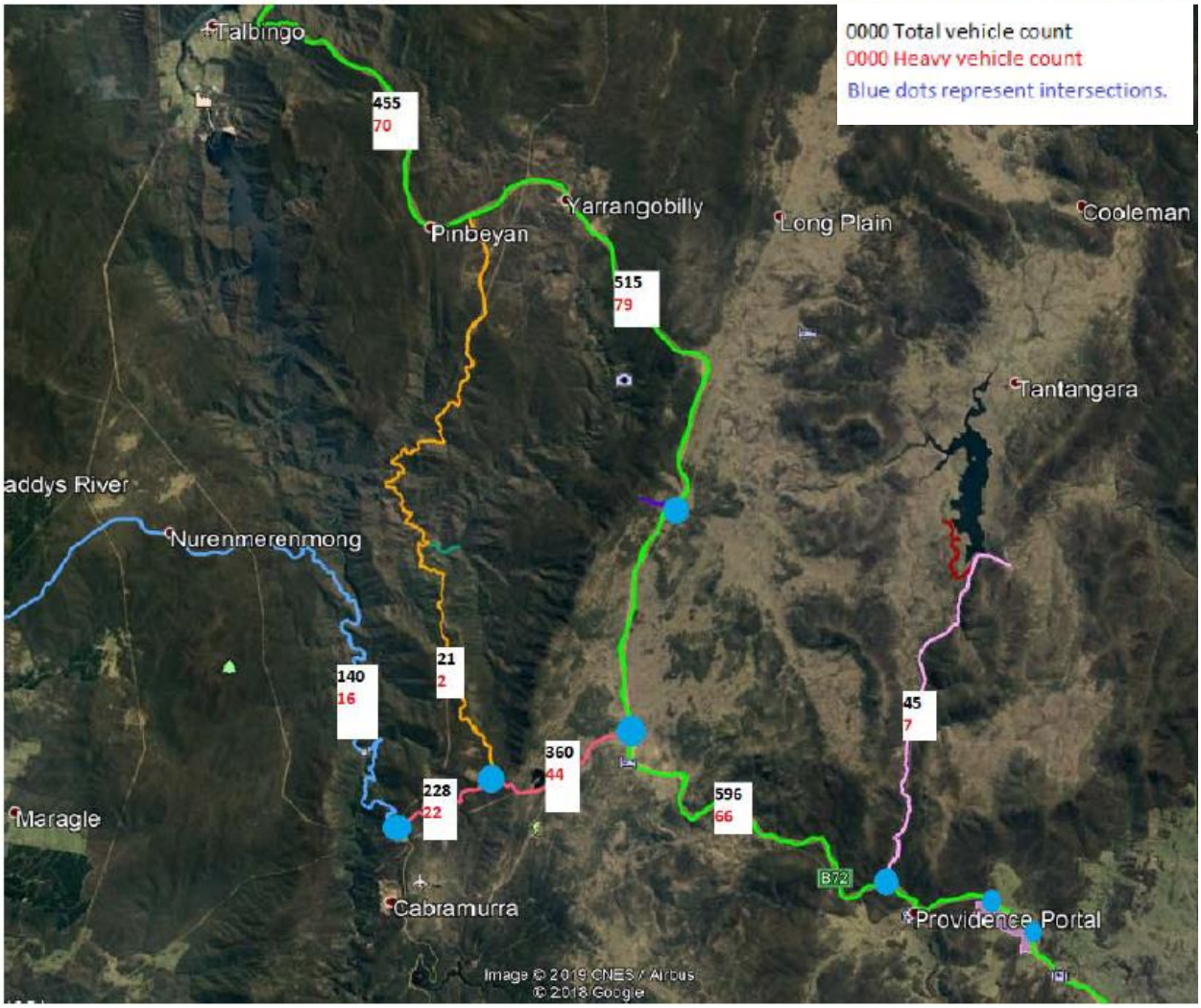
Snowy Hydro, as the owner and proponent of the proposed segment factory, would be responsible for overseeing its construction and operation to ensure it is delivered in line with the conditions of approval, if granted. Snowy Hydro has appointed FGJV to construct and operate the segment factory in compliance with this EIS and the conditions of approval, if granted.

An EPL would be obtained for scheduled activities undertaken at the site and an EMP would be prepared and implemented for activities relating to construction and operational impacts. The mitigation measures outlined in this EIS will be incorporated into the detailed design and construction of the proposed segment factory, and into the EMP.

