snowy 2.0

EMM
creating opportunities

VOLUME 1

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED SEGMENT FACTORY

September 2019

ENVIRONMENTAL IMPACT STATEMENT

Certification

For submission of an environmental impact statement (EIS) under Part 5, Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

EIS prepared by

Brett McLennan
Bachelor of Town Planning (Hons)

EMM Consulting Pty Limited
Ground floor, 20 Chandos Street
St Leonards NSW 2065

Applicant

Snowy Hydro Limited

Description of development

The construction and operation of a factory to manufacture precast concrete segments to line the tunnels for Snowy 2.0.

Land to be developed

The land to be developed includes:

- 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.

Certification

I certify that the contents of this EIS have been prepared in accordance with Part 5, Division 5.2 of the EP&A Act, Schedule 2 of the NSW *Environmental Planning and Assessment Regulation 2000* and the NSW Department of Planning, Industry and Environment Secretary's Environmental Assessment Requirements issued for the development on 31 July 2019. To the best of my knowledge, it contains all available information that is relevant to the environmental assessment of the development to which the statement relates. The information contained in this EIS is neither false nor misleading.

Brett McLennan
Director
25 September 2019

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CHAPTER 1

INTRODUCTION

1 Introduction

1.1 Overview

Snowy Hydro Limited (Snowy Hydro) owns and operates the Snowy Mountains Hydro-electric Scheme (Snowy Scheme), a large and complex water storage and diversion scheme in the Australian Alps in southern New South Wales (NSW). In March 2017 Snowy Hydro announced a plan to conduct a Feasibility Study into a possible pumped hydro-electric expansion of the existing Snowy Scheme, called 'Snowy 2.0'. The final investment decision (FID) to proceed with Snowy 2.0 was made by Snowy Hydro's Independent Board of Directors on 12 December 2018 following two years of robust market and economic modelling, extensive due diligence and planning. Shareholder approval was subsequently received from the Australian Government on 26 February 2019.

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 increase the pumped hydro-electric capacity of the existing Snowy Scheme by linking Tantangara and Talbingo reservoirs with tunnels and a power station built in between, almost 1 km below the ground.

Snowy 2.0 will increase the generation capacity of the Snowy Scheme by almost 50%, providing an additional 2,000 megawatts (MW) generating capacity, and making approximately 350,000 megawatt hours (MWh) (175 hours of energy storage) available to the National Electricity Market (NEM). When operational, Snowy 2.0 will provide on-demand energy generation and large-scale energy storage; allowing the water to flow from Tantangara Reservoir into Talbingo Reservoir in the generating mode and pumping water out of Talbingo Reservoir (the lower reservoir) to Tantangara Reservoir (the upper reservoir) in the storage mode.

Snowy 2.0 will provide large-scale energy storage and quick-start electricity generation at critical times of peak demand when energy supply is constrained and at times when intermittent renewable energy output is low. Pumping water at times of low electricity demand (ie when there is excess supply) means that Snowy 2.0 will have water ready to use for energy generation at times when consumers need it most. Snowy 2.0 will make efficient use of precious water resources to generate electricity without impacting on downstream water users and environmental flows for the Murray-Darling Basin.

Snowy 2.0 has been declared State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) in accordance with the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The declaration of Snowy 2.0 as a CSSI project acknowledges that the project is critical to the State for environmental, economic or social reasons.

Snowy 2.0 is being developed in two stages. The first stage 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). The Exploratory Works were approved by the former NSW Minister for Planning on 7 February 2019 as a separate project application to DPIE (SSI 9208). Construction of Exploratory Works has commenced.

The second stage 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). Main Works also includes the operation of Snowy 2.0. The EIS for Main Works was submitted to DPIE on 13 September 2019.

1.2 The segment factory

This EIS addresses an ancillary aspect of Snowy 2.0; being a factory that would manufacture precast concrete segments exclusively to line the tunnels being excavated for Snowy 2.0 (the proposed segment factory), including the tunnels being excavated for Exploratory Works and Main Works.

The proposed segment factory would be located on industrial-zoned land in the south-eastern corner of Polo Flat, which is an industrial area located to the east of Cooma. It would contain a concrete batching plant (CBP), a building for the manufacture of precast concrete segments (the precast building), uncovered storage areas for raw material and segments, vehicle parking areas and associated offices and workshops.

Primary inputs for the proposed segment factory include aggregate, sand, cement and rebar steel. Primary outputs include the segments which would be transported to the construction sites of Snowy 2.0 within KNP.

The site of the proposed segment factory can be seen in its regional and local contexts in Figure 1.1 and Figure 1.2.

1.3 Objectives

The objectives of the proposed segment factory are:

- to construct and operate a factory to produce high quality segments to line the tunnels of Snowy 2.0;
- to situate the factory on land that is zoned to facilitate industrial development;
- to maximise the economic and social benefits of the factory in an area proximate to Snowy 2.0;
- to minimise potential amenity impacts of the factory on nearby and surrounding residents; and
- to minimise the potential impacts of the factory on the local environment.

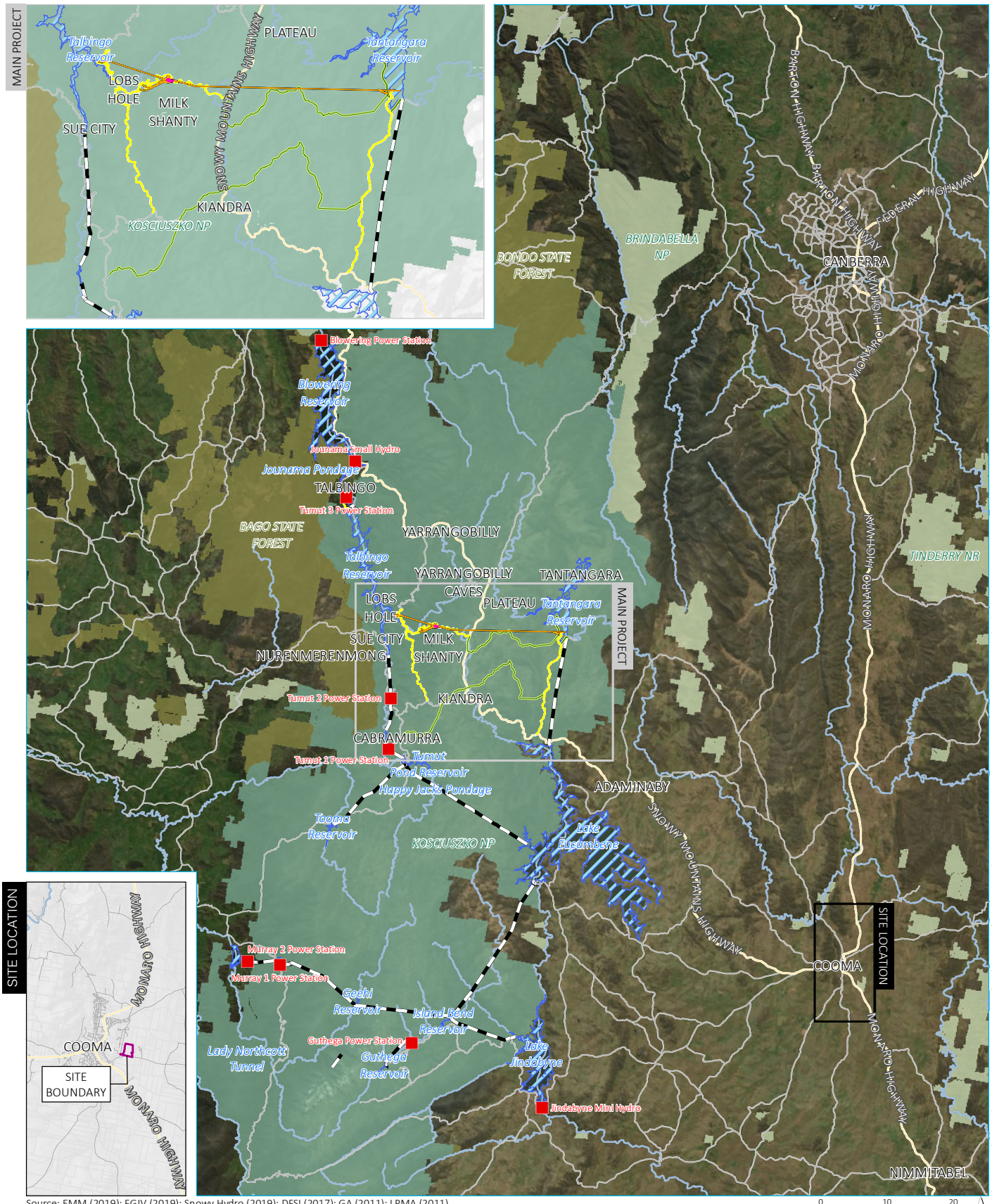
1.4 History

1.4.1 Snowy Scheme

The Snowy Scheme was designed to collect and store water, divert it through trans-mountain tunnels and power stations and then release it west of the Snowy Mountains into the catchments of the Murray and Murrumbidgee rivers. This long-term water regulation was designed to counteract the effects of severe drought sequences and increase agricultural productivity in the Murray Darling Basin (Snowy Hydro 2017). While the diversion of water for irrigation was always part of the original vision of the Snowy Scheme, the engineers were well aware of the potential for the generation of hydro-electricity.

The Snowy Scheme is the largest engineering project ever undertaken in Australia and is one of the largest and most complex hydro-electric schemes in the world. It took about 100,000 workers around 25 years to build, and resulted in many new towns being established. Its construction is seen by many as a defining point in Australia's history, and an important symbol of Australia's identity as an independent, multicultural and resourceful country (Commonwealth Government 2015).

A photograph showing tunnelling during the original Snowy Scheme construction is shown in Photograph 1.1, and construction of Tantangara Reservoir is shown in Photograph 1.2. A photograph of the construction of Tumut 3 power station is shown in Photograph 1.3.



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
Environmental Impact Statement
Proposed Segment Factory
Figure 1.1

snowy2.0

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

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KEY

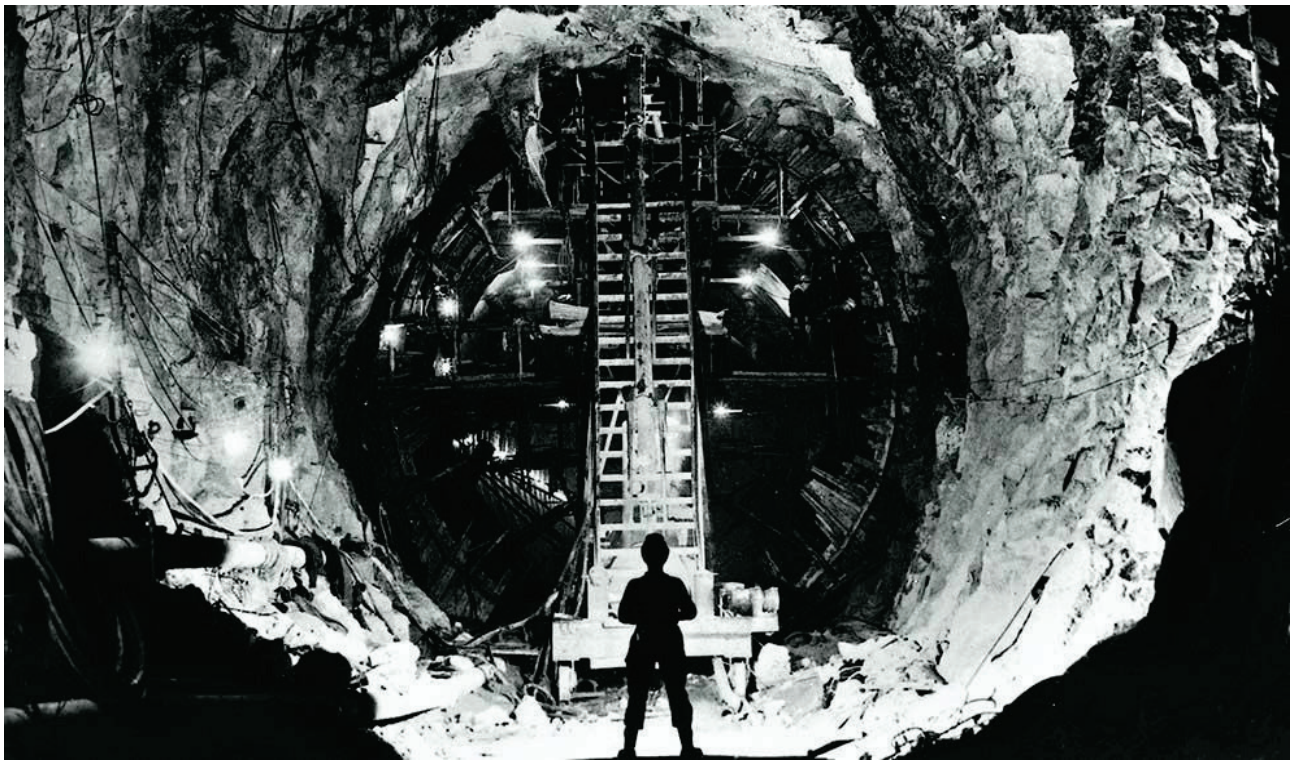
- Site boundary
- Rail line
- Main road
- Local road or track
- Watercourse
- Cadastral boundary
- NPWS reserve

Location of site in local context

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 1.2

snowy2.0

EMM creating opportunities



Photograph 1.1 Worker inside a tunnel constructing the Snowy Scheme

Photograph 1.2 Construction of Tantangara Reservoir – 1959

Source: Cliff Jones

Photograph 1.3 Construction of Tumut 3 power station – circa 1970

1.4.2 The site

The site of the proposed segment factory forms part of a larger parcel of land that contains an airfield that was originally established in 1921 to provide a runway for a visit from Charles Kingsford-Smith.

In 1957, the Snowy Mountains Hydro-electric Authority established a flying unit to service the Snowy Scheme which was headquartered on the site. The Authority began constructing airstrips at several key locations within the mountains, including Jindabyne, Island Bend, Geehi, Blowering, Khancoban, Talbingo, Cabramurra and Eucumbene. The runway at the site was upgraded and facilities such as a terminal building and radio equipment installed. It formed the main and home airfield for the Authority throughout the construction of the Snowy Scheme (Journal of Aviation Historical Society Australia, Vol 18, No 4).

The site was sold by Snowy Hydro in 1998 where it continued use as a private airfield. Snowy Hydro purchased the land back again in early 2019. The airfield continues to be used by private aircraft, including light planes and helicopters.

A photograph of most of Snowy Hydro's aircraft fleet can be seen in Photograph 1.4.

Source: https://www.goodall.com.au/australian-aviation/piaggio-136-166/piaggiop166.html

Photograph 1.4 Most of the Snowy Mountains Hydro-electric Authority's aircraft fleet assembled at Polo Flat in November 1967 – the site can be seen in the background of the photograph

1.4.3 The Snowy Scheme today

The Snowy Scheme plays a critical role in the National Electricity Market (NEM) today and has been modernised and well-maintained over the decades since its construction. Its quick-start dispatchable generation provides energy security and reliability across the NEM at times of high energy demand. It is expected that as the economy continues to decarbonise, the demand for the energy products that Snowy Hydro produce today (such as energy storage, capacity, firming and ancillary services) will increase.

The Snowy Scheme operates predominantly within the KNP under a lease (the Snowy Park Lease) from the NSW Minister for Energy and Environment. The Snowy Scheme consists of:

- 16 major reservoirs with a total storage capacity of 7,000 gigalitres (GL);
- nine power stations;
- one pumping station and one pump storage capability at Tumut 3 power station; and
- 145 kilometres (km) of tunnels and pipelines and 80 km of aqueducts.

The Snowy Scheme has 4,100 megawatts (MW) of existing hydro-electric generating capacity and produces 4,000 gigawatt hours (GWh) on average each year for households and businesses across the NEM. The Snowy Scheme comprises two major developments: the northern Snowy-Tumut Development and the southern Snowy-Murray Development.

The Snowy Scheme operates within the KNP in accordance with the NSW *Snowy Hydro Corporatisation Act 1997* (SHC Act). Part 6, section 37(2) of the SHC Act entitles Snowy Hydro to the grant of a lease, licence, easement or right of way over KNP, for the purposes of the existing Snowy Scheme development. The Snowy Park Lease was granted to Snowy Hydro by the NSW Minister for Energy and Environment in 2002 and has a term of 75 years. Snowy Hydro operates the Snowy Scheme under a stringent water licence administered by the NSW Department of Planning, Industry and Environment (DPIE) that allows for water collection, storage, diversion and release in order to generate electricity.

Tantangara and Talbingo reservoirs are existing water storages within the northern Snowy-Tumut Development of the Snowy Scheme. Snowy Hydro controls the water levels within these reservoirs. The maximum and minimum water levels for reservoirs within the Snowy Scheme are stated in the Snowy Water Licence and referred to as Full Supply Level (FSL) and Minimum Operating Level (MOL), respectively.