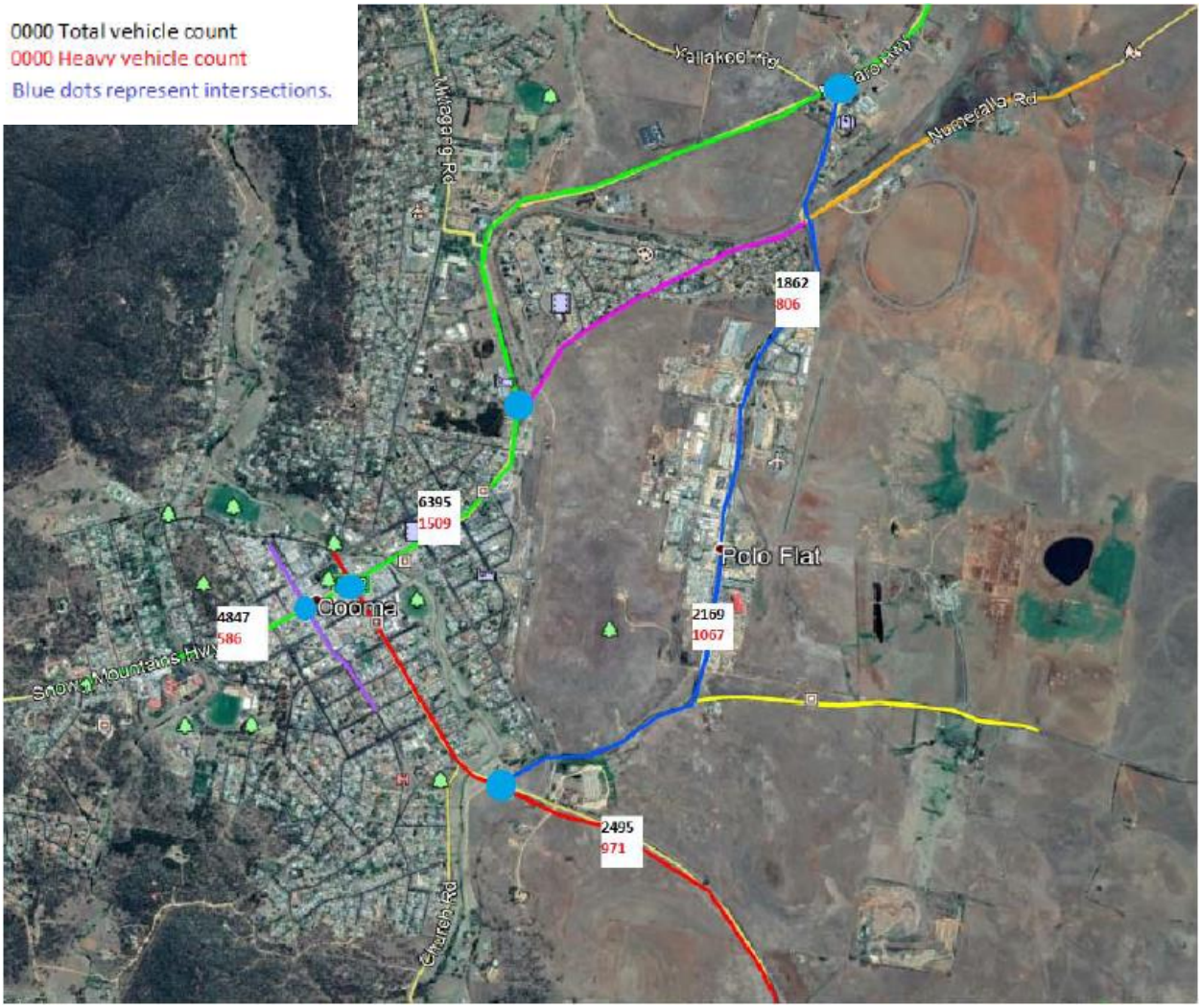
ANNEXURE A

Existing traffic data

Baseline average daily traffic numbers – KNP area



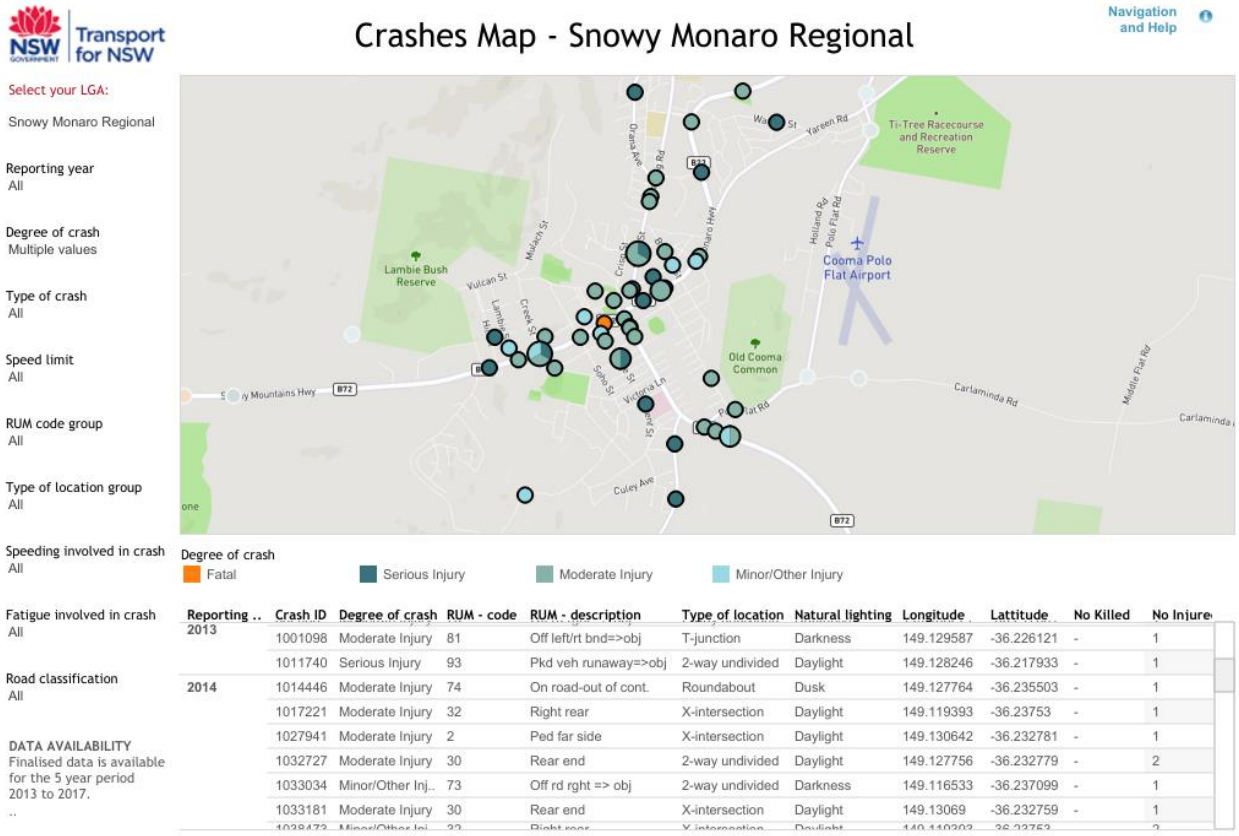
Baseline average daily traffic numbers – Cooma and Polo Flat



ANNEXURE B

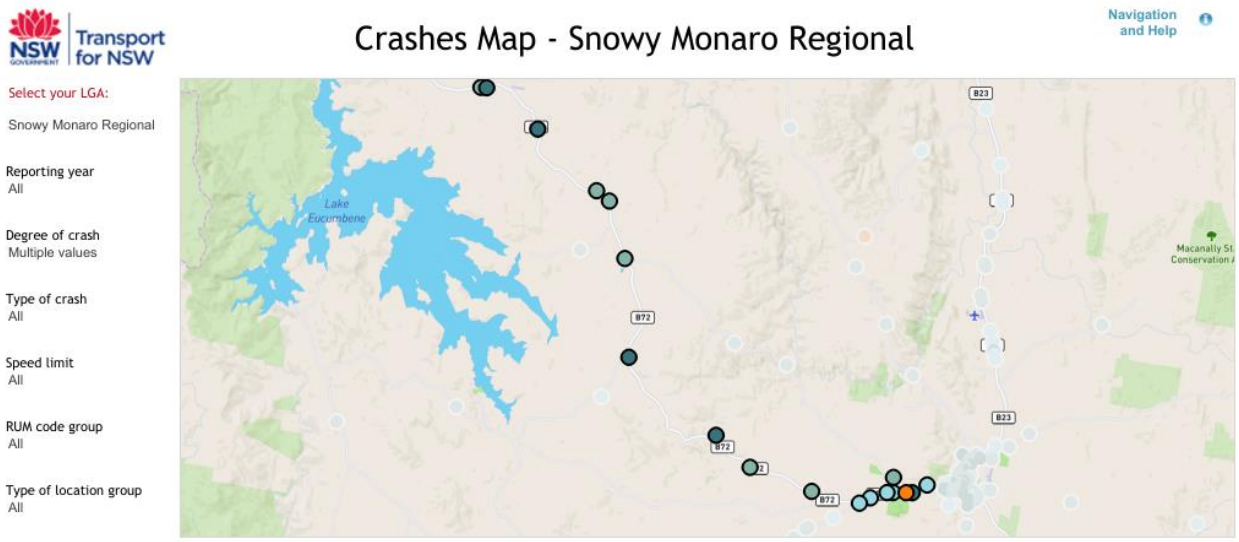
Accident history

Crash Map – Cooma township



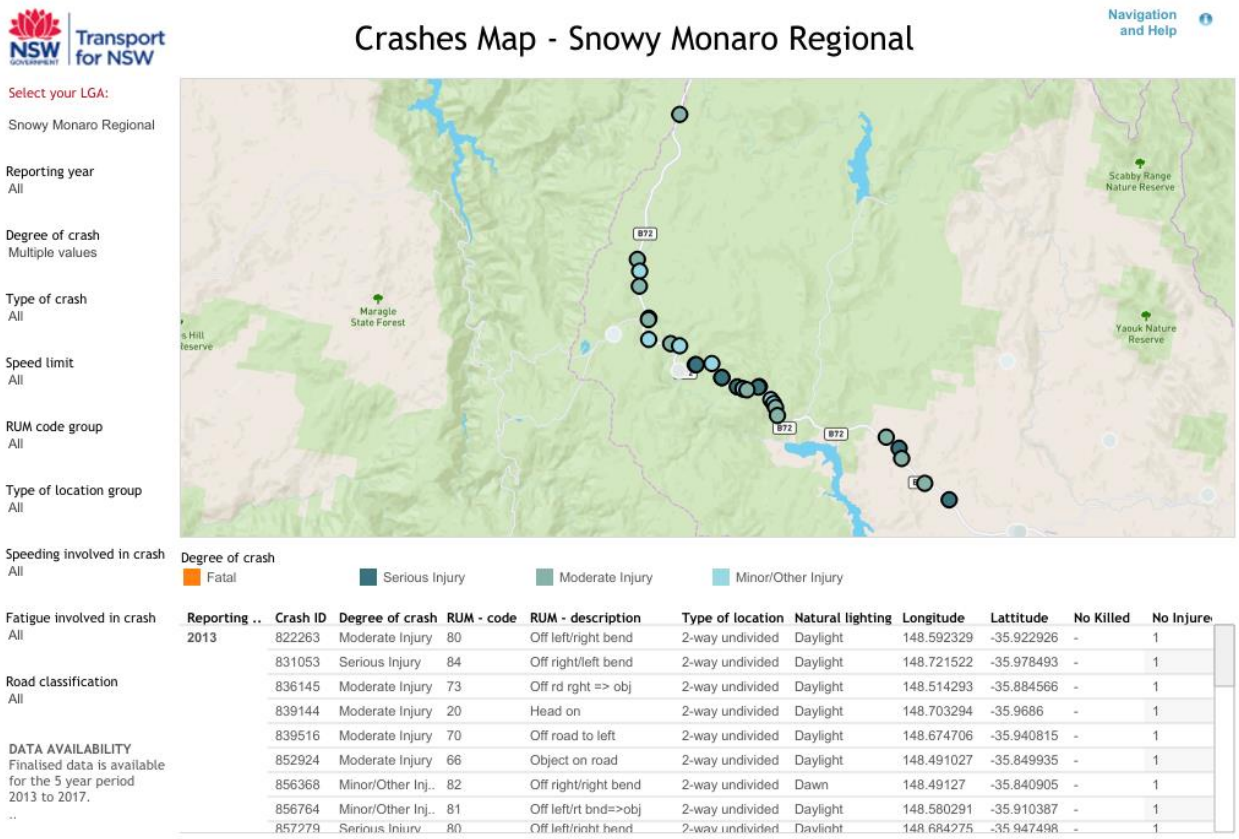
Reporting ..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Lattitude	No Killed	No Injure
2013	1001098	Moderate Injury	81	Off left/rt bnd=>obj	T-junction	Darkness	149.129587	-36.226121	-	1
	1011740	Serious Injury	93	Pkd veh runaway=>obj	2-way undivided	Daylight	149.128246	-36.217933	-	1
2014	1014446	Moderate Injury	74	On road-out of cont.	Roundabout	Dusk	149.127764	-36.235503	-	1
	1017221	Moderate Injury	32	Right rear	X-intersection	Daylight	149.119393	-36.23753	-	1
	1027941	Moderate Injury	2	Ped far side	X-intersection	Daylight	149.130642	-36.232781	-	1
	1032727	Moderate Injury	30	Rear end	2-way undivided	Daylight	149.127756	-36.232779	-	2
	1033034	Minor/Other Inj..	73	Off rd rght => obj	2-way undivided	Darkness	149.116533	-36.237099	-	1
	1033181	Moderate Injury	30	Rear end	X-intersection	Daylight	149.13069	-36.232759	-	1

Crash Map – Cooma to Adminaby



Reporting ..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Lattitude	No Killed	No Injure
2016	1106561	Minor/Other Inj..	67	Struck animal	2-way undivided	Darkness	149.072139	-36.240613	-	1
	1110498	Moderate Injury	21	Right through	T-junction	Daylight	149.076954	-36.231544	-	1
	1112851	Moderate Injury	30	Rear end	2-way undivided	Daylight	148.970253	-36.225485	-	1
	1126291	Moderate Injury	70	Off road to left	2-way undivided	Daylight	148.856075	-36.059531	-	1
2017	1129681	Fatal	70	Off road to left	2-way undivided	Darkness	149.08633	-36.240688	1	1
	1135338	Moderate Injury	85	Off rt/lft bnd=>obj	2-way undivided	Daylight	149.016109	-36.23992	-	1
	1139553	Moderate Injury	85	Off rt/lft bnd=>obj	2-way undivided	Daylight	148.865629	-36.065747	-	1
	1147508	Serious Injury	30	Rear end	T-junction	Darkness	149.090908	-36.240681	-	3

Crash Map –Adminaby to LGA Boundary



Reporting ..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Lattitude	No Killed	No Injure
2013	822263	Moderate Injury	80	Off left/right bend	2-way undivided	Daylight	148.592329	-35.922926	-	1
	831053	Serious Injury	84	Off right/left bend	2-way undivided	Daylight	148.721522	-35.978493	-	1
	836145	Moderate Injury	73	Off rd rght => obj	2-way undivided	Daylight	148.514293	-35.884566	-	1
	839144	Moderate Injury	20	Head on	2-way undivided	Daylight	148.703294	-35.9686	-	1
	839516	Moderate Injury	70	Off road to left	2-way undivided	Daylight	148.674706	-35.940815	-	1
	852924	Moderate Injury	66	Object on road	2-way undivided	Daylight	148.491027	-35.849935	-	1
	856368	Minor/Other Inj..	82	Off right/right bend	2-way undivided	Dawn	148.49127	-35.840905	-	1
	856764	Minor/Other Inj..	81	Off left/rt bnd=>obj	2-way undivided	Daylight	148.580291	-35.910387	-	1
	857279	Serious Injury	80	Off left/right bend	2-way undivided	Daylight	148.684275	-35.947498	-	1

Crash Map – LGA Boundary to Talbingo

Transport for NSW

Crashes Map - Snowy Valleys

Navigation and Help

Select your LGA:
Snowy Valleys

Reporting year
All

Degree of crash
Multiple values

Type of crash
All

Speed limit
All

RUM code group
All

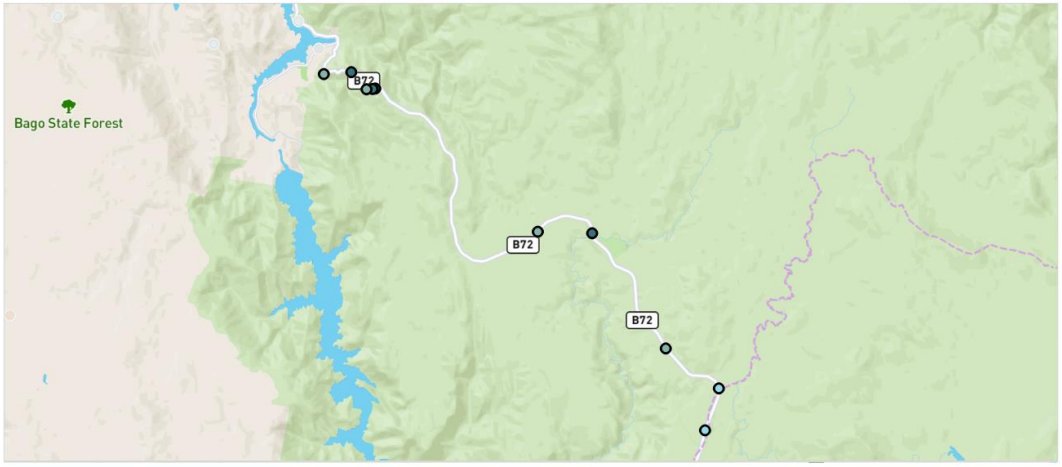
Type of location group
All

Speeding involved in crash
All

Fatigue involved in crash
All

Road classification
All

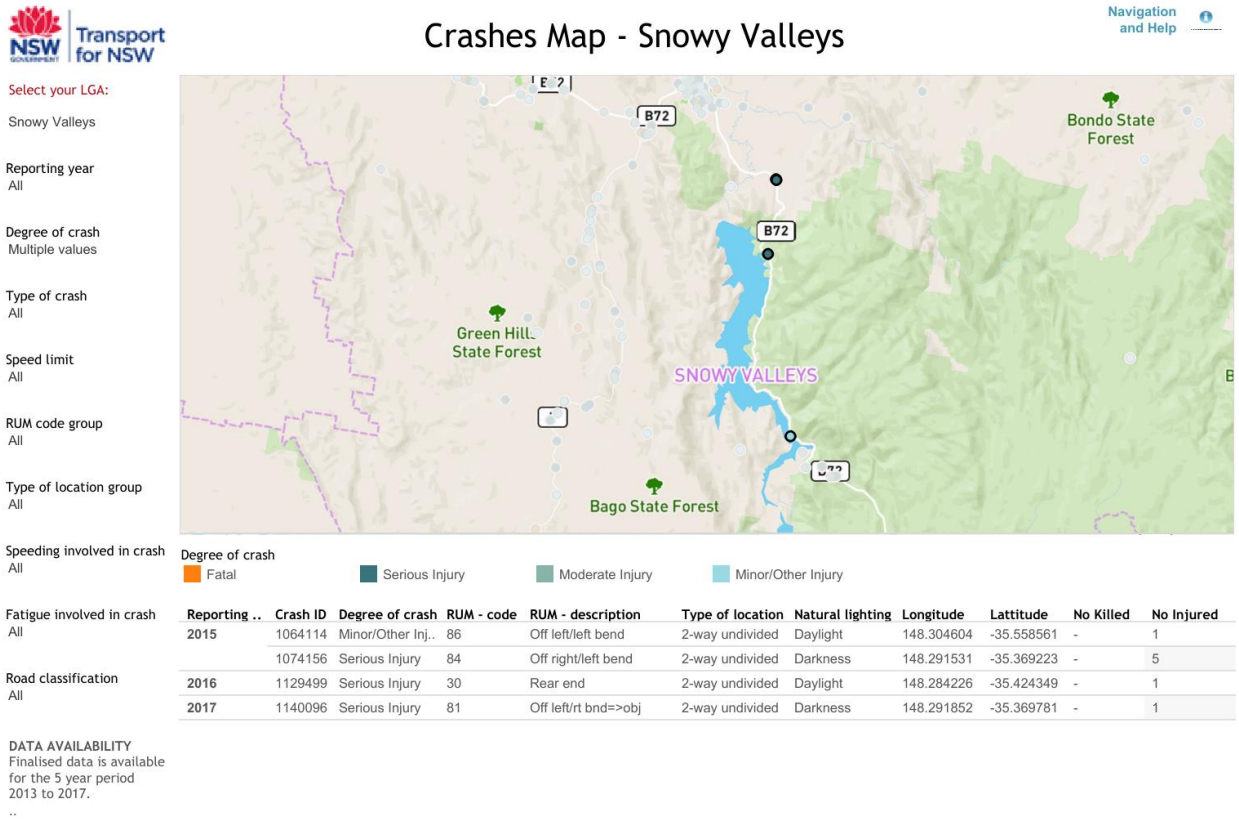
DATA AVAILABILITY
Finalised data is available for the 5 year period 2013 to 2017.
..