1.5 Snowy 2.0

In March 2017 Snowy Hydro announced a plan to conduct a feasibility study (*Snowy 2.0 Feasibility Study*, Snowy Hydro 2017) into a possible pumped hydro-electric expansion of the existing Snowy Scheme, called 'Snowy 2.0'. The final investment decision (FID) to proceed with Snowy 2.0 was made by the Snowy Hydro board on 12 December 2018 following two years of careful and extensive planning. Shareholder approval was subsequently received from the Australian Government on 26 February 2019.

Snowy 2.0 will increase the pumped hydro-electric capacity of the existing Snowy Scheme by linking Tantangara and Talbingo reservoirs with tunnels that will feed a new underground power station. When operational, Snowy 2.0 will function primarily as an energy storage facility; pumping water out of Talbingo Reservoir (the lower reservoir) to Tantangara Reservoir (the upper reservoir) in the storage mode and allowing the water to flow from Tantangara Reservoir into Talbingo Reservoir in the generating mode. This concept is shown in Figure 1.3.

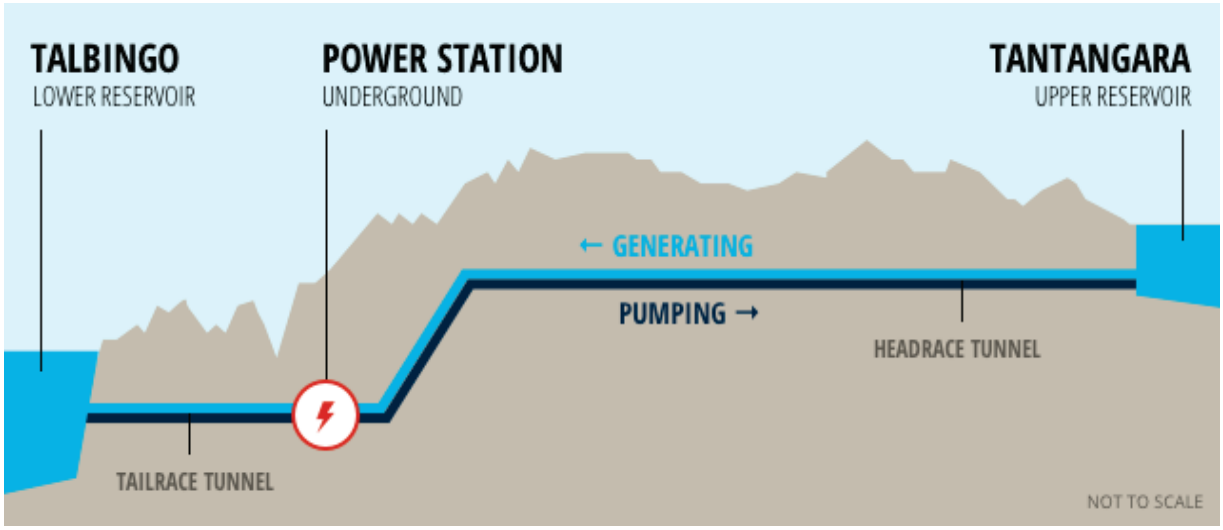


Figure 1.3 Snowy 2.0 pumped hydro concept

Snowy 2.0 will provide large-scale storage of energy that will be available as quick-start electricity generation at critical times of peak demand and when supply is constrained. Pumping water at times of low electricity demand (when there is excess supply) means that Snowy 2.0 will have water ready to use for energy generation at times when consumers need it most. Snowy 2.0 will make efficient use of precious water resources to generate electricity without impacting on the supply of valuable irrigation and town water supplies for the Murray-Darling Basin.

1.6 Alternatives and design development

1.6.1 Alternatives

In developing Snowy 2.0, Snowy Hydro contracted with Future Generation Joint Venture (FGJV) to design and construct Snowy 2.0. Snowy Hydro and FGJV have considered a range of alternative designs, layouts and locations for the proposed segment factory. Some of these were considered during the *Snowy 2.0 Feasibility Study* (Snowy Hydro 2017). Others were the subject of more recent and detailed investigations and resulted in the location of the proposed segment factory at Polo Flat in its proposed layout on the site.

The alternatives and options considered included:

- Within KNP – Snowy Hydro considered siting of the proposed segment factory within KNP at Tantangara Dam to maximise operational efficiencies and minimise the traffic movements associated with the segments, inclusive of material that was proposed to be sourced from within KNP (quarries).
- Overseas – FGJV considered the manufacture of the segments at an existing factory in Malaysia which constructs segments for tunnelling projects in Asia. It was envisaged that these segments would have been transported to Australia via ship to the port of Eden, which is the closest port to the site. In order to receive and unload the segments onto trucks, facilities at the port and some sections of road along the haulage route would have needed to be upgraded.
- Site of an existing quarry – FGJV considered constructing and operating the proposed segment factory at the site of an existing quarry at Culcairn, which is located about half-way between Wagga Wagga and Albury. This site was considered to minimise traffic movements associated with raw materials required (aggregate and some sand) for the segments.
- Private land adjacent to KNP – the construction and operation of the proposed segment factory on private land adjacent to KNP was considered by Snowy Hydro and FGJV to reduce traffic movements associated with the delivery of the segments to the KNP.
- Other sites – several alternative sites, including sites within the Australian Capital Territory (ACT) were considered for the location of the proposed segment factory.

1.6.2 Design development

In developing the layout of the proposed segment factory, an iterative and risk-based design and assessment process was adopted, referred to as a design integration and assessment approach (DIAA). This DIAA process was undertaken with the guiding principles of avoiding and minimising environmental impacts where possible.

The DIAA process can be seen in Figure 1.4.

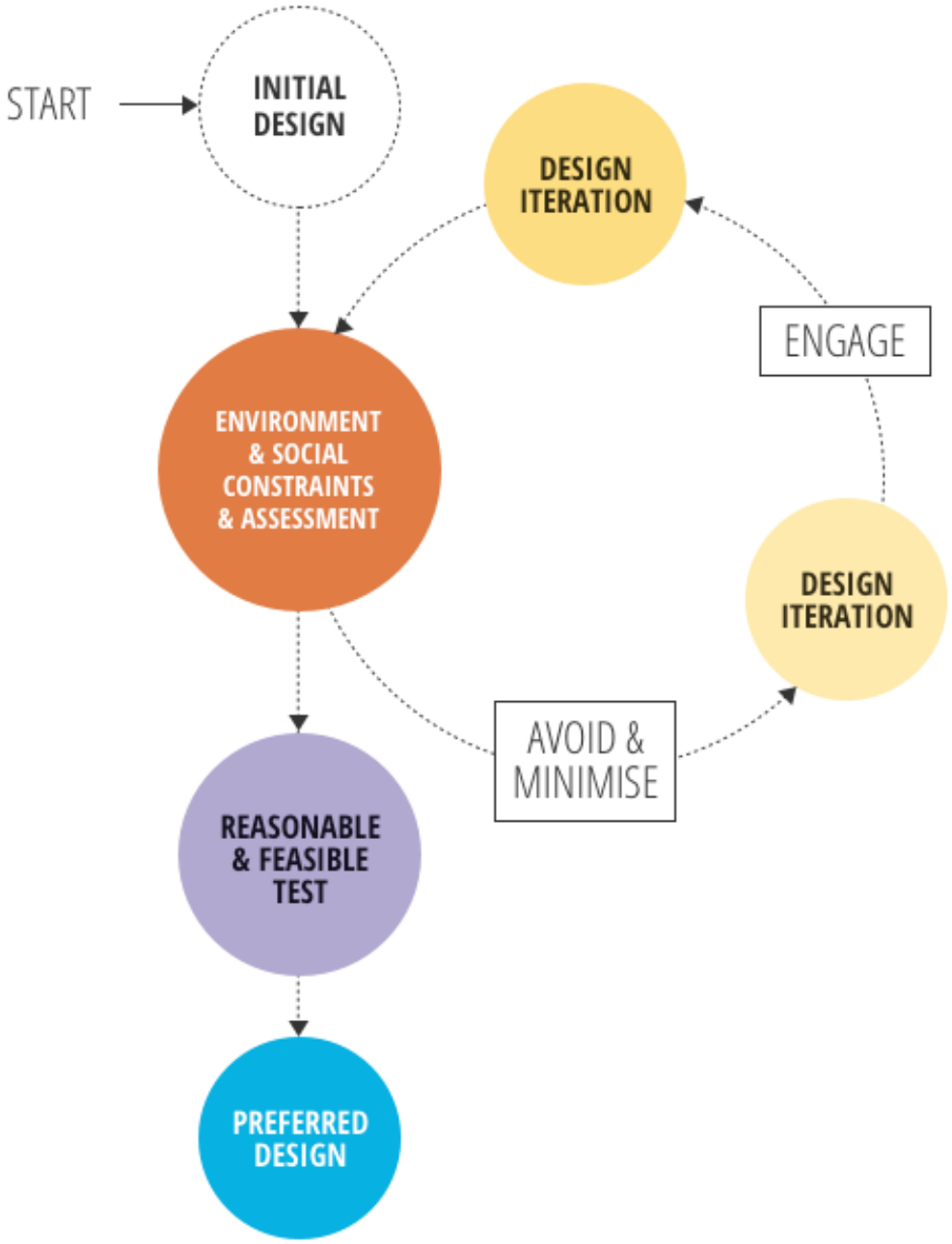


Figure 1.4 DIAA process

As part of the DIAA process, several alternative layouts and configurations at the site were considered by FGJV for the proposed segment factory to maximise the efficiency of the factory but also minimise environmental impacts, particularly impacts on native grasslands and impacts of operational noise on nearby residents.

Some of the key alternative layouts and configurations of the proposed segment factory are discussed further below in Table 1.1.

Table 1.1 Alternative site layouts and configurations

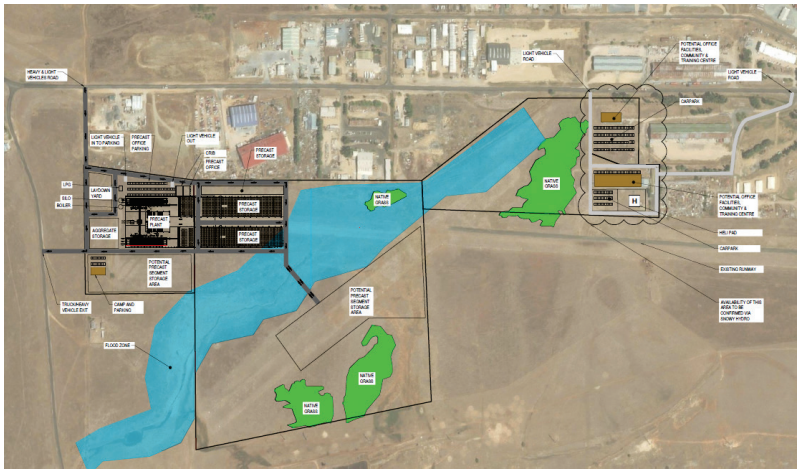
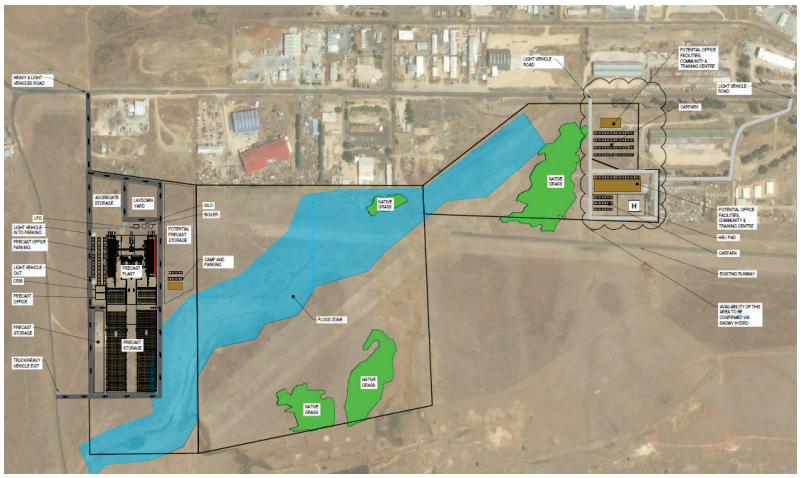
Layout	Description
16 March 2019 - Option 1 	Originally two options for the layout of the proposed segment factory were provided for consideration, including: • Option 1 – where the precast building and storage areas were located in the south-western corner of the site; and • Option 2 – where the precast building and storage areas were located on the southern boundary of the site. Both options included provision of offices and associated facilities in the middle of Lot 14 where the existing hangers are located.
16 March 2019 - Option 2 	

Table 1.1 Alternative site layouts and configurations

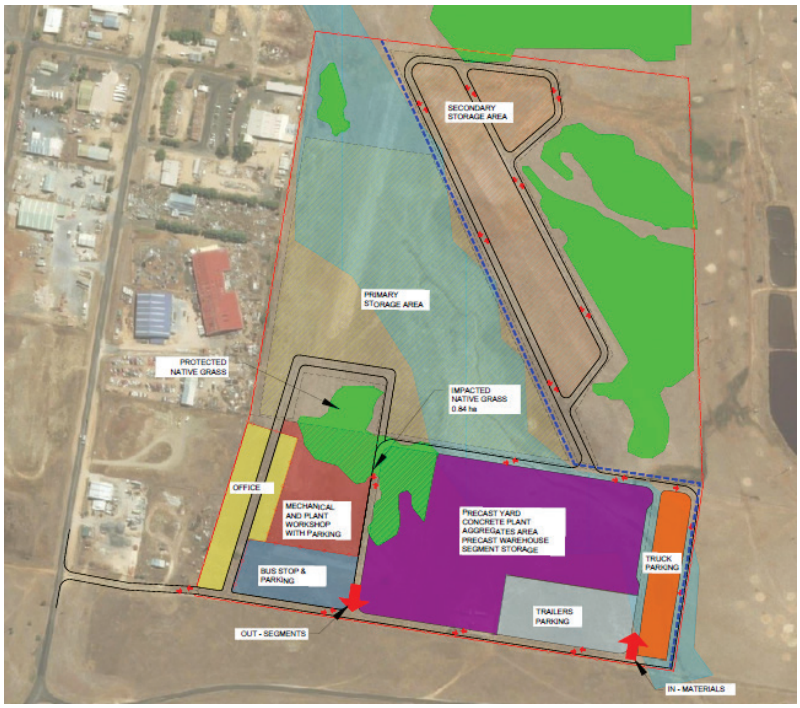
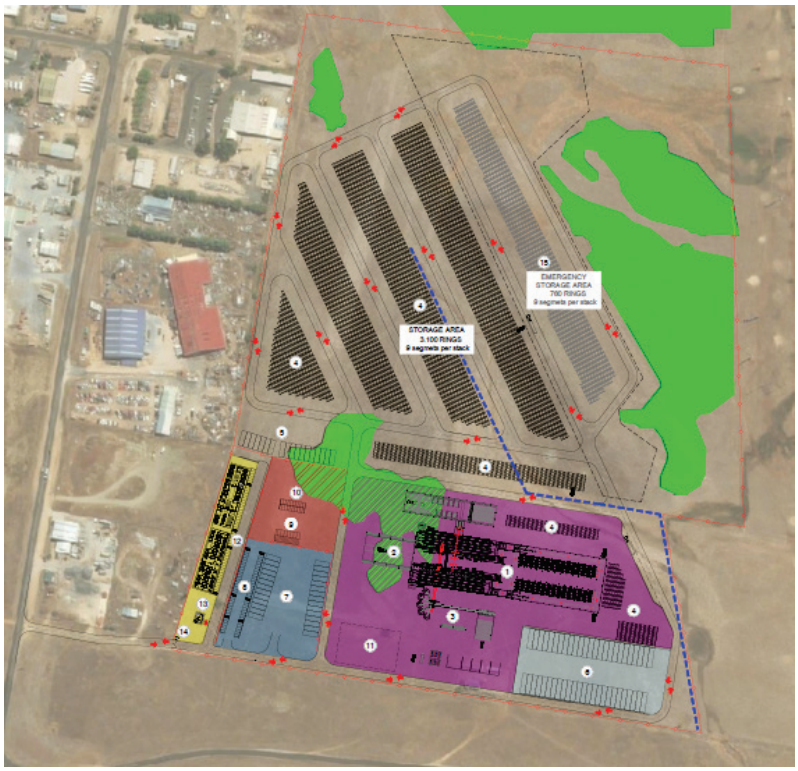
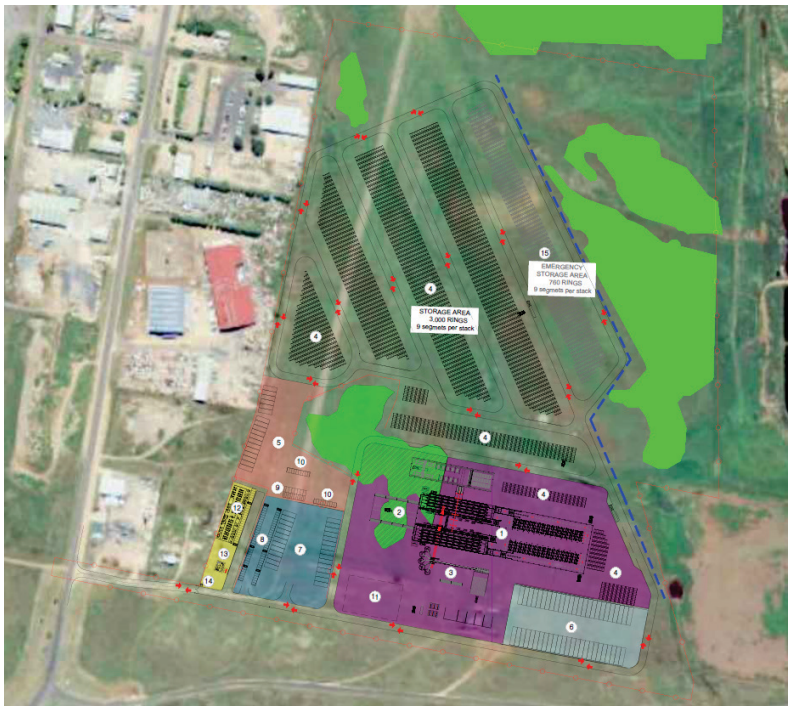
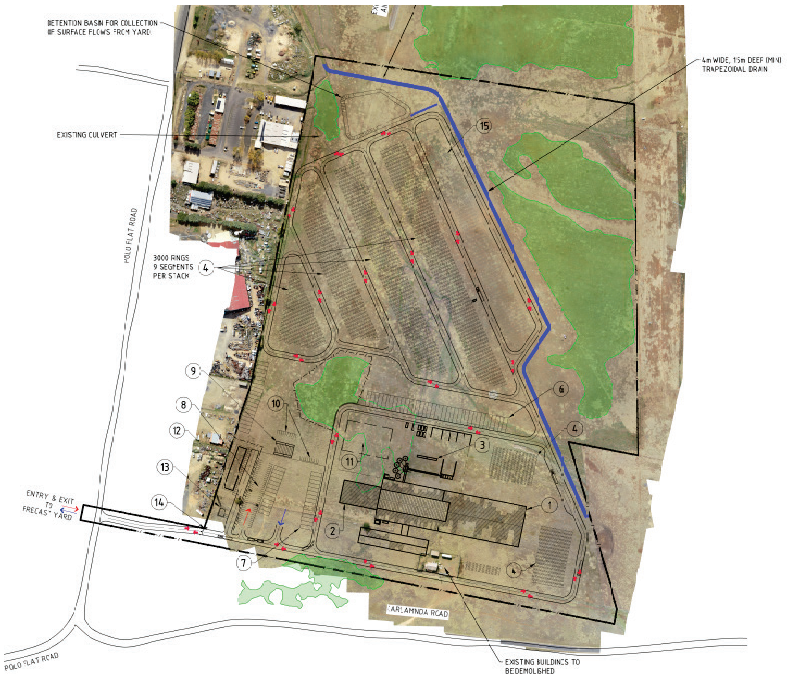
Layout	Description
24 May 2019 	The proposed segment factory was shifted to avoid impacts to higher quality native grasslands in the middle of the site, including moving offices and car parking areas.
19 June 2019 	The layout of the proposed segment factory was amended to contain development on the south-eastern part of the site.

Table 1.1 Alternative site layouts and configurations

Layout	Description
5 July 2019 	The layout of the proposed segment factory was reconfigured to avoid some of the native grasslands in the eastern portion of the site.
5 August 2019 	The layout of the proposed segment factory was amended to minimise potential noise impacts to residents to the south and south-east of the site, including: • enclosure of the CBP; • relocating the CBP and associated infrastructure such as the aggregate and sand stockpiles and bins to the northern side of the precast building; and • relocating the truck parking area in the south-western corner of the site to the north of the precast building.

It should be noted that the DIAA process will continue through to the detailed design of the proposed segment factory.

1.6.3 Summary

Ultimately the site and layout of the proposed segment factory was chosen by the project as it:

- utilises land that is zoned for industrial uses;
- is likely to provide the best opportunities for the local community with regards to direct employment and additional flow on economic benefits from using other local companies and facilities;
- minimises potential environmental impacts of the proposed segment factory, particularly to native grasslands and operational noise to nearby residents;
- is located outside the KNP and therefore reduces the amount of land (and, in turn, amount of clearing) that would otherwise be required in park; and
- minimises travel distance for raw material supply.

1.7 Approval process

1.7.1 New South Wales

Development that is ancillary to Snowy 2.0 falls within the declaration of the 'Snowy 2.0 and Transmission Project' as CSSI under clause 9(6) of Schedule 5 of the SRD SEPP.

Accordingly, the proposed segment factory is CSSI given that it is ancillary to the construction of Snowy 2.0 by providing concrete segments exclusively for the purpose of the Snowy 2.0 project and will be decommissioned upon the conclusion of construction of Snowy 2.0.

As previously stated, an application for CSSI must be accompanied by an EIS and be determined by the NSW Minister for Planning and Public Spaces.

On 19 June 2019, EMM Consulting Pty Limited (EMM), on behalf of Snowy Hydro, submitted a scoping report for the proposed segment factory to DPIE. It was prepared with input from FGJV. The purpose of the scoping report was to request and inform the content of the Secretary's (of DPIE) Environmental Assessment Requirements (SEARs) which specify the requirements for the EIS required to accompany the application for the proposed segment factory.

On 31 July 2019, DPIE issued the SEARs for the proposed segment factory. These SEARs are provided in Appendix A and summarised in Table 1.2.

This EIS has been prepared in accordance with these SEARs.

Further details on the NSW approval process are provided in Chapter 3.

1.7.2 Commonwealth

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation that governs the protection of the environment. Approval under the EPBC Act is required where actions (or proposed actions) undertaken by or on behalf of Commonwealth agencies will have or are likely to have a significant impact on matters of national environmental significance (MNES) or the environment inside or outside the Australian jurisdiction. MNES include World and National heritage properties and places, and Commonwealth listed threatened ecological communities and species.

On 26 June 2019, Snowy Hydro referred the proposed segment factory (Reference Number 2019/8481) to the Commonwealth Minister for the Environment, and on a precautionary basis, nominated that it had potential to have a significant impact on the environment generally. 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 does not require further assessment or approval under the EPBC Act.

A copy of the referral decision notice from DEE is contained in Appendix B.

1.8 Proponent

Snowy Hydro is the proponent of Snowy 2.0 and 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.

The proposed segment factory would be constructed and operated by FGJV on behalf of Snowy Hydro. FGJV has been contracted by Snowy Hydro to construct Snowy 2.0.

1.9 Purpose of this document

This EIS has been prepared by EMM on behalf of Snowy Hydro to support the CSSI application under Part 5, Division 5.2 of the EP&A Act for the proposed segment factory. It has been prepared to the form and contents requirements set out in clauses 6 and 7 of Schedule 2 of the NSW *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and the SEARs. It has also been prepared with consideration of DPIE's *draft Preparing an Environmental Impact Statement Guideline* (DPE 2017).

The primary objective of this EIS is to inform government authorities and other stakeholders about the proposed segment factory and the measures that will be implemented to mitigate, manage and/or monitor potential impacts, together with a description of the remaining social, economic and environmental impacts.

It addresses the specific requirements provided in the SEARs issued by DPIE on 31 July 2019. The SEARs and where they have been addressed in this EIS are provided in Table 1.2 and Appendix A.

Table 1.2 SEARs and where they are addressed

Requirement	Location in EIS
The EIS for the project must comply with the requirements in Schedule 2 of the EP&A Regulation.	
In particular, the EIS must include:	
• a stand-alone executive summary;	Executive summary
• a summary of the background to the project, including the alternatives that were considered to the project;	Section 1.5
• a full description of the project accompanied by suitable maps and plans, including the:	Chapter 2
– disturbance area;	
– physical layout of the project over time, including sections of key components;	
– key uses and activities to be carried out on site;	
– likely timing of the project including any stages, the key phases within each stage (site preparation, construction, commissioning, operation, decommissioning and rehabilitation) and the sequencing of these stages and phases;	

Table 1.2 SEARs and where they are addressed

Requirement	Location in EIS
• the relevant strategic context for the project having regard to:	Chapter 3
– State and Commonwealth legislation, policies and guidelines (see below);	
– key features of the environment that could affect or be affected by the project;	
– any other existing, approved or proposed projects that could result in cumulative impacts with the project;	
• the relevant statutory context for the project, including:	Chapter 3
– the assessment pathway for the project under the EP&A Act;	
– the approvals required before the project may be carried out, including any approvals under the EPBC Act;	
– any relevant matters for consideration;	
• a description of the engagement that was carried out during the preparation of the EIS, the key issues raised during this engagement and the proposed engagement strategy for the project if it is approved;	Chapter 4
• an assessment of the likely economic, social and environmental impacts of the project having regard to the requirements in any relevant Government legislation, policies and guidelines (see below), including:	Chapter 5
– the state of the existing environment;	
– community views;	
– the measures that would be implemented to avoid or minimise impacts, including a consolidated summary of the proposed mitigation measures for the project;	
– the predicted impacts of the project, including any cumulative impacts;	
– actions proposed to deal with any uncertainties associated with the assessment;	
• a detailed evaluation of the merits of the project as a whole.	Chapter 7
In addition to the matters set out in Schedule 1 of the EP&A Regulation, the EIS must be accompanied by a signed report from a suitably qualified person that includes an accurate estimate of the capital investment value of the development (as defined in Clause 3 of the EP&A Regulation).	Appendix C
The level of assessment of key matters must be proportionate to the likely significance of the impacts on the matter.	
In particular, the EIS must include the following:	
• **Transport:**	Section 5.1
– 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;	
– a strategy to ensure vehicles transporting products from the site to the KNP comply with strict vehicle hygiene protocols and minimise the risk of spreading weeds from the site;	
• **Amenity**: an assessment of the:	Section 5.2
– construction, operational, decommissioning and road noise impacts of the project;	
– vibration impacts of the project;	
– visual impacts of the project, including lighting impacts and potential impacts on views from sensitive receivers and key vantage points in the public domain	
• **Air:** an assessment of the particulate matter and greenhouse gas emissions of the project;	Section 5.3

Table 1.2 SEARs and where they are addressed

Requirement	Location in EIS
• **Biodiversity:**	Section 5.4
– an assessment of the impacts of the project on terrestrial ecosystems, including listed State threatened species or communities;	
– a strategy to offset the residual impacts of the project on these ecosystems;	
• **Land:**	Section 5.5
– an assessment of impacts of the project on the soils and land capability of the site, including potential impacts associated with the use of hydrocarbons and chemicals and dealing with any contaminated soil on site;	
– a strategy to manage the progressive rehabilitation of the land disturbed by the project;	
• **Water:**	Section 5.6
– a detailed site water balance for the project, including the water take from each surface and ground water source;	
– an assessment of the impacts of the project on:	
▪ the quantity and quality of the area's surface and ground water resources;	
▪ hydrological flows, including any potential flooding impacts;	
▪ key water features on site, including potential impacts on riparian land;	
▪ water-related infrastructure and water users;	
• **Heritage:** an assessment of the Aboriginal and historic heritage (cultural and archaeological) impacts of the project;	Section 5.7
• **Hazards:** an assessment of any potential hazardous impacts or public safety risks of the project;	Section 5.8
• **Social:** an assessment of the social impacts of the project on the locality, including the demand for any infrastructure or services in Cooma;	Section 5.9
• **Economic:** an assessment of the economic impacts of the project on the locality.	Section 5.10
A list of some of the legislation, policies and guidelines that may be relevant to the assessment of the project can be found at: https://www.planningportal.nsw.gov.au/major-projects/assessment/policiesand-guidelines.	
During the preparation of the EIS, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.	Chapter 5

A copy of the signed report that contains the estimate of the capital investment value of the proposed segment factory is contained in Appendix C.

The EIS is supported with input from technical specialists who have undertaken assessments of the proposed segment factory in their fields of expertise. The EIS study team is provided in Appendix D.

CHAPTER 2

PROJECT DESCRIPTION

2 Project description

2.1 Introduction

It is proposed to construct and operate a factory on the site to supply precast segmental linings exclusively for the tunnels that will be built for both Snowy 2.0 Exploratory Works and Main Works.

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

In total, approximately 14,500 precast reinforced concrete tunnel rings (containing 130,500 segments) would be manufactured over the operational period to be exclusively used as part of the Snowy 2.0 project.

The proposed segment factory would be constructed and operated by FGJV.

The site layout of the proposed segment factory can be seen in Figure 2.2. Plans, including elevations and cross-sections can be seen in Appendix E. As noted in Chapter 1, as part of the DIAA process, the detailed design of the segment factory will be undertaken prior to its construction. This process will enable any requirements resulting from the approval process to be addressed.

At completion of operations, and once construction of Snowy 2.0 is completed, the site would be decommissioned.

Table 2.1 provides a summary of the key characteristics of the proposed segment factory.

Table 2.1 Summary of proposed segment factory

Element	Summary
Capital investment value	$55 million
Site details	
Site description	• 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 • Unmade road corridor, directly south of Lot 14 and Lot 3
Site area	About 31.6 hectares (ha)
Site uses	• Southern part of Lot 14 – forms part of private airfield • Lot 3 – decommissioned communications tower and dilapidated buildings • Unmade road corridor – unformed and informal access road
Surrounding uses	• North – northern part of Lot 14 and industrial development in Polo Flat industrial area zoned IN1 General Industrial under *Cooma-Monaro Local Environmental Plan 2013* (the CMLEP) • East – abattoir zoned RU1 Primary Production under CMLEP • South – vacant land zoned RE1 Public Recreation and E2 Environmental Conservation and isolated industrial operation containing residence zoned IN1 General Industrial under CMLEP • West – industrial development zoned IN1 General Industrial under CMLEP
Construction phase	
Timeframe	About five months
Hours	Monday to Saturday for 10 hours per day
Workforce	About 30 people (24 sourced locally)

Table 2.1 Summary of proposed segment factory

Element	Summary
Daily traffic volumes	• Light vehicles – average of 30 and peak of 40 one-way movements • Heavy vehicles – average of 15 and peak of 25 one-way movements
Operational phase	
Timeframe	About 3.5 years
Hours	24 hours a day, seven days a week
Workforce	About 125 people (100 sourced locally)
Segments produced	About 130,500 segments
Access	Via access road constructed in unmade road corridor connecting with Polo Flat Road
Main facilities	• CBP and precast building located on southern part of site • Open storage areas on northern part of site • Site offices and workshops in south-western corner of site • Two large parking areas in south-west corner and to north of precast building • Construction of drain diversion around eastern part of the site
Main raw materials	• Cement and ground slag • Aggregates and sand • Segment accessories and concrete materials
Traffic movements	• Majority of heavy vehicle movements into the site would come from the north on Monaro Highway and turn left onto Polo Flat Road • Majority of heavy vehicle movements leaving the site would travel north on Polo Flat Road and turn left on Monaro Highway and travel through Cooma before heading to KNP • Majority of traffic movements during the day • 20% of traffic movements at night • An alternative route for heavy vehicles which bypasses Cooma is being pursued by Snowy Hydro in consultation with SMRC and the State Government
Daily traffic volumes	• Monaro Highway east of Polo Flat Road – Light vehicles – average of 16 and peak of 26 one-way movements – Heavy vehicles – average of 52 and peak of 84 one-way movements • Monaro Highway west of Polo Flat Road – Light vehicles – average of 156 and peak of 196 one-way movements – Heavy vehicles – average of 78 and peak of 132 one-way movements • Polo Flat Road north of site – Light vehicles – average of 150 and peak of 194 one-way movements – Heavy vehicles – average of 130 and peak of 216 one-way movements • Polo Flat Road south of site – Light vehicles – average of 210 and peak of 266 one-way movements – Heavy vehicles – no movements • Snowy Mountains Highway west of Bombala Street – Light vehicles – average of 16 and peak of 30 one-way movements – Heavy vehicles – average of 78 and peak of 132 one-way movements
Decommissioning	
Removal of plant and equipment	• At the completion of construction of Snowy 2.0, the proposed segment factory would be decommissioned, which would involve removal of all plant and equipment • Snowy Hydro would seek to lodge a development application (DA) for an alternative use of the site prior to the proposed segment factory being decommissioned

2.2 Site description

2.2.1 The site

The site of the proposed segment factory is located on the south-eastern corner of the Polo Flat industrial area, 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 (see Figure 1.2).

The site contains the following land parcels:

- southern part of Lot 14 – also known as 9 Polo Flat Road, Polo Flat;
- Lot 3 – also known as 33 Carlaminda Road, Polo Flat; and
- an unmade road corridor, directly south of 9 Polo Flat Road, Polo Flat and 33 Carlaminda Road, Polo Flat.