Degree of crash
Fatal
Serious Injury
Moderate Injury
Minor/Other Injury

Reporting ..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Lattitude	No Killed	No Injure
2013	856840	Serious Injury	81	Off left/rt bnd=>obj	2-way undivided	Daylight	148.346047	-35.588013	-	1
2014	1015248	Serious Injury	71	Off rd left => obj	2-way undivided	Darkness	148.46282	-35.651288	-	1
	1032695	Moderate Injury	20	Head on	2-way undivided	Dusk	148.502476	-35.701622	-	4
2015	1073575	Minor/Other Inj..	87	Off lft/lft bnd=>obj	2-way undivided	Daylight	148.531051	-35.719062	-	1
	1075866	Serious Injury	88	Out of cont on bend	2-way undivided	Daylight	148.344583	-35.588211	-	1
	1088824	Moderate Injury	81	Off left/rt bnd=>obj	2-way undivided	Daylight	148.341313	-35.588343	-	1
2016	1124955	Moderate Injury	87	Off lft/lft bnd=>obj	2-way undivided	Daylight	148.318337	-35.581702	-	1
	1128684	Serious Injury	88	Out of cont on bend	2-way undivided	Daylight	148.333117	-35.580852	-	1

Crash Map – Talbingo to Tumut



Reporting ..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Lattitude	No Killed	No Injured
2015	1064114	Minor/Other Inj..	86	Off left/left bend	2-way undivided	Daylight	148.304604	-35.558561	-	1
	1074156	Serious Injury	84	Off right/left bend	2-way undivided	Darkness	148.291531	-35.369223	-	5
2016	1129499	Serious Injury	30	Rear end	2-way undivided	Daylight	148.284226	-35.424349	-	1
2017	1140096	Serious Injury	81	Off left/rt bnd=>obj	2-way undivided	Darkness	148.291852	-35.369781	-	1

Crash Map – Tumut Township

Transport for NSW

Crashes Map - Snowy Valleys

Navigation and Help

Select your LGA:
Snowy Valleys

Reporting year
All

Degree of crash
Multiple values

Type of crash
All

Speed limit
All

RUM code group
All

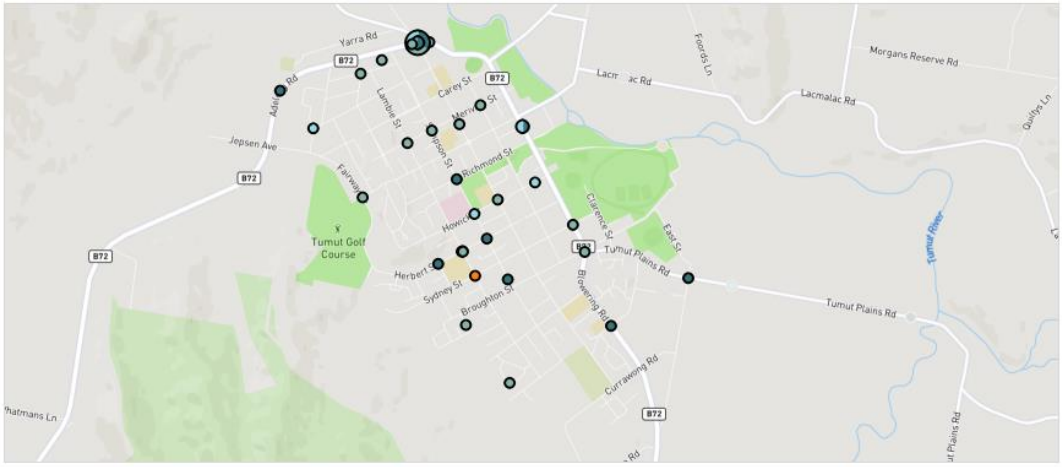
Type of location group
All

Speeding involved in crash
All

Fatigue involved in crash
All

Road classification
All

DATA AVAILABILITY
Finalised data is available for the 5 year period 2013 to 2017.
..



Degree of crash
Fatal | Serious Injury | Moderate Injury | Minor/Other Injury

Reporting ..	Crash ID	Degree of crash	RUM - code	RUM - description	Type of location	Natural lighting	Longitude	Lattitude	No Killed	No Injure
2013	823804	Minor/Other Inj..	10	Cross traffic	X-intersection	Daylight	148.215652	-35.294993	-	1
	825726	Minor/Other Inj..	10	Cross traffic	X-intersection	Daylight	148.220929	-35.30797	-	1
	835526	Moderate Injury	71	Off rd left => obj	X-intersection	Darkness	148.219855	-35.310827	-	1
	839879	Moderate Injury	10	Cross traffic	X-intersection	Daylight	148.214701	-35.3026	-	1
	840934	Serious Injury	10	Cross traffic	X-intersection	Daylight	148.222086	-35.309839	-	1
	842383	Serious Injury	66	Object on road	X-intersection	Dawn	148.233635	-35.316451	-	1
	847079	Serious Injury	73	Off rd rght => obj	T-junction	Daylight	148.217561	-35.311753	-	1
	847083	Minor/Other Inj..	30	Rear end	T-junction	Daylight	148.225399	-35.301344	-	1
	849453	Serious Injury	73	Off rd rght => obj	2-way undivided	Dawn	148.224032	-35.312931	-	1

ANNEXURE C

Road safety audit

Snowy Mountains Highway Haul Route

Road Safety Audit

Audit Stage: Existing Conditions

Report for: Snowy Hydro Ltd

SAFE SYSTEM SOLUTIONS

ROAD SAFETY · AUDITING · ENGINEERING · PROJECT DEVELOPMENT

snowy hydro

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Information page

DATE: 10/9/2019

CLIENT: Snowy Hydro Ltd

PROJECT NUMBER: S20190286

FRONT
COVER

QUALITY RECORD:

Issue	*Date*	*Description*	*Prepared By*	*Reviewed By*	*Approved By*
1	9/9/2019	Draft RSA	Max McCardel Domenic Gangi	Kenn Beer	
2	10/9/2019	RSA	Max McCardel Domenic Gangi	Kenn Beer	

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ACN: 164 341 084 ABN: 98 164 341 084 Industry Code: 99994
Professional Indemnity Insurance Policy Number: 83CON1007716
Public Liability Insurance Policy Number: 15T2402729
Victorian WorkCover Policy Number: 14074213

1. Executive Summary

Safe System Solutions Pty Ltd has been engaged by Snowy Hydro Ltd to undertake an Existing Conditions Road Safety Audit (RSA) for Snowy Mountains Highway Haul Route.

The "Snowy 2.0" project will mean there will be additional Heavy Vehicles (HVs) operating on the road network to transport construction materials, precast elements and plant. 'Future Generation JV, the appointed Contractor for the project, have identified a haulage route to enable this transportation of goods.

This RSA exclusively focusses on the effects on road safety with increasing the volume of Heavy Vehicles for the transport of precast concrete segments along the proposed haulage route.

A number of issues have been identified associated with the following areas which require further investigation and consideration:

a) Redundant railway signage
b) Redundant infrastructure
c) Angled parking
d) Pedestrians
e) Cooma Creek Bridge
f) Roundabouts
g) Kosciusko intersection
h) Tantangara intersection
i) Road standard
j) Absence of linemarking
k) Steep drop-offs
l) Road geometry
m) Road pavement
n) Barrier systems
o) Overtaking opportunities
p) Wildlife

These are detailed in Table of the Road Safety Audit report.

2. Table of contents

3. List of Abbreviations

HV	Heavy Vehicle
RSA	Road Safety Audit
SMH	Snowy Mountains Highway

4. List of Tables

5. Background

a) Safety Audit Procedure

A road safety audit is a term used internationally to describe an independent review of a road project or existing road to identify any safety or performance concerns. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement. The team also considers other factors that are relevant to the existing site.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc.) or an existing road, carried out by an independent qualified team who identify and document road safety concerns. The objective of a Road Safety Audit is to provide reasonable (but not absolute) assurance that potential, foreseeable hazards for all road users when a road is operational which may result in injury (in particular fatal and serious injury) are identified.