Lot 14 and Lot 3 are owned by Snowy Hydro. The unmade road corridor is currently Crown land, but its ownership will be transferred to Snowy Monaro Regional Council (SMRC). At a meeting on 18 July 2019, it was resolved that SMRC:

> Agrees to the request from Snowy Hydro Limited to apply to the Crown to have the Crown reserve road (approximately 780m), which runs from Polo Flat Road to Carlaminda Road, transferred to Council as a Council public road on condition that Snowy Hydro Limited will be responsible for the construction of the road to Council's road standard after it is dedicated to Council;

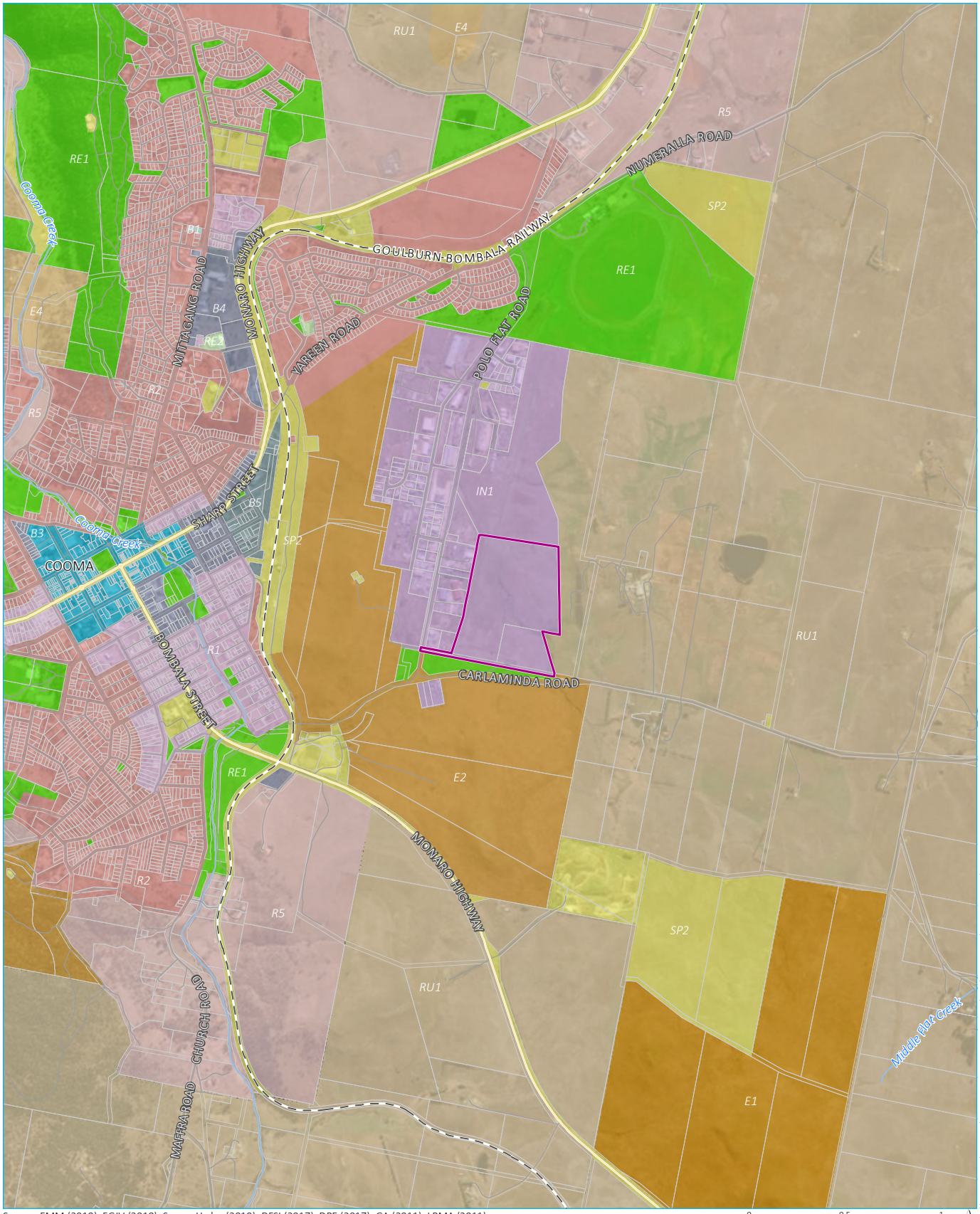
Except for a few vacant and dilapidated buildings and a decommissioned communications tower located on Lot 3, the site is predominantly vacant and dominated by grassland. A drainage line, or dry creek, flows in a north-west direction through the middle of the site.

Lot 14 is a large parcel of land which contains the private airfield predominantly located in the middle and northern part of the land. Only the southern part of Lot 14 forms part of the site.

The site has an area of about 31.6 ha.

The site, including the unmade road corridor, are zoned IN1 General Industrial under the CMLEP.

Photos of the site can be seen in Photograph 2.1 to Photograph 2.11.



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

0 0.5 1 km

GDA 1994 MGA Zone 55

N

KEY

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

Zoning

- B1 Neighbourhood Centre
- B3 Commercial Core
- B4 Mixed Use
- B5 Business Development
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E4 Environmental Living
- IN1 General Industrial
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- SP2 Infrastructure

Zoning plan

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 2.1

snowy2.0

EMM creating opportunities

2.2.2 Surrounding development

The site is located in the south-eastern corner of the Polo Flat industrial area. It is surrounded by industrial development to the north and west and predominantly vacant land to the south and east. The land to the north and west is zoned IN1 General Industrial under the CMLEP, the land to the south is zoned RE1 Public Recreation and E2 Environmental Conservation, and land to the east is zoned RU1 Primary Production. A zoning plan of the site and surrounds can be seen in Figure 2.1.

To the north of the site is the remainder of Lot 14 which contains Snowy Hydro's private airfield, and other industrial development. Snowy Hydro's private airfield contains a main north-south aligned runway and hangers. It also contains an above ground fuel tank for the refuelling of planes and helicopters.

Immediately east of the site is an abattoir (Monbeef Mountain Fresh) that has approval to operate 24 hours a day depending on market demand and cattle supply. The processing facility at the abattoir is located about 350 metres (m) to the east of the site.

There is an isolated industrial operation containing a residence located about 150 m to the south-south-west of the site on the opposite side of Carlaminda Road.

The nearest rural residence is located about 450 m to the south-east of the site on the opposite side of Carlaminda Road. The nearest residences within Cooma are located about 1 km to the west of the site on land zoned R2 Low Density Residential and R1 General Residential under the CMLEP.

Further details on the environmental characteristics of the site can be found in Chapter 5.

Photos of the surrounding development can be seen in Photograph 2.1 to Photograph 2.11.

Photograph 2.1 The site as viewed from the west – the site is located behind the industrial development located in the middle-ground of the photograph

Photograph 2.2 **The site as viewed from the southern part of the site looking north**

Photograph 2.3 **The site as viewed from the northern part of the site looking south**

Photograph 2.4 **Looking south towards the site from the north-south runway located in the northern part of Lot 14**

Photograph 2.5 **The site as viewed from the southern part of the site looking east towards the abattoir**

Photograph 2.6 **The site as viewed from Carlaminda Road looking to the west**

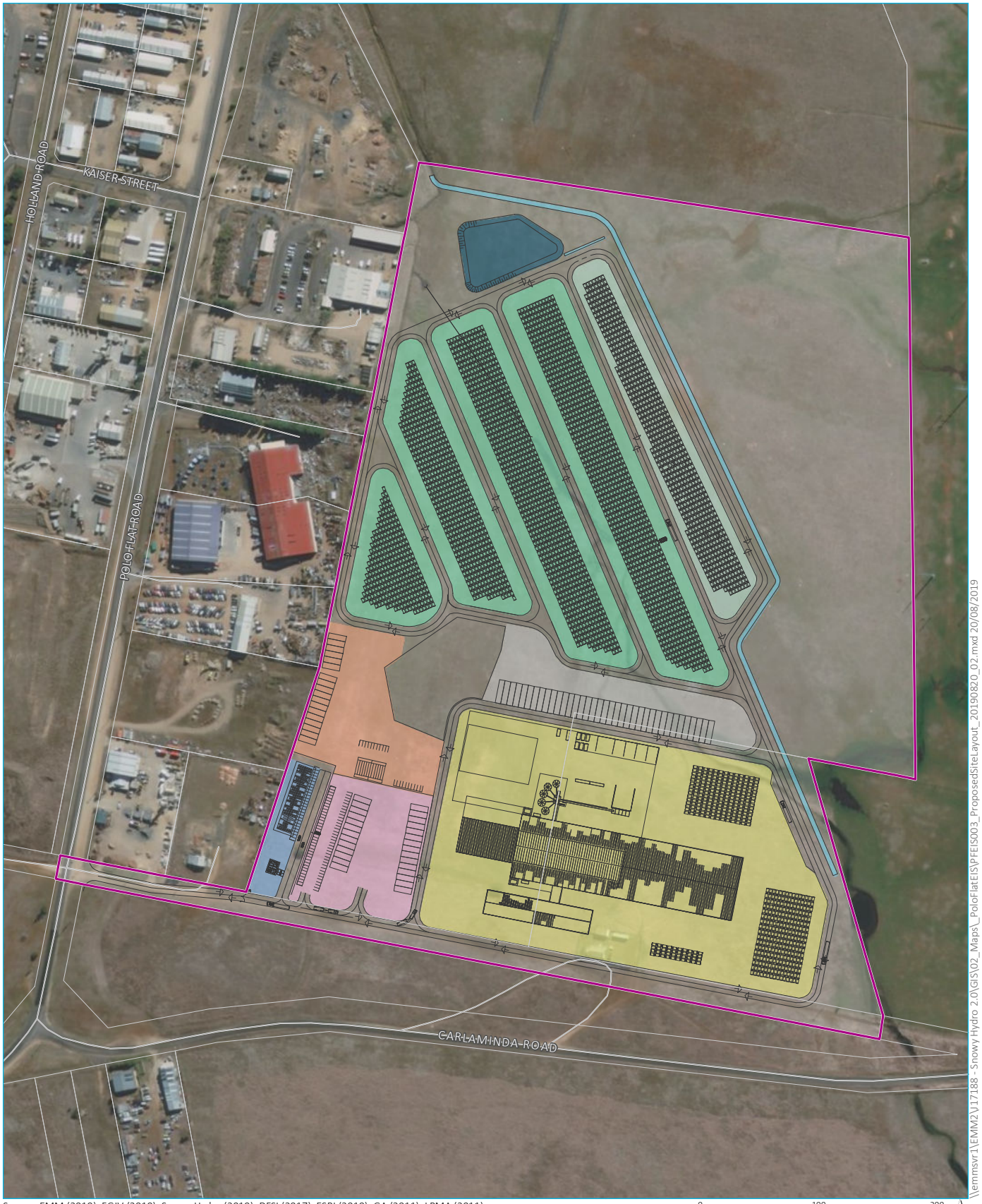
Photograph 2.7 **Looking east along the unmade road corridor – the buildings and decommissioned communications tower on Lot 3 can be seen in the middle-ground of the photograph**

Photograph 2.8 **Looking west along the unmade road corridor – adjoining industrial development can be seen on the right of the photograph**

Photograph 2.9 **Looking to the south east of the site – the industrial development fronting Carlaminda Road to the south of the site with a residence can be seen on the right of the photograph**

Photograph 2.10 **Looking east along the unmade road corridor – Carlaminda Road is located in the background of the photograph**

Photograph 2.11 **Looking south along Polo Flat Road – photograph shows typical industrial development adjoining Polo Flat Road**



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

0 100 200 m

GDA 1994 MGA Zone 55

N

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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
Environmental Impact Statement
Proposed Segment Factory
Figure 2.2

snowy2.0

EMM creating opportunities

2.3 Construction

2.3.1 Main activities

The main construction activities which would be undertaken include:

- demolition and removal of buildings on southern part of the site, and removal of the decommissioned communications tower;
- installation of temporary fencing and security measures as well as any necessary construction environmental management measures;
- confirmation of all utility services and any affected services which will be relocated or required to be made safe to allow construction to proceed;
- clearing and removal of topsoil and vegetation (excavated topsoil excavated will be stockpiled on site for later use);
- earthworks, including:
  - cut and fill to establish a level area for the pads;
  - trenching to install services (power, water and communications);
  - laying concrete for the precast building;
  - laying of asphalt or concrete for all internal roads; and
  - laying of cement soil for all other areas, including the storage areas;
- construction of the primary access road in the unmade road corridor and connection to Polo Flat Road; and
- construction of all buildings (precast building, offices, workshops and guardhouse), CBP, carparks, and associated facilities.

Plans of the proposed segment factory are contained in Appendix E.

2.3.2 Plant and equipment

An indicative list of plant and equipment likely to be required for construction of the proposed segment factory is provided below in Table 2.2. Note that not all the equipment identified below will be required for all phases of the proposed construction.

Table 2.2 Indicative construction equipment

Backhoes	Dump trucks	Pneumatic jackhammers
Bob cats	Elevated working platforms	Rigid tippers
Bulldozers	Excavators (various sizes)	Crushers
Concrete agitators	Flatbed Hiab trucks	Rollers
Concrete pumps	Drilling machines	Semi-trailers

Table 2.2 Indicative construction equipment

Cranes, including gantry cranes - various sizes up to approximately 200 tonnes (t)	Transport trucks	Tilt tray trucks
Crawler crane with grab attachments	Generators	Trenchers

Source: FGJV

2.3.3 Excavation and filling

Excavation will be carried out at the site to provide a level surface, establish the access roads and create the required trenches for drainage and services within the site. Excavation works will be carried out using excavators, dozers and crushing plant.

Excavated material may be reused on site for filling and compaction (including benching areas of the site where required). Where excavated material is determined not to be appropriate for re-use on site, it may be necessary to import additional material to site to make up any identified deficit.

2.3.4 Waste

All waste generated during construction will be reused if appropriate, or removed, transported and disposed from the site in accordance with the NSW *Waste Classification Guidelines* (EPA 2014), NSW *Protection of the Environment Operations Act 1997* (POEO Act) and the NSW *Protection of the Environment Operations (Waste) Regulation 2005*.

2.3.5 Traffic

Construction vehicle movements will comprise vehicles transporting equipment, waste, materials and spoil, as well as workers' vehicles. The average and peak daily heavy one-way vehicle movements expected during the construction of the proposed segment factory are outlined in Table 2.3.

Table 2.3 Estimated vehicle movements during construction

Vehicles	Movement type	Estimated one-way movements
Light vehicles	Indicative daily movements (average day)	30
	Maximum daily movements (peak construction period)	40
Heavy vehicles	Indicative daily movements (average day)	15
	Maximum daily movements (peak construction period)	25

Source: FGJV

2.3.6 Construction hours

The construction phase of the proposed segment factory would last about five months (estimated to start March 2020). 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 would commence at 7 am.

2.3.7 Workforce

The construction phase would require a workforce of about 30 people.

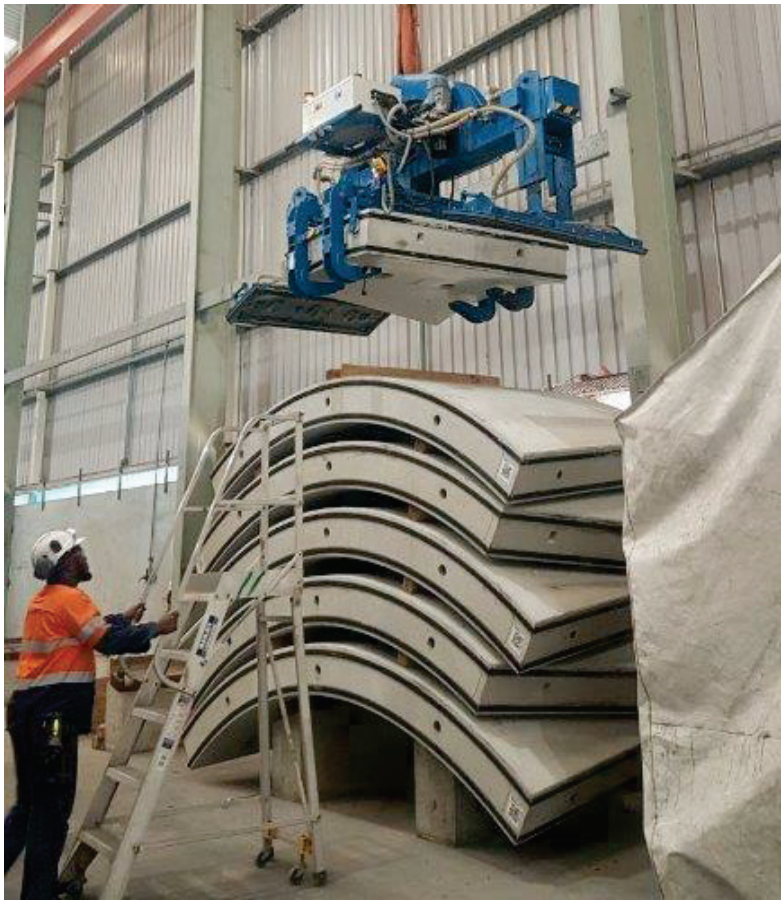
FGJV has advised that 80% of the construction workforce is expected to be sourced locally from Cooma or surrounding localities. As such, it is expected that 24 people would be employed locally to construct the proposed segment factory.

2.4 Operations

2.4.1 Tunnel segments

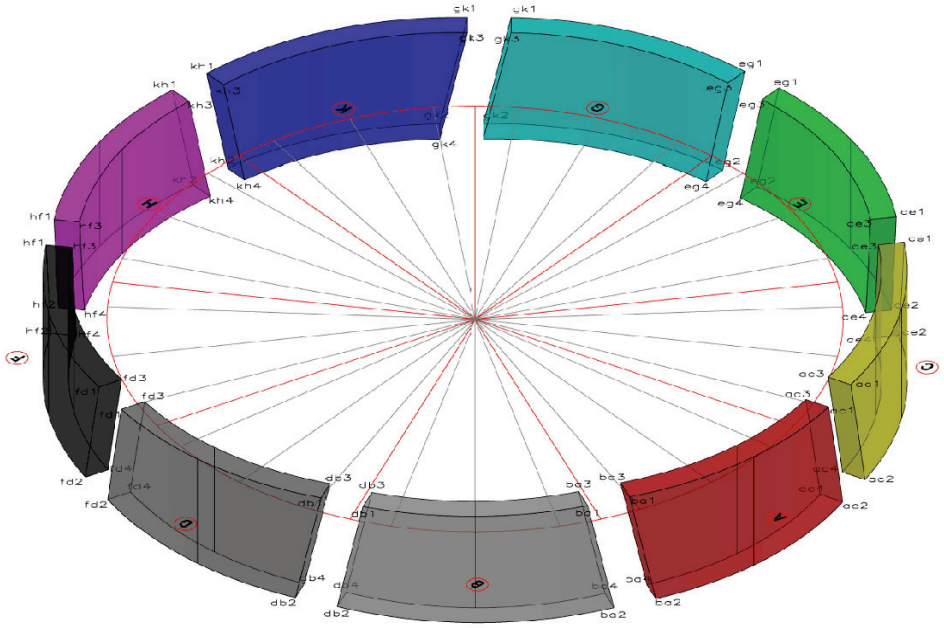
Approximately 130,500 segments making up about 14,500 precast concrete tunnel rings would be manufactured over the operational period of the proposed segment factory. Each tunnel ring will consist of nine individual segments.

The manufactured segments can be seen in Photograph 2.12.Figure 2.3 Figure 2.3 shows how the segments form a tunnel ring.



Source: FGJV

Photograph 2.12 Typical segments



Source: FGJV

Figure 2.3 Precast tunnel segment ring

Precast tunnel segments would be constructed utilising steel moulds specifically designed to meet the specifications of Snowy 2.0. The steel moulds would be used in conjunction with a double carousel with four production lines on each carousel, one active production line and three lines in the curing chamber. In the carousel system, the moulds are moved on rails to pass through the various workstations in the production process before storage and transport to the construction sites within KNP.

The key elements in the fabrication of the precast tunnel segments include carousel production cycle, curing of segments, repair works, packer placement, quality control, and precast tunnel segment handling and transport.

2.4.2 Site layout

i Ingress and egress

As previously stated, vehicular ingress and egress to the site would be off Polo Flat Road using a primary access road to be constructed within the unmade road corridor.

The primary access road would also facilitate access to the industrial properties to the west of the site that currently use the road corridor for access.

ii 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.

A guard house, offices and workshops would be located in the south-western corner of the site.

iii Raw materials storage

Cement and slag silos, and an aggregate and sand storage area for the CBP would be sized to hold approximately three days production to ensure any potential disruption on raw material supply will limit its impact on segment production.

Other raw materials include steel rebar (or steel reinforcement), concrete admixtures and specialised concrete chemicals, which would be stored in, or adjacent to, a warehouse attached to a precast building.

Cement deliveries would by via 28 t tankers, whilst aggregate and sand would be delivered via truck and dog configuration (about 32 t per truck).

iv Crib area

A crib area would be located adjacent to the precast building to provide toilet facilities, change rooms, lockers, showers, lunchroom and break out areas for the factory workers.

v Offices

Offices, meeting rooms, training rooms and induction facilities are proposed to be located in the south-western part of the site.

vi 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.

vii Drainage

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

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

2.4.3 Resources

i Plant and equipment

The plant and equipment to be utilised for production of the segments include:

- CBP with conveyor system;
- fibre dosing units;
- segment production plant;
- carousel system;
- working line transfer system;

- curing chamber;
- WTP;
- steam boiler;
- control room and casting station;
- segment moulds;
- vacuum handling devices;
- segment tilting devices;
- segment lifting devices;
- overhead cranes and gantry cranes; and
- forklifts and/or wheel loaders.

Photographs of typical plant and equipment likely to be used at the proposed segment factory can be seen in Photograph 2.13 to Photograph 2.21.

Source: FGJV

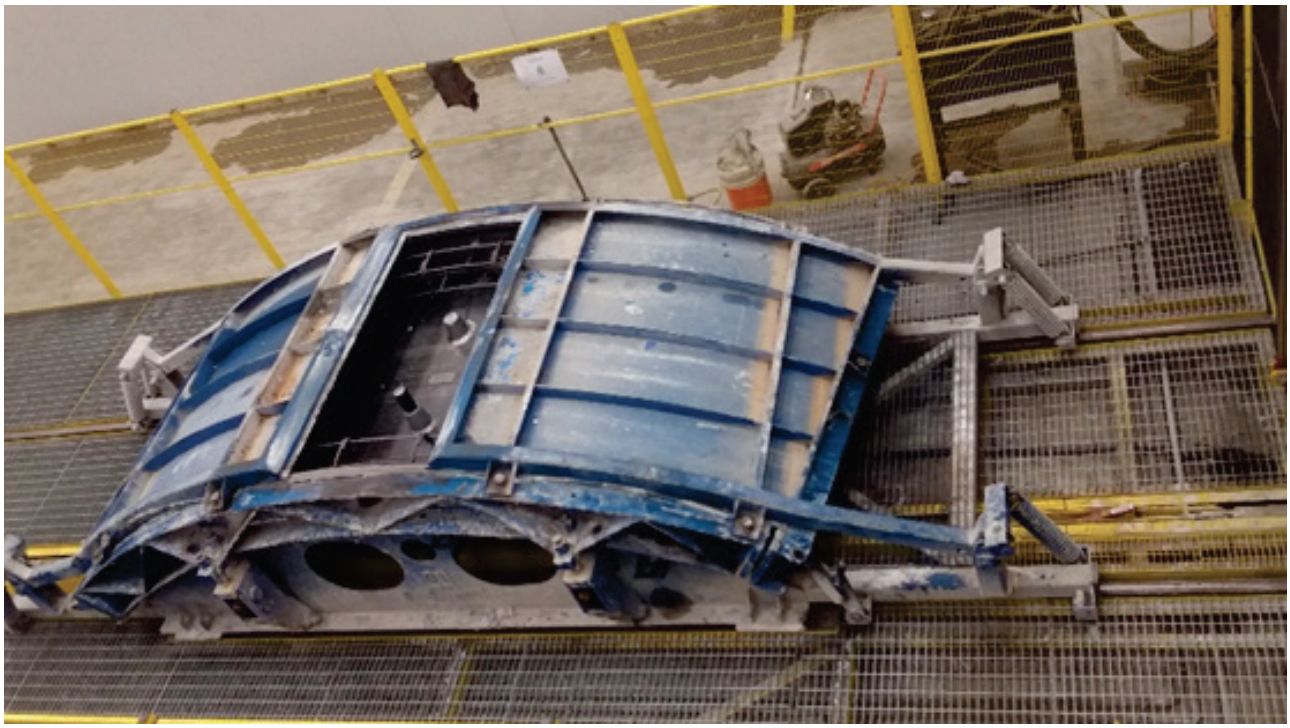
Photograph 2.13 Typical CBP and associated aggregate and sand stockpile bins

Source: FGJV

Photograph 2.14 Typical concrete delivery conveyor system

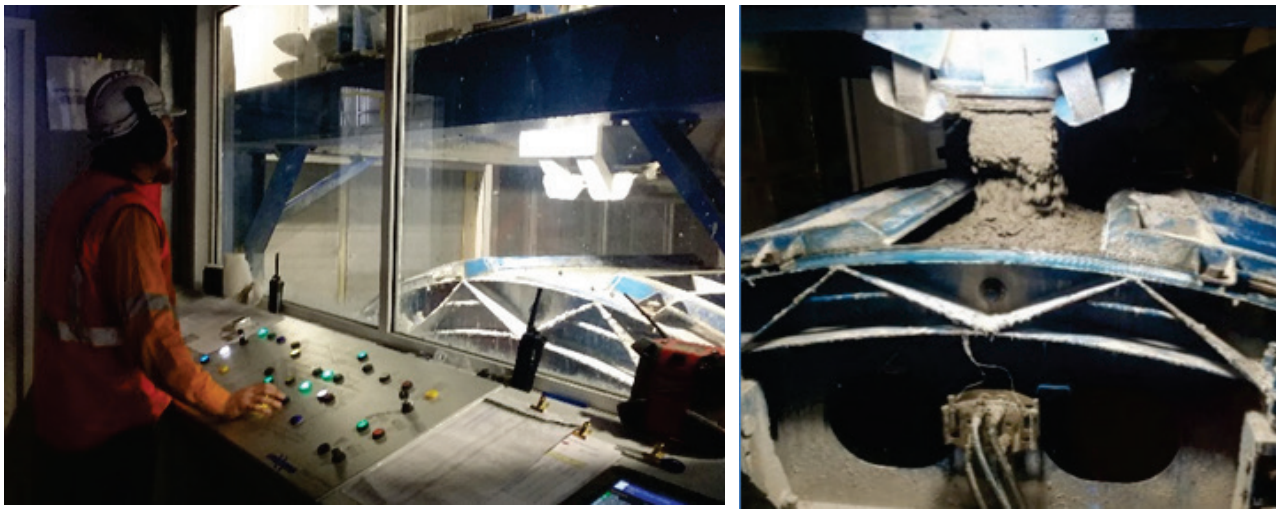
Source: FGJV

Photograph 2.15 Typical carousel system production line – steam curing chamber can be seen in right side of photograph



Source: FGJV

Photograph 2.16 Typical tunnel segment lining mould on carousel with rebar before concrete casting



Source: FGJV

Photograph 2.17 Typical concrete casting

Source: FGJV

Photograph 2.18 Typical overhead cranes within precast building

Source: FGJV

Photograph 2.19 Typical steam curing chamber

Source: FGJV

Photograph 2.20 Typical vacuum lifter

Source: FGJV

Photograph 2.21 Typical segment turning table

ii Materials

The following materials, which would comply with relevant Australian standards (AS) and project specifications, would be required for the construction of the segments:

- coarse aggregates in compliance with AS 2758.1;
- fine aggregates in compliance with AS 2758.1;
- cement in compliance with AS 3972;
- ground slag in compliance with AS 3582.1;

- silica fume in compliance with AS 3582.3;
- mixing water in compliance with AS 1379-2007;
- concrete admixtures in compliance with AS 1478.1;
- steel fibres in compliance with BS EN14889-1-2006;
- concrete mix supplied from the CBP and tested in accordance and in compliance with FGJV specifications;
- steel reinforcement (or steel rebar) supplied in compliance with AS 4671-2007;
- anchored gasket type Fama UG029A or equivalent;
- circumferential connector Fama smart blockn110-140 300-60 or equivalent;
- dowels smart block 110-140/300.60 or equivalent;
- guiding rod type Sofrasar or equivalent;
- threaded grout/lift socket type Fama or equivalent;
- mould release agent Crete-Lease 20-VOC or equivalent;
- evaporation retardant/finishing aid A-Film or equivalent; and
- curing compound Masterkure 250 or equivalent.

2.4.4 Workforce

A workforce of about 125 people would be required to operate the proposed segment factory.

It is anticipated that about 80% of the operational workforce would be sourced locally. As such, it is anticipated that about 100 people would be employed locally to operate the proposed segment factory.

A breakdown of the potential workforce requirements for the proposed segment factory is provided in Table 2.4.

Table 2.4 Operational workforce

Designation	Approximate number on site
Construction Manager	1
Tunnel Manager	1
Quality Manager	1
Plant Manager	1
Senior QC Engineer	1
QA Engineer	2
WHS Manager	1
E & S Manager	1
Precast Manager	1
Precast Engineers	3
Production Supervisors	3
Maintenance/Mechanical Supervisor	1
Leading Hands	5
Workforce	> 100

Source: FGJV

2.4.5 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.

2.4.6 Utility requirements

This section provides details on utility requirements for the proposed segment factory. Some utility connections may be required to occur outside of the site. These connections would be confirmed as part of the detailed design.

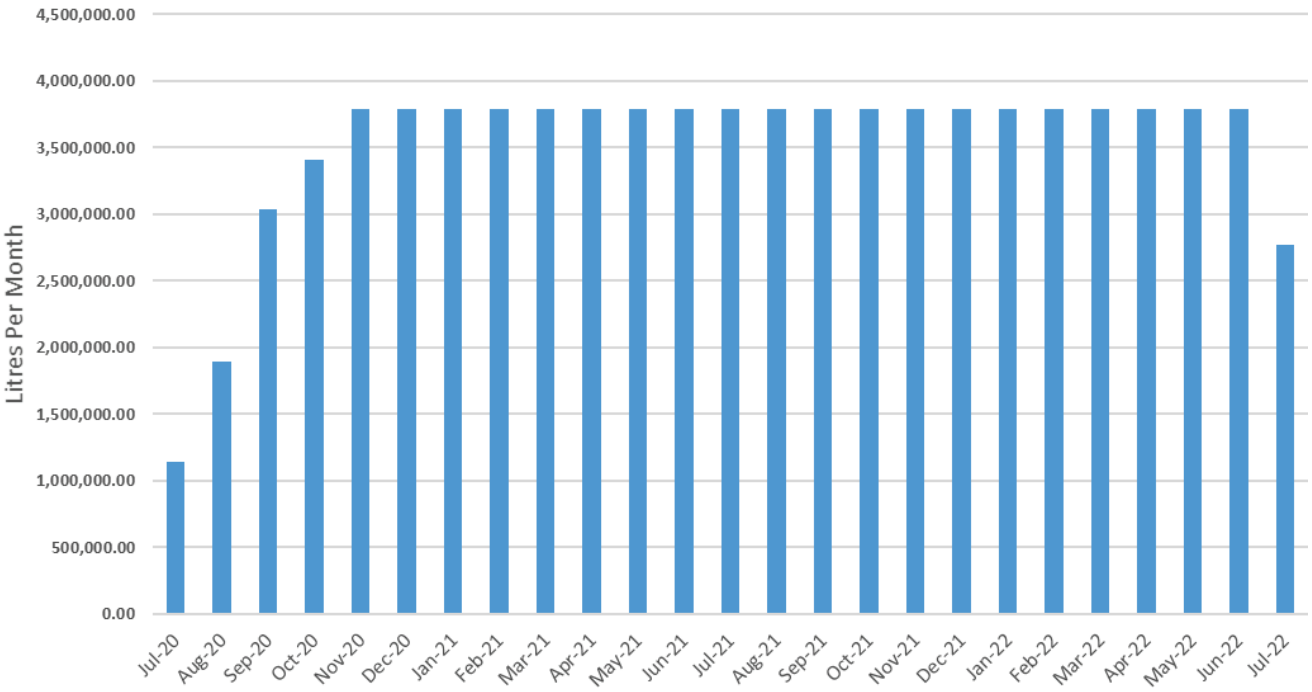
i Water and sewage

Water demand for the proposed segment factory would predominantly be driven by the production of the concrete within the CBP.

Figure 2.4 provides an overview of the indicative water demand for the project based on an initial demand curve of the operations. Water is expected to be provided from SMRC's mains supply.

Water will also be stored in six x 40,000 litres (L) above ground tanks located to the north of the precast building. The tank water would be a reserve or buffer water supply for the curing process. In the event of disruptions to the water supply from the mains line, the water stored in these tanks will be utilised for segment production.

A WTP would be used to treat water as part of the CBP to ensure it meets FGJV's standards. The design of the WTP would be documented as part the detailed design of the proposed segment factory.