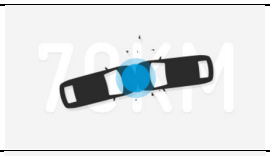
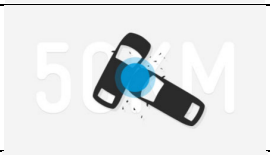
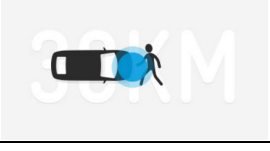
A road safety audit is intended to help deliver a safe road system and is **not** a review of compliance with standards.

b) The Safe System

The Austroads Guide to Road Safety Part 6 (2019): Managing Road Safety Audits states that: *"for any project, there is a responsibility on the road authority to maximise alignment with Safe System principles".* The Guide continues to offer two methods for achieving this:

1. Undertake a Safe System Assessment in the early stages of the project.
2. Integrate Safe System principles into the Road Safety Audit process.

Table 1: Safe System Kinetic Energy

	Crash Type	Tolerable (10%) Speed (passenger vehicle)
	Head-On	~70km/h
	Side Impact (90°) Side Impact (45°)	~50km/h ~60km/h
	Side Impact into Point Source Hazard (eg. Tree, Power Pole)	30 – 40km/h
	Pedestrian, Cyclist, Motorcyclist	~30km/h

Source: Austroads (2018).

This RSA has been undertaken to conform with AGRS Part 6: Managing Road Safety Audits (2019). As such, an assessment has been undertaken for each RSA finding to determine if the kinetic energy associated with the possible crash is above tolerable levels (as set out above). Also, each recommendation has been categorised into one of the Austroads Safe System treatment categories described in Table 2 below.

Table 2: Safe System Treatment Categories

Primary	Road planning, design and management considerations that practically eliminate the potential of fatal and serious injuries occurring in association with the foreseeable crash types.
Supporting (step towards)	Road planning, design and management considerations that improve the overall level of safety associated with foreseeable crash types, but not expected to virtually eliminate the potential of fatal and serious injury occurring. Improves the ability for a Primary Treatment to be implemented in the future.
Supporting	Road planning, design and management considerations that improve the overall level of safety associated with foreseeable crash types, but not expected to virtually eliminate the potential of fatal and serious injury occurring. Does not change the ability for a Primary Treatment to be implemented in the future.
Non-Safe System Other Elements	Road planning, design and management considerations that are not expected to achieve an overall improvement in the level of safety associated with foreseeable crash types occurring. Reduces the ability for a primary treatment to be implemented in the future.

Source: Austroads (2018a).

c) The Safety Audit Team

Road Safety Audits are undertaken in teams of two or more, with at least one Senior Road Safety Auditor. The team consisted of:

Table 3: Road Safety Audit Team

Senior Road Safety Auditors	Road Safety Auditor
Domenic Gangi Safe System Solutions Pty Ltd **Kenn Beer** Safe System Solutions Pty Ltd Level 3	**Max McCardel** Safe System Solutions Pty Ltd

d) Site inspections and meetings

A list of site inspections and meetings associated with this Road Safety Audit is provided in the table below:

Table 4: Inspection and meetings

Activity	Location	Date	Time
PRE-AUDIT MEETING	Snowy Hydro Office, Cooma	05.09.209	1000
DAYTIME SITE INSPECTION	Snowy Mountains Highway Haul Route	05.09.209	1200
NIGHTTIME SITE INSPECTION	Snowy Mountains Highway Haul Route	05.09.209	1800

e) Audit process

This Road Safety Audit has been conducted in accordance with the procedures set out in the *Austroads Guide to Road Safety Part 6: Managing Road Safety Audits (2019)* and *Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits (2019)*. A review of the site has been completed to identify issues that affect road user safety and other relevant issues. The auditors cannot guarantee that every issue that affects road user safety has been identified. Although the adoption of the audit recommendations will improve the level of safety of the site it will not, however, eliminate all the road user safety risks.

Road Safety Audits are a formal process and the audit findings and recommendations should be documented by the client in writing. If recommendations are not accepted by the client then reasons should be included within the written response. A client is under no obligation to accept all the audit findings and recommendations and should consider these in conjunction with all other project considerations. It is not the role of the auditor to approve the client's response to an audit.

f) Risk assessment

The potential road safety problems identified have been ranked as follows:

A risk rating based on the **likelihood** of a crash occurring as a result of the deficiency together with the potential **consequence** of that crash.

The risk ratings adopted are:

- ⇒ **Intolerable**
- ⇒ **High**
- ⇒ **Medium**
- ⇒ **Low**

Tables 6 to 8 below show the risk rating process.

Table 5: Likelihood of a crash (Austroads, 2019)

Frequency	Description
Frequent	Once or more per week
Probable	Once or more per year (but less than once a week)
Occasional	Once every five to ten years
Improbable	Less often than once every ten years

Table 6: Likely severity of a crash (Austroads, 2019)

Severity	Description	Examples
Catastrophic	Likely multiple deaths	- High speed, multi-vehicle crash on a freeway - Car runs into crowded bus stop - Bus and petrol tanker collide - Collapse of a bridge or tunnel
Serious	Likely deaths or serious injury	- High or medium speed vehicle/vehicle collision - High or medium speed collision with a fixed roadside object - Pedestrian or cyclists struck by a car
Minor	Likely minor injury	- Some low speed vehicle collisions - Cyclist falls from bicycle at low speed - Left-turn rear-end crash in a slip lane
Limited	Likely trivial injury or property damage only	- Some low speed vehicle collisions - Pedestrian walks into object (no head injury) - Car reverses into post

Table 7: Resulting level of risk (Austroads, 2019)

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

6. Scope of Audit

This Road Safety Audit has been commissioned to independently examine the road safety issues for the proposed haulage route that is to be used for the transport of precast concrete segments to be manufactured at the Polo Flat Site and used to line the tunnels that make up Snowy 2.0 Main Works. The haulage route commences at the proposed vehicular ingress/egress at Polo Flat Road into the precast segment factory and ends at the Link Road intersection with Lobs Hole Ravine Road at the perimeter of the Snowy 2.0 Main works construction site within Kosciuszko National Park. Tatangara Road which intersects the Snowy Mountain Highway will also be used as a haulage route.

This road safety audit is a requirement of the Secretary's Environmental Assessment Requirements (SEARs) for separate Environmental Impact Assessments for the Snowy 2.0 Main Works project and an associated pre-cast concrete segment manufacturing factory proposed for a site off Polo Flat Road at Cooma. The roads that define the haul route inclusive of their posted speed are summarized in

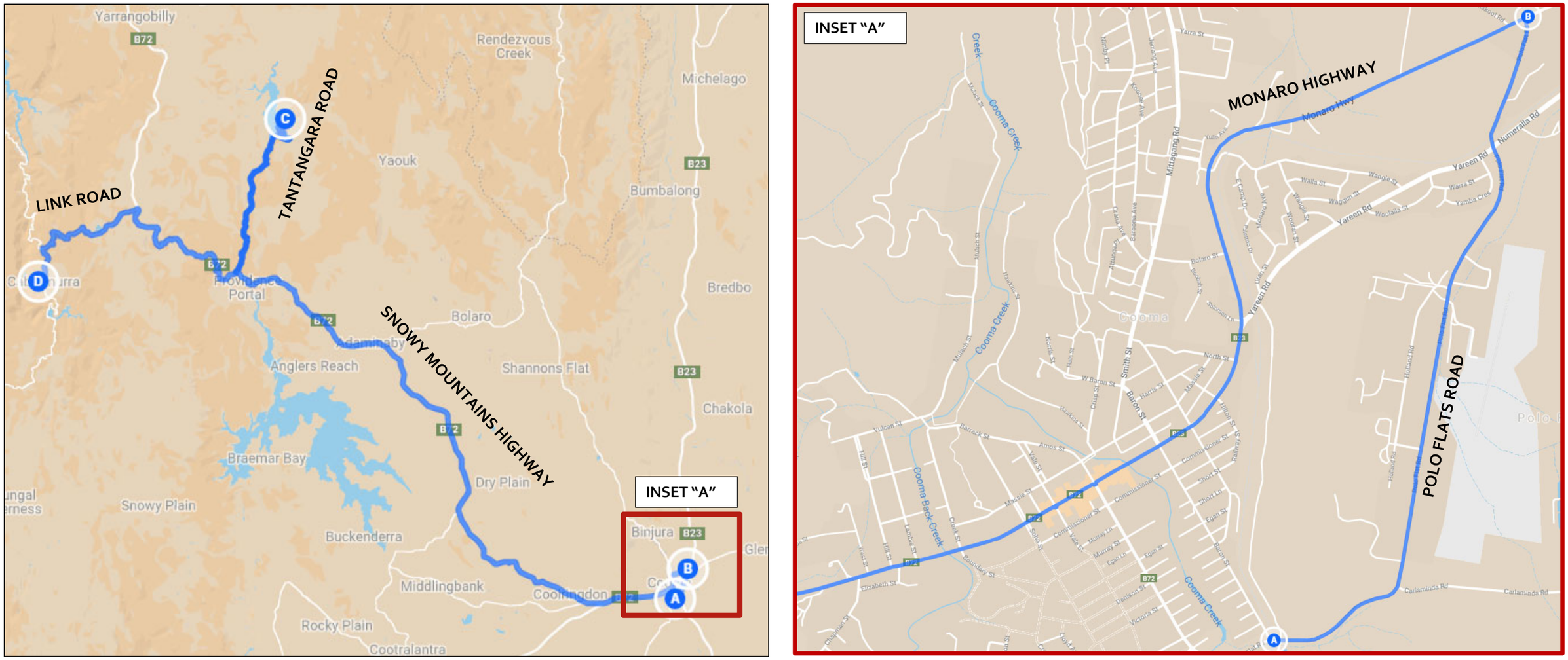
The Audit will consider the existing road geometry and cross section, intersections and property accesses, road signage, safety barriers, delineation and clear zones. The aim of the audit is to identify any potential road safety issues associated with hauling precast elements along the route. It will consider the route for haulage of precast elements and the implications that the haulage will have for other road users. It is not intended that the audit be a detailed review of all roads and intersections along the route and associated safety concerns for all road users under normal operation of the roads.