Source: FGJV

Figure 2.4 Indicative water demand

Wastewater would be generated from the crib at the precast building and the offices. Wastewater would be handled using SMRC's mains.

ii Power

Initial analysis indicates a power draw of 1,100 kilo volt amps (kVa) for the proposed segment factory with a load factor of 80%. Power would be connected from the main grid.

iii Gas

Gas would be typically used to supply the boiler system that runs the curing chamber for the proposed segment factory. Demand for gas would be approximately 60 litres per hour (L/hr) hour for each heating system (or total of 120 L/hr). The gas used at the boiler would be supplied from Jemena's main grid.

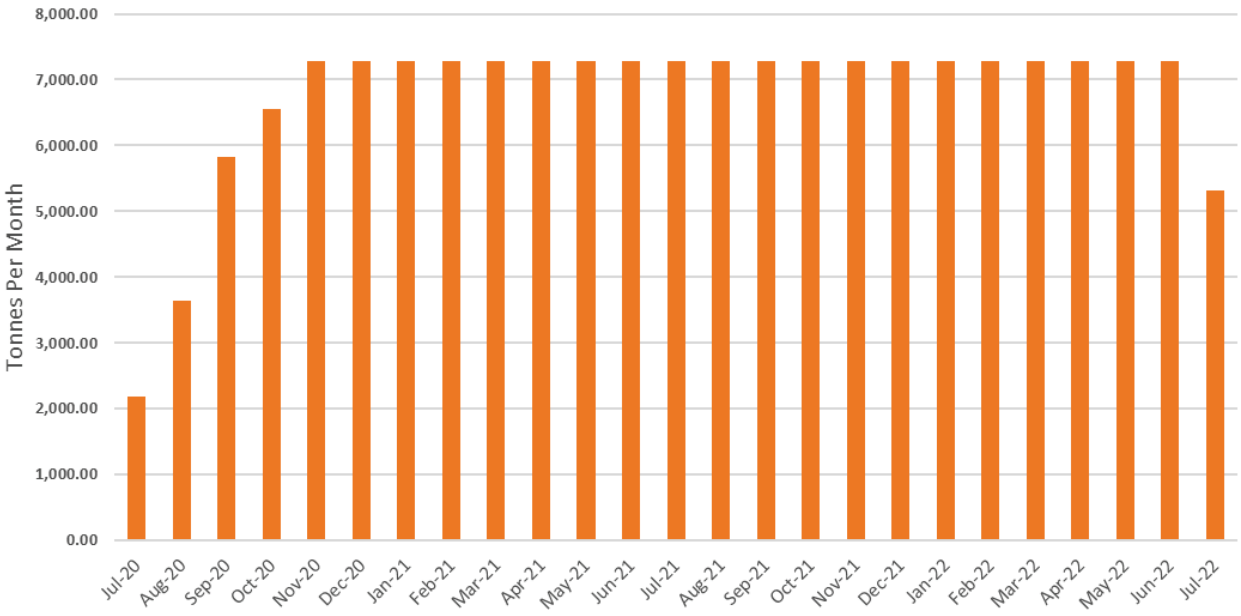
iv Diesel

Two x 20,000 L above ground diesel tanks are proposed to the north and south of the precast building. The diesel would be used for machinery and mobile equipment. It is expected that the approximate rate of use of diesel will be 500 litres per day (L/day).

2.4.7 Raw material requirements

i Cement and ground slag

The current mix design for the concrete for the segments contains shrinkage limited cement and ground slag. Based on the current mix design Figure 2.5 provides a summary of the indicative requirements for cement and ground slag for the operational phase of the proposed segment factory.



Source: FGJV

Figure 2.5 Indicative cement and ground slag demand

It is likely that the cement and ground slag would be sourced from Canberra and would be transported in 28 t road tankers to site using the Federal and Monaro highways, and Polo Flat Road. From the Monaro Highway, the tankers would turn left onto Polo Flat Road (to the north of Cooma) and travel through the industrial area to the site access road.

ii Aggregates and sand

Figure 2.6 provides a summary of the indicative demand for aggregates and sand at the proposed segment factory.

The likely primary source of aggregates and coarse sand would be from quarries near Canberra. From the Monaro Highway, the trucks would turn left onto Polo Flat Road (to the north of Cooma) and travel through the industrial area to the site access road.

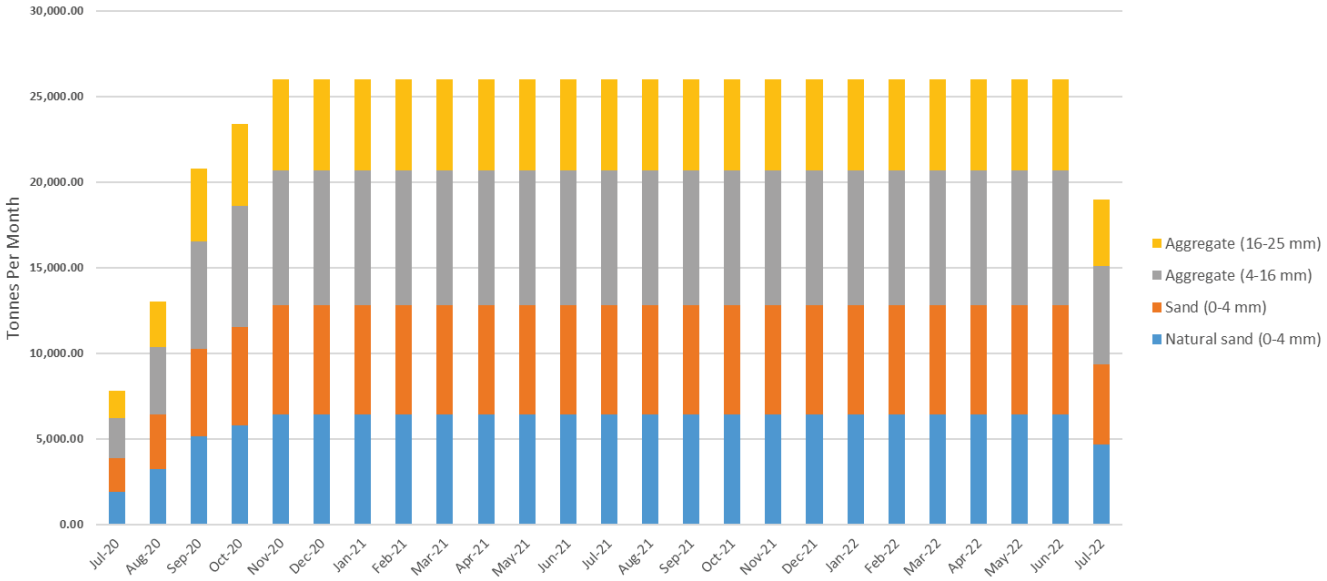
There are several quarries located to the north of the site close to the Monaro Highway between Cooma and Canberra that could provide fine sand to the project. As such, trucks delivering fine sand would likely access the site via the Monaro Highway and Polo Flat Road.

As previously stated, aggregate and sand would be delivered via truck and dog configuration (about 32 t per truck).

iii Segment accessories and concrete materials

As stated above, several accessories and materials are required to produce the segments, such as steel rebar, steel fibres, gaskets and inserts, concrete admixtures, mould release agent, evaporation retardant, curing compound etc. These would primarily be transported to the site from Canberra via the Federal and Monaro highways, and Polo Flat Road.

These materials would likely be delivered by semi-trailers.



Source: FGJV

Figure 2.6 Indicative aggregate and sand demand

iv Segments

Once the segments are cast and cured, they would be transported to the construction sites within KNP. The segments would most likely be transported on standard flatbed semi-trailers. Three segments would be transported per truck.

Notwithstanding this, FGJV are investigating the use of trucks using pocket B-triple trailers which would be able to transport more segments per truck movement.

Source: FGJV

Photograph 2.22 Typical flatbed truck used to transport segments

The route the trucks would take from the site would be north-bound along Polo Flat Road, left onto the Monaro Highway through Cooma and then right onto the Snowy Mountains Highway for delivery to KNP.

Initially all tunnel segments would be delivered to Lobs Hole via Link Road and Lobs Hole Ravine Road as the Exploratory Works is executed. During the Main Works, approximately half of the segments would go to Lobs Hole, and the other half would go to Tantangara via Tantangara Road.

2.4.8 Traffic movements

The predicted average and peak daily light and heavy vehicle one-way movements during the operations of the proposed segment factory are presented in Table 2.5 and shown in Figure 2.7 and Figure 2.8.

Note that within Cooma, the Monaro and Snowy Mountains highways are also known as Sharp Street.

Table 2.5 Average and peak daily one-way traffic movements during operation

Road network	Average daily light vehicle movements	Average daily heavy vehicle movements	Peak daily light vehicle movements	Peak daily heavy vehicle movements
Monaro Highway (east of Polo Flat Road north towards Canberra)	16	52	26	84
Monaro Highway (west of Polo Flat Road south towards Cooma)	156	78	196	132
Polo Flat Road (north)	150	130	194	216
Polo Flat Road (south)	210	0	266	0
Monaro Highway (south of Polo Flat Road towards Bombala)	16	0	26	0

Table 2.5 Average and peak daily one-way traffic movements during operation

Road network	Average daily light vehicle movements	Average daily heavy vehicle movements	Peak daily light vehicle movements	Peak daily heavy vehicle movements
Snowy Mountains Highway (west of Bombala Street towards Adaminaby)	16	78	30	132
Tantangara Road	10	36	16	84
Link Road	10	36	16	84

Source: FGJV

The majority of traffic movements would be undertaken during the day. However, up to 20% of the traffic movements would be undertaken during the night.

While Table 2.5 shows the predicted number of traffic movements generated through the operational phase of the proposed segment factory, there may be other movements required to support the project.

In addition to the key roads in Table 2.5, an alternative route for heavy vehicles between the proposed segment factory and the Snowy 2.0 construction sites within KNP which bypasses Cooma has been investigated by Snowy Hydro in consultation with SMRC and the State Government. This route includes Yallakool, Mittagang, Shannons Flat and Bobeyan roads.

Use of this alternative route by heavy vehicles generated by the proposed segment factory would likely require upgrade works including:

- minimal road widening where required;
- the sealing of Shannons Flat and Bobeyan roads; and
- upgrades to the intersections of Bobeyan Road and Snowy Mountain Highway, Yallakool Road/Polo Flat Road and Monaro Highway.

The investigation into the alternative transport route is intended to reduce impacts during peak traffic flows on the Monaro and Snowy Mountains highways. If used, this alternative route would reduce traffic volumes generated by the proposed segment factory in Sharp Street in Cooma, including during peak holiday periods. The reductions in traffic volumes are not reflected in Table 2.5.

It should be noted that the use of the alternate transport route does not form part of the project, and therefore approval is not being sought for the use of the route at this stage. Should the alternate transport route be upgraded to the standard required approval would be sought separately.

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

0 0.5 1 km

GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM2\171188 - Snowy Hydro 2.0\GIS\02_Maps_PoloFlatEIS\PFEIS005_AverageTrafficMovements_20190823_01.mxd 24/09/2019

KEY

- Site boundary
- Rail line
- Main road
- Local road or track
- Watercourse
- Cadastral boundary
- NPWS reserve
- Traffic survey location
  - 00 Light vehicles
  - 00 Heavy vehicles

Average daily one-way traffic movements

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 2.7

snowy 2.0

EMM creating opportunities

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

0 0.5 1 km

GDA 1994 MGA Zone 55

N

\\emmsvr1\EMM2\171188 - Snowy Hydro 2.0\GIS\02_Maps_PoloFlatEIS\PFEIS006_PeakTrafficMovements_20190823_01.mxd 24/09/2019

KEY

- Site boundary
- Rail line
- Main road
- Local road or track
- Watercourse
- Cadastral boundary
- NPWS reserve
- Traffic survey location
  - 00 Light vehicles
  - 00 Heavy vehicles

Peak daily one-way traffic movements

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 2.8

snowy 2.0

EMM creating opportunities

2.5 Decommissioning

At the completion of construction of Snowy 2.0, the proposed segment factory would be decommissioned which would include removal of all 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 DA to SMRC for an alternative use of the site prior to the decommissioning phase of the project.

CHAPTER 3

STRATEGIC AND STATUTORY CONTEXT

3 Strategic and statutory context

3.1 Strategic context of Snowy 2.0

The strategic context of Snowy 2.0 relates to its critical significance for the NEM, key State and Commonwealth government plans and policies, and economic, social and environmental trends driving change in the energy market.

During the *Feasibility Study for Snowy 2.0* and in the lead-up to its FID, Marsden Jacob Associates (MJA) carried out independent market modelling to understand upcoming trends and the future NEM in which Snowy 2.0 would operate. The findings of these studies confirm the strategic justification and need for Snowy 2.0 to provide large-scale storage that facilitates firming and reliability to the NEM, as the NEM decarbonises over the next few decades.

While the MJA modelling in the lead up to FID in late 2018 is still very relevant and underpins the strong economic case for the project -since this time, the energy market has evolved and changed much more quickly than originally anticipated even just a year ago. The likelihood of coal-fired generators closing earlier than previously anticipated is increasing (Aurora Energy Research 2019) and concurrently, the rapid uptake of intermittent renewables due to favourable economics is changing the energy market landscape. For example, investment in large-scale renewable energy projects doubled in 2018 compared to a previous record-breaking 2017, increasing from $10 billion (B) to $20 B (Clean Energy Council 2019).

3.1.1 A changing energy system and market

i National electricity market

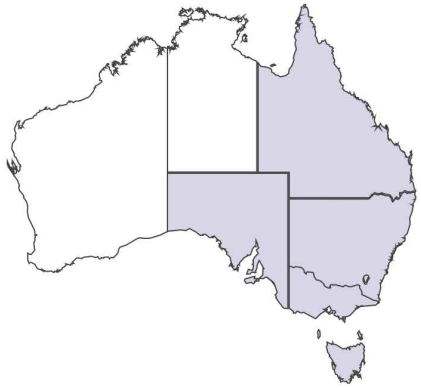
The NEM involves the wholesale generation of electricity from coal, gas and renewable sources that is transported via high voltage transmission lines from generators to local distributors. From the distributors, it is converted to low voltage electricity and delivered to almost 10 million homes and businesses across the Australian eastern and south eastern seaboard. The NEM delivers around 80% of all electricity consumption in Australia.

The NEM operates on one of the world's longest interconnected power systems and connects five regional market jurisdictions – Queensland, NSW (including the Australian Capital Territory), Victoria, South Australia, and Tasmania (as shown Figure 3.1). The NEM has over 300 registered industry participants which include market generators, transmission network service providers, distribution network service providers and market customers.

The NEM is a wholesale commodity exchange for electricity across the five regional markets. As electricity cannot currently be stored easily, the NEM works as a 'pool', or spot market, where power supply and demand across all jurisdictions is matched instantaneously in real time through a centrally coordinated dispatch process.

The spot market is managed by a set of procedures that is managed on a five minute basis by the Australian Energy Market Operator (AEMO), where generators offer to supply the market with specified amounts of electricity and AEMO decides which generators will be deployed to produce electricity, with typically the cheapest generator put into operation first. NEM operation is designed to meet electricity demand (or consumption) in the most cost-efficient way.

The NEM and how it works



There are over **300** registered participants such as generators, retailers & distributors in the NEM

States/Territories that form the NEM

40,000 km
of transmission lines and cables.

80%
of all electricity used in Australia is delivered via the NEM

9 million
customers

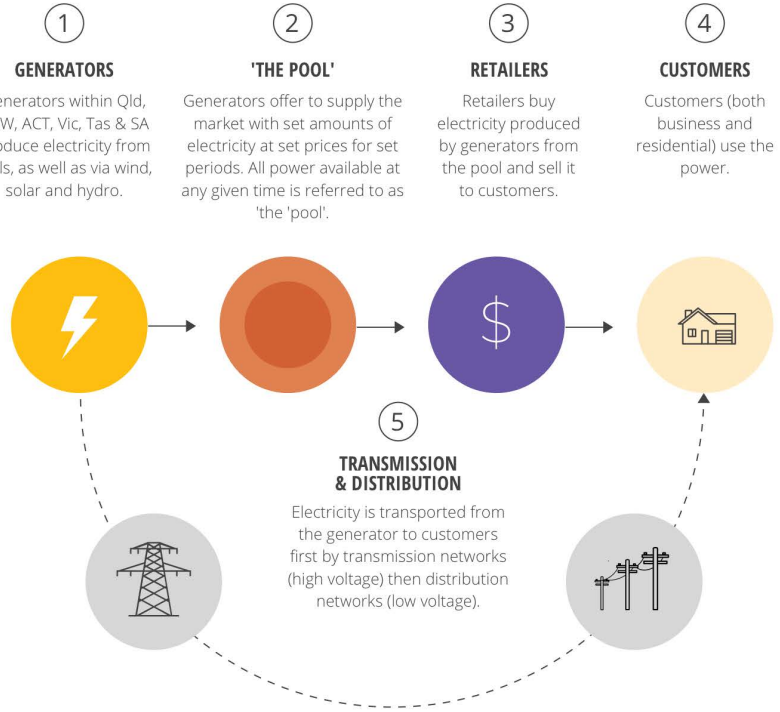


Figure 3.1 **National Electricity Market**

ii Planning policies driving change and regulation

The NSW energy system (and broader NEM) is facing several challenges through rising energy costs, deterioration in energy system security and reliability, and a transition in the generation mix away from coal-fired, dispatchable, baseload power to renewable wind and solar power characterised by intermittency. These challenges create a need for more energy storage within NSW and the NEM.

This energy transition towards renewables is driven by rapidly decreasing costs of wind and solar technologies as well as legislation and several strategic plans and policies set out by the Australian Government and States in the interconnected NEM.

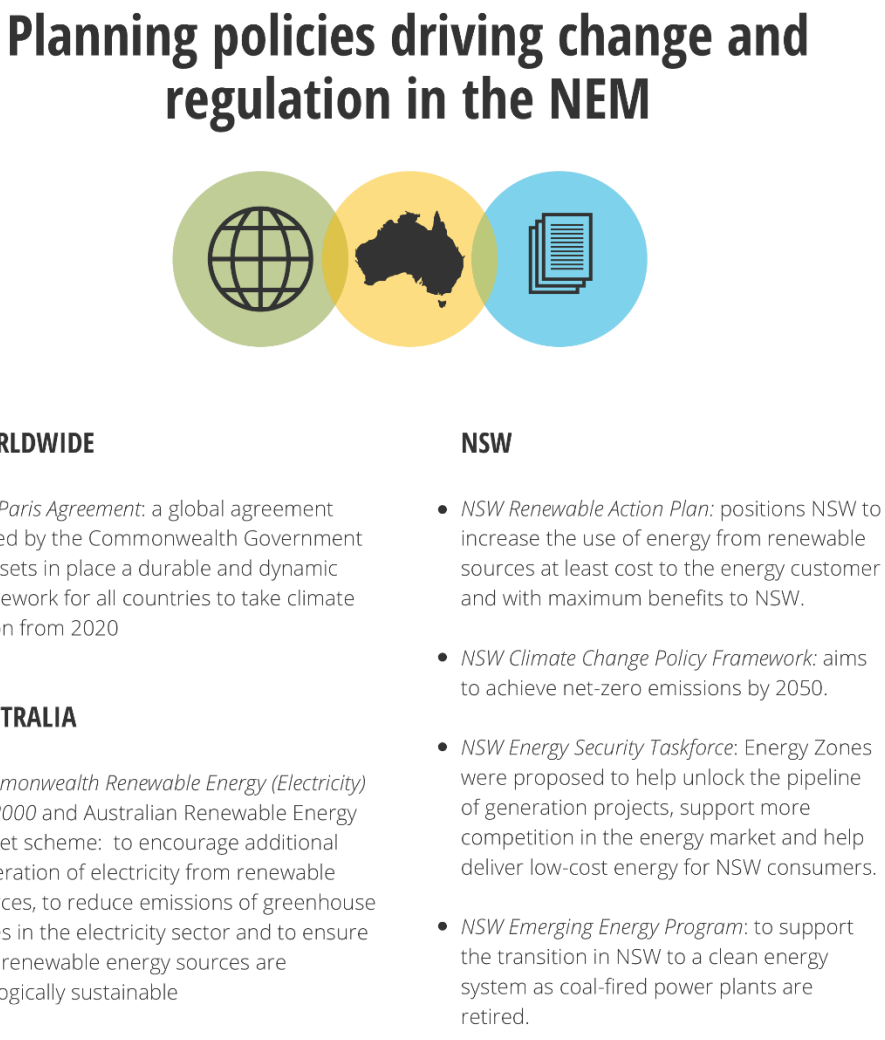


Figure 3.2 Relevant planning policies and regulation

iii Technological, economic and social trends

Currently, coal-powered generation accounts for approximately 77% of the annual generation of electricity within the NEM, with gas (9%), water (8%) and wind (5%) contributing the majority of the remainder. Solar and other generators (including biomass generators) currently account for approximately 1% of generation within the NEM (https://www.aemo.com.au/). Key system changes and operational challenges for the NEM are shown in Figure 3.3.

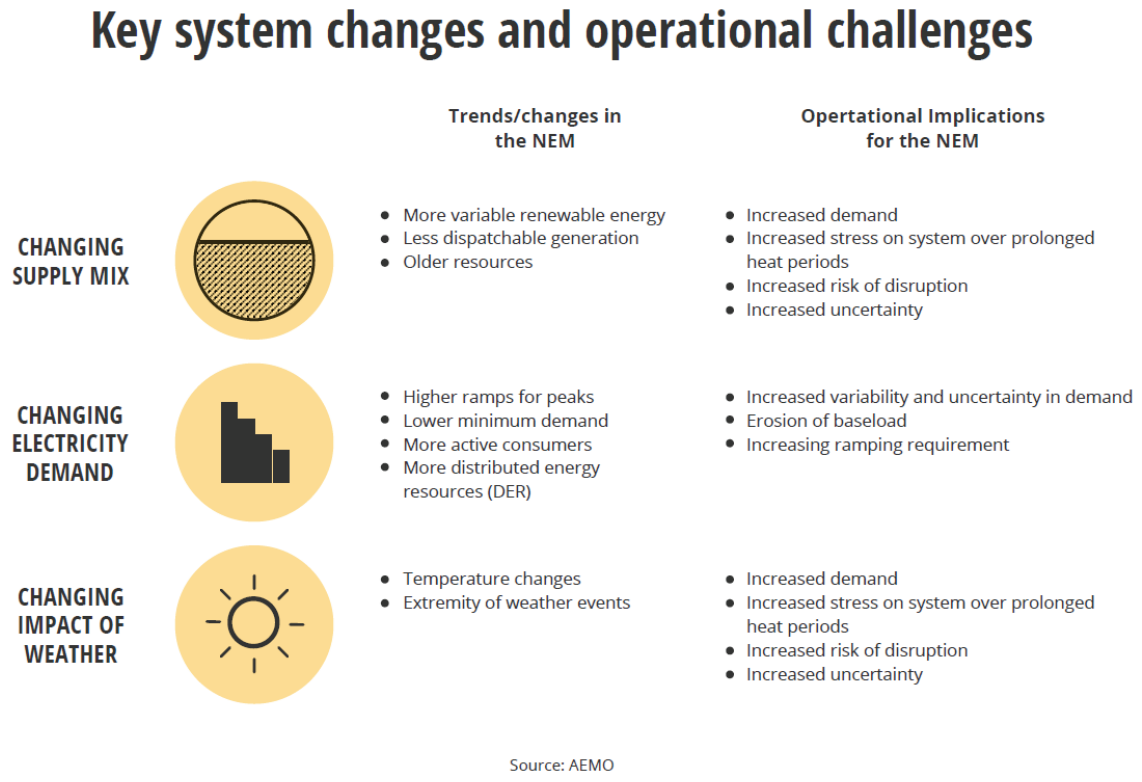


Figure 3.3 Key system changes and operational challenges

As with many electricity markets around the world, the NEM is undergoing a paradigm transformation that has been brought about by significant shifts in energy efficiency, rapidly decreasing costs of wind and solar generation (known as variable renewable energy or VRE), coal power station retirements, increasing coal and gas costs and Australia's participation in global commitments to reduce carbon emissions (ie Paris Agreement).

Amongst the participants of the NEM, NSW is likely to have one of the greatest requirements for energy replacement and capacity, as several coal-fired power plants are confirmed to be retired. As the likelihood of new coal-fired power stations is considered to be low, much of the replacement of coal-powered generation will be from renewable sources and to a lesser extent gas. Figure 3.4 shows the projected evolution of the generation mix in the NEM to 2040, demonstrating both the increase in forecast generating capacity within the NEM and the shift from coal to renewable energy.

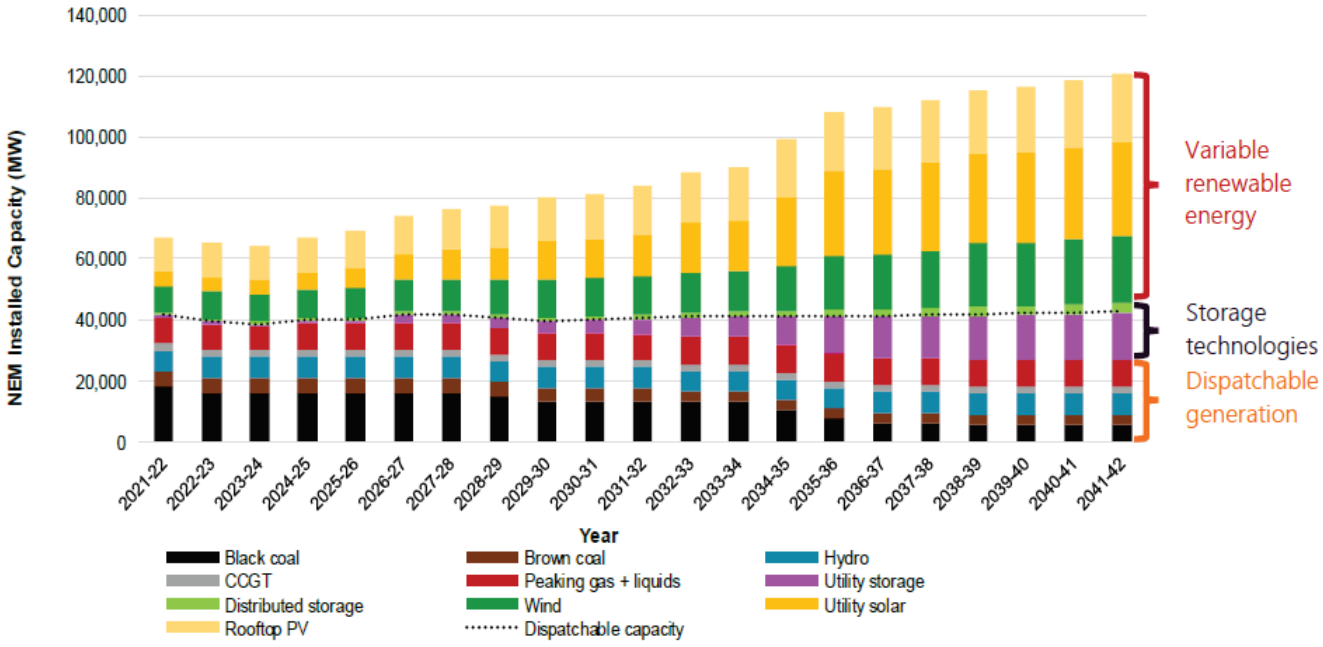


Figure 3.4 Forecast NEM generation capacity (Integrated System Plan (ISP) 2018b)

i Security, reliability and resilience

In the NEM, changes in technology, costs, policy and customer preferences are occurring at a rapid rate. As energy generation needs to balance with customer demand in real time, the integration of intermittent generation will require increased peaking generation and energy storage solutions to provide a sufficiently fast response capacity and to 'time shift' non-dispatchable renewable generation to those periods when it is needed. The requirements for the NEM include storage that can provide energy for consecutive days (MJA 2018a).

While VRE provide energy during model conditions, the challenge for these sources are during prolonged wind and/or solar droughts when they would not operate. Energy storage helps build power system resilience to weather events (including wind, solar, and hydro droughts) by storing surplus renewable generation for use at times when these resources are scarce and allowing more constant operation of less flexible existing generation. This, in turn, creates a more dispatchable and reliable power system, while helping to keep prices down for consumers. This concept is shown in Figure 3.5.

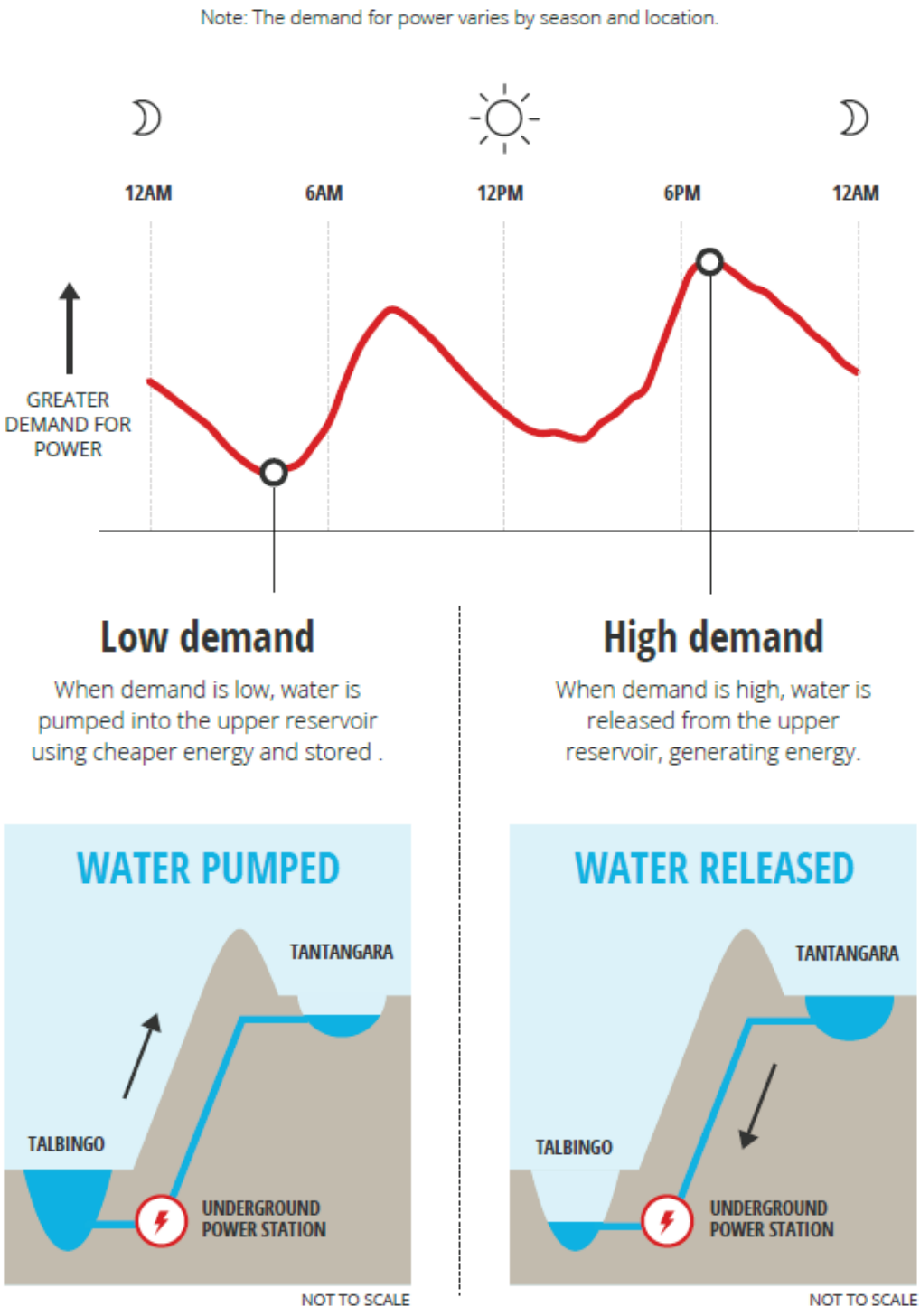


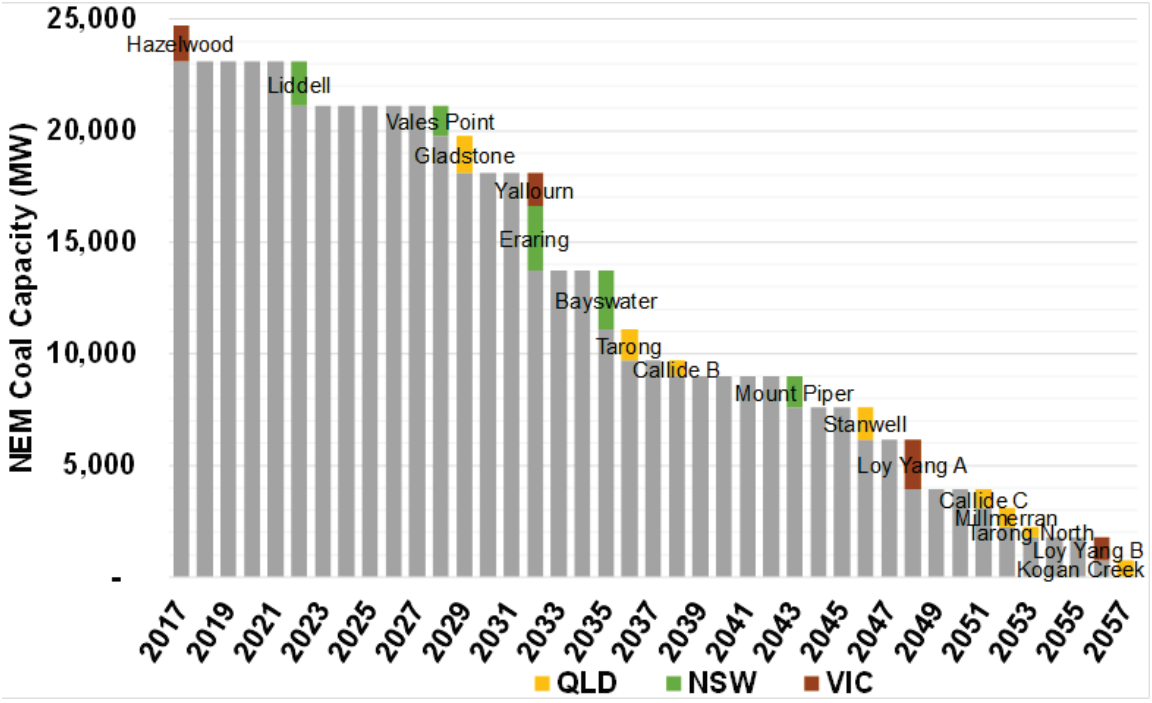
Figure 3.5 Snowy 2.0 operational phases responding to daily power demand

A large pumped hydro system such as Snowy 2.0 (with approximately 350,000 MWh of energy storage) can provide significant energy storage capable of delivering large-scale generation within minutes in times when VRE and/or other generation output is low.