Table 9: Likely severity of a crash (Austroads, 2019)

Road Name	Posted speed	Segment Length
Polo Flat Rd	60-80 km/h	3km
Monaro Hwy	40-100 km/h	3km
Sharp St (Hilton St to Montague St)	60 km/h	2.5km
Snowy Mountains Hwy	80-100 km/h	88km
Link Rd	40-80 km/h	8km
Tantangara Rd	100 km/h*	16km

**default rural speed limit unposted*

Figure 1: Map of audit location (source: Google My Maps)



7. Audit Findings and Recommendations

The findings and recommendations of the Road Safety Audit can be found in Table 9 below.

Table 10: Audit Findings

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
a) Polo Flats Road					
REDUNDANT RAILWAY SIGNAGE: i. Along Polo Flats Road there is a railway crossing that is no longer active. Yet at this location, the railway signage is still present including the "GIVE WAY" sign. Vehicles travelling along this road may slow at the railway crossing, expecting to give way, which could lead to potential rear-end type crashes.  **SOURCE:** S2-8700-REP-000001-A	Improbable Minor **Low**	Below tolerable	Consider removing redundant signage including (S): • Railway Crossing signs • Give Way Signs • "Reduce Speed Residential Area" – This appears to be a non-standard sign.		

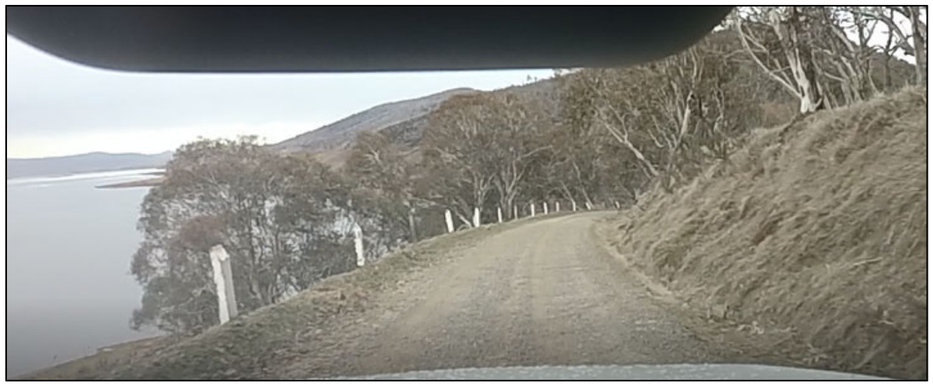
Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
REDUNDANT INFRASTRUCTURE: ii. Along Polo Flats Road, near the Baron Street intersection, there is an existing timber rail bridge. There is a low clearance for the bridge structure of 4.1m. Also, the timber piers are unprotected. A Heavy Vehicle colliding with either the top of the rail bridge or one of the timber piers could potentially collapse the structure. It is assumed that this is a non-active rail bridge. 	Improbable Serious **Medium**	Below tolerable	A Construction Access Management Plan should be created to inform Heavy Vehicle drivers of the low clearance at this location (S) The rail bridge bridge piers should be shielded with approved road safety barriers and crash cushions on either end and installed to an approved design that includes specifications such as the number of barriers, deflection and the offset from kerb or pavement.		
b) Sharp Street (Cooma Town Centre)					
ANGLED PARKING: i. Along Sharp Street there is angled parking. This parking geometry means that vehicles exiting their park need to creep out to improve their sight distance. Whilst cars are reversing out of their spot, there is an opportunity for rear-end crashes to occur with the through traffic. 	Improbable Minor **Low**	Below tolerable	It is recommended to investigate whether the angled parking along Sharp Street can be remarked to parallel parking bays. This improves sight distances for vehicles exiting their parks. (S) If this can not be achieved, investigate a line marking scheme that encourages drivers to leave a buffer between the reverse parked vehicles. (S)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
PEDESTRIANS: ii. The strip shopping centre environment increases the likelihood of pedestrian jay-walking. A crash involving a pedestrian and fully-laden Heavy Vehicle has the potential to result in serious/fatal outcomes – even in a low speed environment.  The below is an example of a crossing point and pedestrian refuge near Lambie Street:  	Improbable Serious **Medium**	Above tolerable	It is recommended to review all the formalised crossing points along Sharp Street and to improve their road safety performance. (S) A variety of Local Area Traffic Management devices could be employed to improve the road safety performance of these crossing points. A non-exhaustive list of treatments includes: • Narrowing the road environment (S) • Increasing sight line distances (S) • Zebra crossings or wombat (raised) crossings (S) • Kerb outstands (S) • Chevron pavement marking (S) • Pedestrian Fencing In addition to the above physical infrastructure treatments, consider reducing the speed throughout the town centre. (S)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
COOMA CREEK BRIDGE: iii. The Cooma Creek Bridge has non-standard features including: a. The vertical face of the concrete barrier. This is a rigid, fixed object. Should an errant vehicle collide with this vertical edge, there would be rapid deceleration increasing the impact force on the occupants. b. The concrete barrier tapers from kerb height (approx. 100mm) to approx. 500mm. Should a vehicle leaving Cooma mount the barrier on the bridge, then travel along the concrete barrier system (one side of the vehicle on the barrier and the other on the road pavement) this could potentially lead to a roll-over crash. c. The existing bridge containment appears to be pedestrian parapet and would be unlikely to contain an errant Heavy Vehicle. A Heavy Vehicle that loses control at this site, could drive through the containment system and fall into the creek below.  **SOURCE:** S2-8700-REP-000001-A	Improbable Serious **Medium**	Below tolerable	Consider measures to improve the road safety of the structure and approach. This would require a detailed design and consideration of the best energy absorbing and redirecting barrier or other systems. (P or S)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
c) Snowy Mountains Highway					
KOSCIUSKO INTERSECTION: i. The Snowy Mountain Highway continues straight onto Kosciusko Road. To continue on the SMH, a vehicle needs to turn right using the Channelised Right Turn facility. This right turn has restricted sight lines due to the crest of the road. This restricted sight line increases the likelihood of HVs not seeing an oncoming vehicle and therefore the likelihood of cross-traffic type crashes. In addition, the Channelised Right Turn facility appears to have a short deceleration lane with inadequate space for additional storage. As HV will be turning right here as part of the haul route, inadequate deceleration lanes and lack of storage could lead to rear-end type crashes. 	Improbable Serious **Medium**	Above tolerable	It is recommended to verify the sight lines currently being achieved at this intersection. Depending on how poor the sight lines are, various treatments could be adopted including: • Relocation of the existing 80km/h signage facing eastbound traffic further west • Reducing the speed (S) • Additional signage to advise of the approach to the intersection (S) • Regrading the road to remove this crest (P) It is recommended to review and redesign the Channelised Right Turn facility to increase the distance of the deceleration lane and provide additional storage. (S)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
TANTANGARA INTERSECTION: ii. At the Tantangara Road intersection, the sight lines are restricted due to the horizontal and vertical geometry along Snowy Mountains Highway. This may mean a HV exiting the minor road may not be able to see a vehicle travelling on SMH and the vehicle would need to brake to let the HV in or manoeuvre around the HV. This could lead to a collision with the HV or with oncoming traffic. Also, a HV turning right into Tantangara Road needs to hold up the through-traffic lane. This increases the risk of a rear-end crash. 	Improbable Serious **Medium**	Below tolerable	As the HV traffic movements are anticipated to be high at this location, it is recommended to consider the installation of a Channelised Right Turn on SMH to enable vehicles to overtake the HVs turning right into Tantangara Road. (S) It is also recommended to consider implementing a reduced speed limit or warning for when HVs are exiting Tantangara Road. This could be achieved using a detector loop on the exit, and electronic speed limits that are only activated when the HV triggers the loop. Dropping the speeds will improve reaction times and inform drivers as they approach the intersection that something has changed in the road environment (a HV is entering SMH and still gaining speed). (S)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
d) Tantangara Road					
ROAD STANDARD: i. Tantangara Road is currently an unsealed narrow road that has substandard horizontal and vertical curves as well as numerous locations where there are unshielded roadside hazards. Being unsealed leaves the road surface more prone to potholes and reduces the amount of grip / traction. All these factors lead to an increased likelihood for run-off road and head-on collisions. 	Improbable Minor **Low**	Below tolerable	It is recommended that the delineation of the route be improved through: • Curve warning signs with advisory speed (as required) (S) • Curve Alignment Markers (S) • Guide Posts (S) It is also recommended to install barrier systems where there are significant drop-offs or fixed hazards adjacent (or remove the hazard) (S) A swept path check along the route is also recommended to ensure that two semi-trailers will be able to pass one another. Alternatively, implement a process for construction drivers to advise one another via CB radio if they are about to enter a location that is too narrow for two semi-trailers and that a holding bay/area is in place to allow for passing. Signage on the road can be used to indicate areas where communication between drivers will be required.		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
e) Link Road					
ABSENCE OF LINEMARKING: i. There is an absence of linemarking on Link Road – due to the reduced carriageway width. Linemarking plays a key role in delineating a road environment, particularly highlighting where the edge of the road ends and where opposing traffic lanes are separated. Lack of delineation increases the risk of run-off road crashes and head-on crashes.   	Improbable Serious **Medium**	Below tolerable	Typically for road widths less than 5.5m the road centreline is not marked unless there is high HV traffic or frequent substandard curves. To improve delineation of the road environment, it is recommended: • Installing additional snow poles / guide posts – also taking note that around sharp curves the spacing of the posts should be adjusted (S) • Installing additional warning signs of upcoming curves combined with advisory speeds as required (S) • The centreline be marked where appropriate In addition to the above, it is recommended to implement a reduced speed limit (S) A swept path check of the radii should be undertaken at each small radius curve to ensure two semi-trailers will be able to pass one another. A preliminary check at one curve has shown that at 50km/h semi-trailers will be able to pass but may slightly encroach on the shoulder. Ensure that the shoulders are always maintained in a trafficable condition.		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
f) General					
STEEP DROP-OFFS: i. Along the haul route there are a several examples where steep drop-offs are unshielded. An errant vehicle travelling at these locations may leave the carriageway and descend down steep batters and potentially rolling-over or colliding with fixed hazards (trees) 	Improbable Serious **Medium**	Above tolerable	Consider installing barrier systems at the highest risk locations to shield errant vehicles from the roadside hazards. (P)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
ROAD GEOMETRY: *ii.* Along the haul route, substandard horizontal and vertical geometry exists. While there are several examples of "Curve Warning" with advisory speed signs along the route, there is further improvement potential along the route where these warning signs could be implemented. The winding nature of this route means there is horizontal and vertical geometry that restricts sights lines. Warning signs inform drivers of the upcoming restricted sight line environment and enables them to adjust their driving to suit conditions. Without these signs, there is an increased potential for run-off road crashes to occur.   	Improbable Serious **Medium**	Above tolerable	It is recommended to undertake a full review of the haulage route with respect to the road geometry and sight lines and swept paths around curves with a check against required curve widening. It would be expected that this review would recommend implementing new warning signs (curve warning signs, curve alignment markers, crest signs, curve widening etc.). (S)		

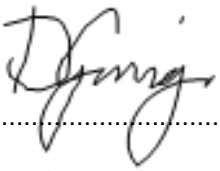
Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
ROAD PAVEMENT: iii. With the introduction of more HVs, the condition of the road pavement would be expected to deteriorate more rapidly. Roads in poor condition can lead to potholes, reduced grip and traction and an increased risk for vehicle loss of stability. The road pavement condition impacts on the likelihood of a crash occurring.	TO NOTE		It is recommended to implement a system to allow HV drivers (and other Snowy Hydro Ltd staff) to report any significant pavement defects. This would enable for patching works to be completed in a timely manner. (S) It is also recommended to conduct routine inspections of the haul route to identify weaknesses in the pavement and to remedy this before more significant defects occur. (S)		
BARRIER SYSTEMS: iv. There are a variety of containment systems implemented along the haul route. It is unclear from the site inspection whether the containment systems are graded to be able contain Heavy Vehicles in the high-speed environment. If the containment system fails, an errant HV could break through the barrier and be exposed to significant roadside hazards (large drop offs, bodies of water, fixed objects etc.)  	Improbable Serious **Medium**	Below tolerable	It is recommended to undertake a full review of the haulage route with respect to the existing containment systems. It would be expected that this review would recommend replacing lengths of barrier systems to shield errant Heavy Vehicles. (S)		

Audit Findings	Level of Risk	Safe System Energy	Recommendations P – Primary ST – Step Towards S – Supporting N – Non-Safe System	Responsible Officer Accept Yes/No	Responsible Officer Comments
					
OVERTAKING OPPORTUNITIES: v. There is an approximately 75km length along SMH where there are no dedicated overtaking lanes. This significant length increases the likelihood of vehicles overtaking by using the oncoming traffic lane. Overtaking in this manner increases the likelihood of head-on collisions.	Improbable Serious **Medium**	Above tolerable	It is recommended to investigate whether additional overtaking lanes can be constructed along SMH. (S) It is recommended to provide HV drivers a map of the pull-over areas / chain fitting bays to use and let traffic pass them. NOTE this recommendation is only appropriate if these areas have adequate deceleration / acceleration distances and sight lines for the HV to safely exit and re-enter the through lane. (S)		
WILDLIFE: vi. During the site inspection, high levels of dead wildlife was observed lying on the shoulders / adjacent the live carriageway. Colliding with animals in high-speed environments can lead to further collisions with run-off road crash types typically occurring. If an animal is left on the live carriageway, HVs may run over the animal causing instability or choose to swerve to avoid the animal potentially leading to head-on crashes.	Improbable Serious **Medium**	Above tolerable	It is recommended to implement a system to allow HV drivers (and other Snowy Hydro Ltd staff) to report dead wildlife on the road. This would enable for the removal of the animal in a timely manner. (S)		

8. Conclusion

This Road Safety Audit has been conducted in accordance with the procedures set out in the *Austroads Guide to Road Safety Part 6: Managing Road Safety Audits (2019)* and *Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits (2019)*. The site has been inspected and the supporting documentation has been examined. The findings, recommendations and Safe System elements are provided for consideration by the client and any other interested parties.

Auditors:



..... 10.09.2019

Domenic Gangi BEng (Civil)
Senior Road Safety Auditor

..... 10.09.2019

Kenn Beer BEng (Hons), RPEng
Senior Road Safety Auditor (Level 3)

..... 10.09.2019

Max McCardel BEng (Hons)
Road Safety Auditor

Appendix A

Photos

Photo 1: Polo Flats Road, looking south

Photo 2: Sharp Street, looking west

Photo 3: Snowy Mountains Highway, northbound lane

Photo 4: Snowy Mountains Highway, northbound lane

Photo 5: Tantangara Road, looking east

Photo 6: Tantangara Road, looking east

Photo 7: Link Road, heading towards construction site

Photo 8: Link Road, approaching construction site

Photo 9: Link Road, (night)

Photo 10: Snowy Mountains Highway, (night)

ANNEXURE D

Construction traffic volumes

Avg - Polo Flat Only	LV	HV
Monaro Hwy - East of Polo Flat	16	52
Monaro Hwy - West of Polo Flat	156	78
SMH - South of Cooma	16	0
SMH - Cooma	226	0
SMH - SMEC Offices	86	78
SMH - West of Cooma	16	78
SMH - Adaminaby	16	78
Polo Flat North	150	130
Polo Flat South	210	0
Link Rd East	10	36
Link Rd West	0	0
SMH Link to Tantangara	10	36
SMH Link to Marica	0	0
SMH Talbingo to Marica	0	0
To Tumbarumba	0	0
Shannons Flat	0	0

0000 - Baseline LV movments
0000 - Baseline HV movements
0000 - Daily project LV movements
0000 - Daily project HV movements

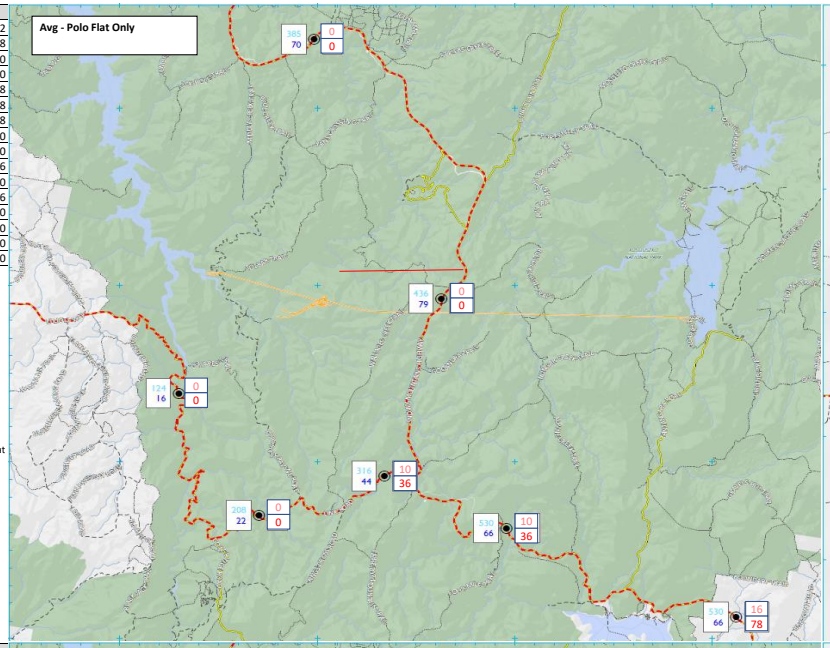
1. Movements shown are one-way only.

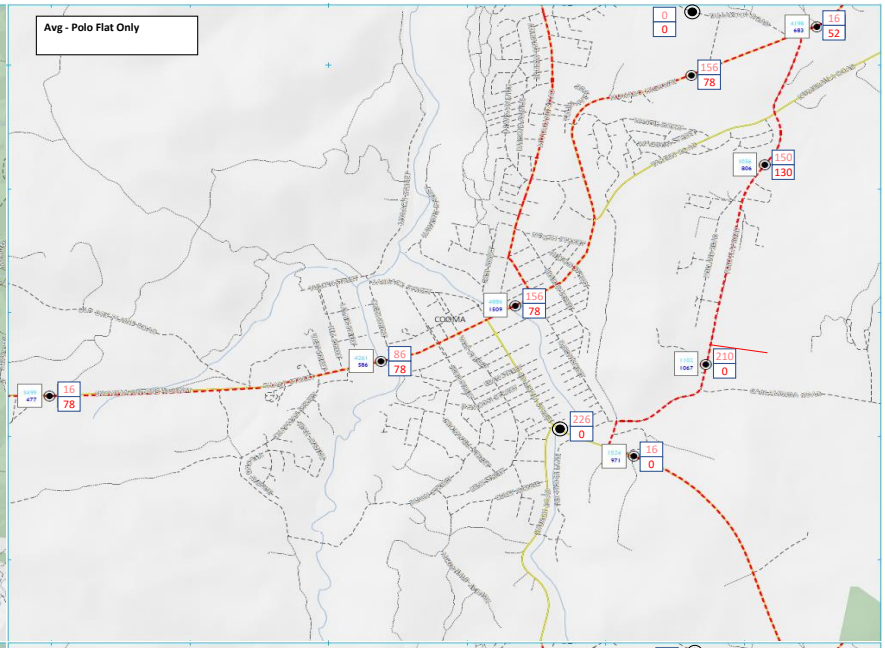
2. Movement numbers are shown only on main access routes. Local workers will use other local roads as appropriate, and project LVs will use local roads to access local business and council offices as required.

3. LV movements include private vehicles for workers at the Polo Flat facility.

4. Average numbers shows approximate average project traffic from Aug 19 to Dec 24. Peak numbers show projected peak movements in a day.

5. Map shows **higher** of FGJV and EMM number.





Peak - Polo Flat Only	LV	HV
Monaro Hwy - East of Polo Flat	26	84
Monaro Hwy - West of Polo Flat	196	132
SMH - South of Cooma	26	0
SMH - Cooma	260	0
SMH - SMEC Offices	110	132
SMH - West of Cooma	30	132
SMH - Adaminaby	30	110
Polo Flat North	194	216
Polo Flat South	266	0
Link Rd East	16	84
Link Rd West	0	0
SMH Link to Tantangara	16	84
SMH Link to Marica	0	0
SMH Talbingo to Marica	0	0
To Tumbarumba	0	0
Shannons Flat	0	0

0000 - Baseline LV movments
0000 - Baseline HV movements
0000 - Daily project LV movements
0000 - Daily project HV movements

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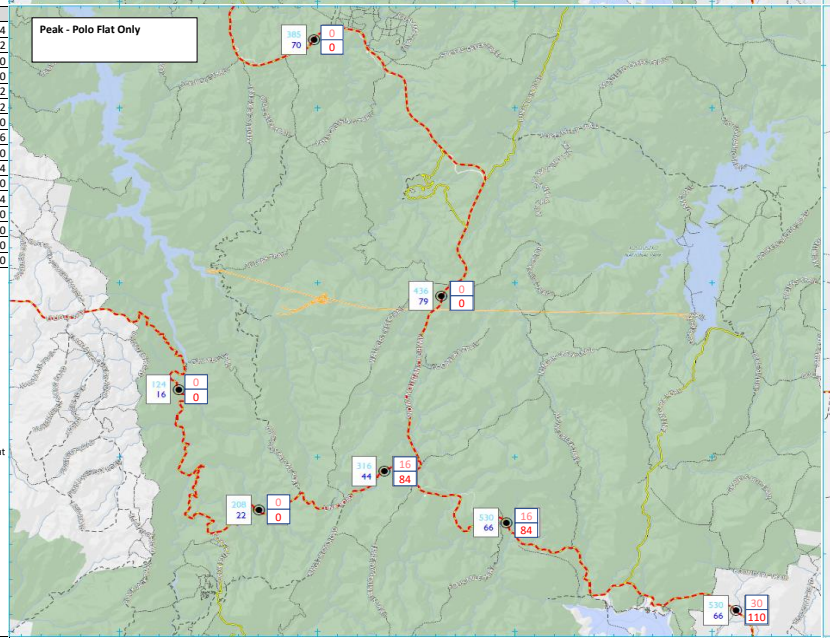

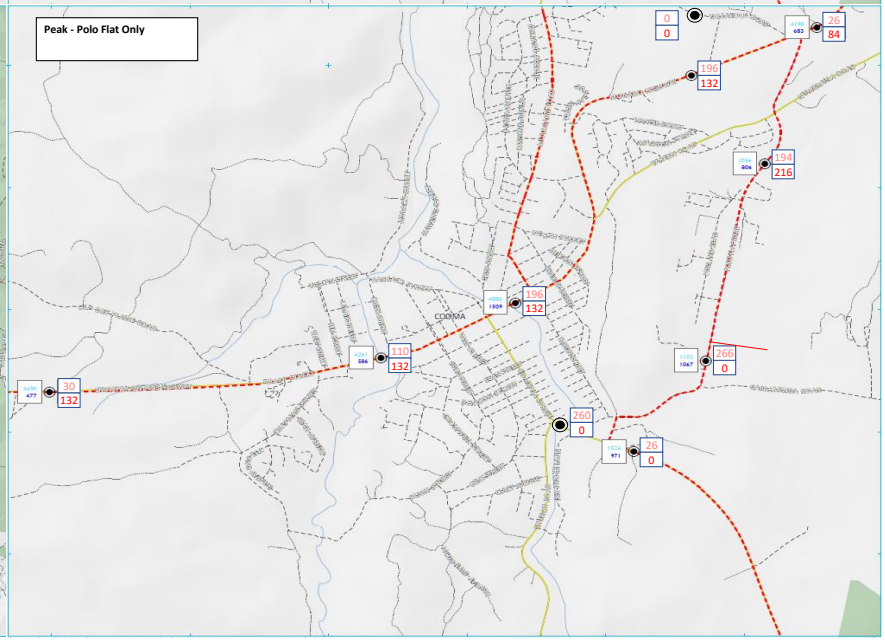

Traffic data on internal movements provided for information only
Based on Rev A data

SCT Consulting