3.2 Need and benefits of Snowy 2.0

As Australia decarbonises, Snowy 2.0 is required to support an orderly transition, prevent blackouts and put downward pressure on energy prices. Snowy 2.0 provides new dispatchable energy generation with large-scale storage to provide secure and reliable energy to the NEM at the lowest cost, which ultimately benefits consumers.

Snowy 2.0 will play a crucial role in providing long term storage and dispatchable generation that can fill and firm the energy void left from the exit of fossil fuel generation. As recognised by the NSW Government in its submission to AEMO (NSW Government 2018), the expected retirement of ageing coal-fired power stations over the next 10 to 15 years combined with increasing demand for energy at peak times will put pressure on the future energy system and require development of replacement firming energy capacity and dispatchable generation. Figure 3.6 shows the current assumptions regarding the closure of these coal-fired generators, with NSW, one of the NEM regions with the greatest scale of age-driven retirements (AEMO 2018). However, as previously discussed, the market has continued to change at a fast pace with an increasing risk that coal-fired generating assets retiring earlier than previously anticipated, placing further pressure on the need to develop replacement firming capacity and dispatchable generation.



Source: MJA S2.0 FID Modelling; technical life basis

Figure 3.6 NEM coal-fired power station operating life (AEMO 2018)

3.2.1 Need for Snowy 2.0 in the NEM

An independent study was carried out by MJA on the operation of Snowy 2.0 in the NEM. The study involved modelling of the NEM with and without Snowy 2.0 for a number of future market scenarios. A detailed account of the methodology and the findings of the study are documented in a detailed report (MJA 2018).

The study included the modelling of the NEM over the period 2018/19 to 2074/75. Further, the modelling was required to properly represent the hourly/daily/weekly/seasonal variations that are fundamental to the operation of generators in the NEM. For each scenario modelled, the impact on the NEM was determined by considering a case where Snowy 2.0 is developed and where Snowy 2.0 is not developed.

As previously discussed, the MJA modelling, whilst carried out in 2017 and 2018, is still very relevant – however, the energy market is evolving and changing much more quickly than originally anticipated even just a year ago. The likelihood of coal-fired generators closing earlier than previously anticipated is increasing (Aurora Energy Research 2019) and concurrently, the rapid uptake of intermittent renewables due to favourable economics is changing the energy market landscape, further underpinning the need for Snowy 2.0.

i The NEM without Snowy 2.0

In the absence of Snowy 2.0, the study concluded the replacement of coal power stations with VRE, gas generation and storage would result in:

- using VRE to replace the lost energy production from the closed coal generators;
- using dispatchable generation (most notably gas) to fill in the gaps when VRE is not generating; and
- using battery storage to capture excess VRE generation that would spill and using it when needed.

Batteries will have a role to play in the future of NEM, but within this scenario, the economics and limited hours of batteries mean that they can only capture part of the variation in VRE and, on their own, do not provide sufficiently for firm capacity. The outlook of this case is that even with the projected reduced costs of batteries, the level of storage required means that more expensive gas generation will be required for firm capacity and to address the majority of the variations in VRE output.

ii The NEM with Snowy 2.0

The MJA study concluded that Snowy 2.0 would influence the operation of and asset mix that replaces the closing coal power stations as follows:

- Significantly more VRE output would be captured thereby improving the economics of VRE entry. Additional VRE generation would be developed. The diversity of VRE output means that Snowy 2.0 would provide for significantly more than 2,000 MW of additional VRE to enter.
- The firm capacity provided by Snowy 2.0 would provide for about 2,000 MW less of more expensive gas generation to be developed.
- Less battery storage would also be needed, although the reduction in battery storage would reduce as battery costs become lower late in the study period.

The net result of Snowy 2.0 being developed is improved market efficiency, more reliable market operation, and lower emissions at the lowest cost.

iii Need for the project

Snowy 2.0 is a critical project for the NEM as it moves to a low-emissions future. As the transition to renewables accelerates, reliable supply cannot be achieved without large-scale energy storage. Snowy 2.0 is the least cost option to build large-scale storage and is centrally located between the NEM's two biggest load centres, Sydney and Melbourne.

In recognition of the need to manage the transition and future energy mix in the NEM, Snowy 2.0 was declared CSSI by the former NSW Minister for Planning under the NSW EP&A Act in March 2018. When announcing the CSSI declaration, the Minister stated that Snowy 2.0 was 'essential for the future security of our energy system, the economy and our environment' with project declared as critical for the energy security and reliability needs of NSW. The declaration signifies the critical role that Snowy 2.0, together with the upgrades to the NSW transmission network, will play in providing reliable energy and large-scale storage to NSW as it transitions to a low emissions economy.

Snowy 2.0 would build on the Snowy Scheme's existing capabilities and meet the needs of the market and consumers by providing fast-start, clean energy generation to address supply volatility, as well as fast-start capability and large-scale storage to address the intermittency issues associated with renewables. Snowy 2.0's 350,000 MWh or 175 hours of energy storage is enough to underpin the stability and reliability of the NEM especially during prolonged weather events, such as wind or solar 'droughts'.

3.2.2 Key benefits of Snowy 2.0

Snowy 2.0 is the largest committed renewable energy project in Australia. By expanding the current Snowy Scheme's renewable energy capacity by almost 50%, the NEM will be served with an additional 2,000 MW generating capacity. In terms of the future energy market, the key benefits of Snowy 2.0 are summarised as follows:

- Snowy 2.0 makes a significant contribution to the continued decarbonisation of the economy;
- Snowy 2.0 provides large-scale energy storages at the least cost to allow more flexibility to respond to seasonal variability when compared to other VRE and batteries;
- Snowy 2.0 will improve the overall efficiency of the NEM by absorbing and storing excess energy from the system at times of excess demand (through pumping) and generate at the critical times of peak times;
- Snowy 2.0, being a closed system, can move water between reservoirs and not rely on natural inflows that may vary seasonally, offering valuable seasonal storage and insurance against drought risk;
- Snowy 2.0 will have the capability to run for over seven days continuously before it needs to be 'recharged'. By comparison, small and large-scale batteries have limited storage (typically one to four hours) and their already high prices increase significantly when used for more than one charge/discharge cycle per day; and
- Snowy 2.0 has a 100 year design life and will operate for generations to come.

The following sections provide further detail on the benefits of Snowy 2.0 within the NEM.

i Supports trilemma of issues of reliability, price and emissions reduction

On a NEM wide basis the above relationships would provide for Snowy 2.0 to directly and substantially contribute to the trilemma issues of reliability (firm capacity), price (least-cost new entry solution), and emissions reduction (optimises VRE storage over time) as the existing fleet of coal-fired generators closes and replacement firm capacity and energy production is required. Lithium ion technology is economically marginal as the reliability (up to 4 hours only) and price (along the learning curve) are not sufficiently profitable in the short to medium term.

ii Avoids excess supply

Snowy 2.0 would utilise otherwise unused low-cost generation (unused coal and VRE) and provide dispatchable and firm capacity that can operate for days if required, with the effect that the NEM would operate more efficiently and with lower emissions.

iii Emissions reduction

Before the closure of NSW Eraring power station, the lowest cost option for reducing emissions is replacing coal generation with VRE generation, together with the level of firming required (with most firming being available from the existing dispatchable generation).

Once Eraring power station and other coal-fired generators close, increasing levels of VRE would require increasing amounts of new firming assets, with economics having this increasingly composed of gas generation. This limits the level of emissions reduction to about a 65% level of abatement (compared to the 2005 level).

A constraint on emissions when coal plant has substantially closed would involve VRE with substantial storage and a reduced reliance on gas generation. The value of large storage is magnified under such conditions.

iv Green energy economy supported by Snowy 2.0

As shown in Figure 3.7, Snowy 2.0, the least-cost economic entrant, displaces both gas (grey bar) and battery (green bar) new entry requirements. In addition, it economically supports wind (black bar) and solar (yellow bar) new entry by converting intermittent dispatchable energy into firm energy using it's unique storage and capacity value capabilities.

Snowy 2.0 provides support and firming for VRE generation. It results in about 3,000 MW of additional VRE generation and a reduction of about 2,000 MW of gas generation (mainly combined gas cycle turbine (CCGT)). Snowy 2.0 results in a reduction of about 1,000 MW of Lithium ion batteries in the initial years of Snowy 2.0 operation, with this reduction diminishing due to the additional VRE that enters in the medium term.

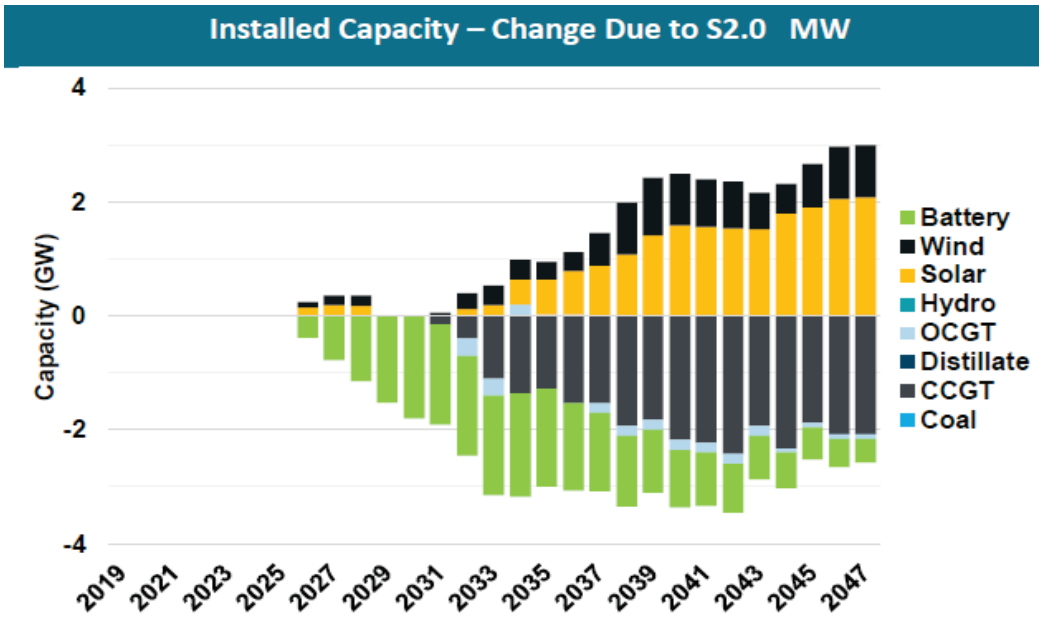


Figure 3.7 **MJA modelling – installed capacity changes due to Snowy 2.0 over time**

The chart in Figure 3.8, is largely consistent with the ISP (AEMO 2018) decarbonisation prediction shows the benefits Snowy 2.0's unique capabilities can provide to enable the transition to a reliable green energy economy. There is very significant coal-fired generation capacity out to 2047. It is replaced with wind and solar energy, battery value (from Lithium ion and Snowy 2.0) as well as capacity/value from open cycle gas turbines (OCGT) and CCGT.

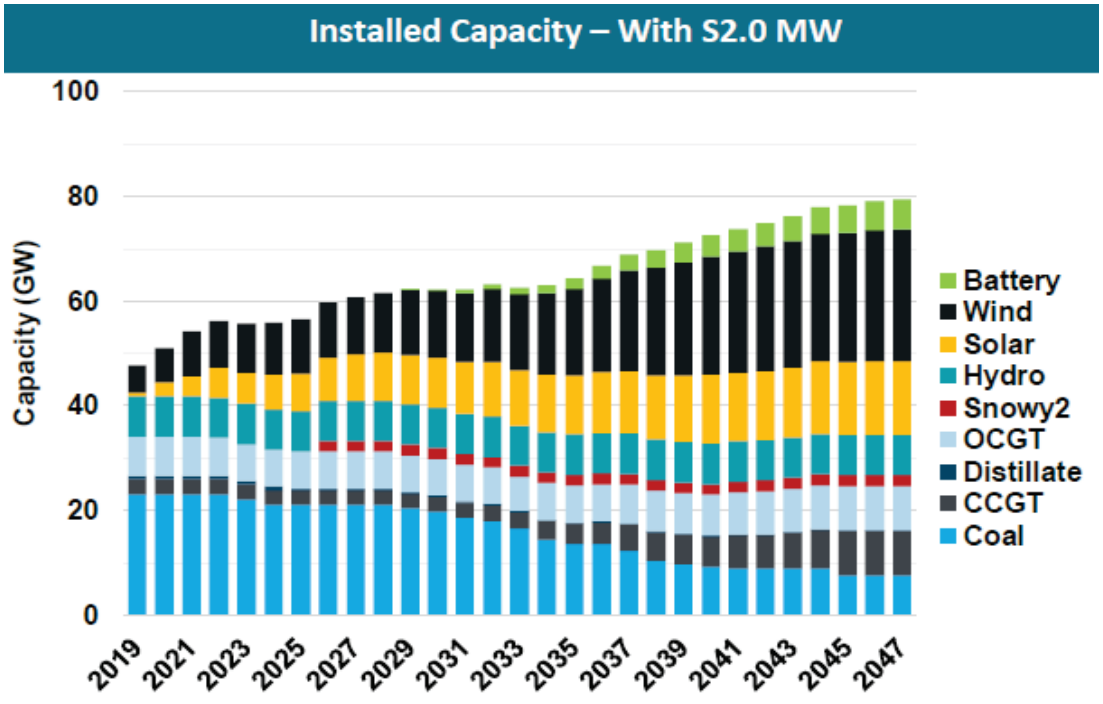


Figure 3.8 **MJA modelling – installed capacity due to Snowy 2.0 over time**

v Supply side options and costs considered in MJA modelling

Lithium ion battery and gas plants were both considered the two possible next best alternatives to Snowy 2.0's capabilities. The full list of generator options considered in the MJA modelling were as follow:

- high efficiency low emission coal plant;
- gas plant – CCGT;
- gas plant – OCGT;
- gas plant – reciprocating;
- solar generation; and
- wind generation.

The main storage providers in the NEM that were considered in the modelling were as follows:

- Large scale pumped hydro schemes. There were only two:
  - Snowy 2.0 which includes the potential further development of Snowy 3.0;
  - Battery of the Nation – Basslink II plus potential developments to the hydro systems in Tasmania. This is supported by the Australian and Tasmanian governments and has economics that requires Riverlink to be developed (which is near being financially committed) and increased VRE development. Battery of the Nation was not costed and has unknown economics;
- Lithium Ion Batteries. Batteries were the principal storage technology developed in the AEMO ISP modelling, and possibly are the most direct competitor to pumped hydro storage in the NEM. However, on the current cost curves, batteries with storage hours of over 4 hours will not be economic from spot price revenues until past 2040;
- Small scale pumped hydro schemes. The geography of Australia limits the number of sizeable and economic sites. Two that were considered included:
  - Kidston in northern Queensland (200 MW and 8 hours of storage); and
  - Cultana in South Australia (up to 250 MW). The Kidston project was assumed to be developed in the MJA modelling.

vi Lithium ion battery as the next best alternative

Not all value that a battery or storage can provide will be translated into a corresponding revenue stream. For example, reducing the costs of coal-fired generator ramping does not appear as a revenue stream.

However, the potential value and revenue streams for batteries that can be modelled and the approach to this assessment of the respective revenue streams includes:

- spot price arbitrage;
- risk value through sustainable operation (associated with storage availability); and

- risk value through the sale (or avoided purchase) of 5-minute cap response products.

The first two of the above increase in value through increased energy in storage.

Another economic factor has been noted; batteries can be developed in conjunction with a solar/wind facility. This can have a battery charge directly from the solar plant and discharge when economic. This can have benefits to transmission use of system charges (if applicable).

The following Lithium ion battery cost curve shown in Figure 3.9 was employed across time on best available, current information on wholesale battery costs.

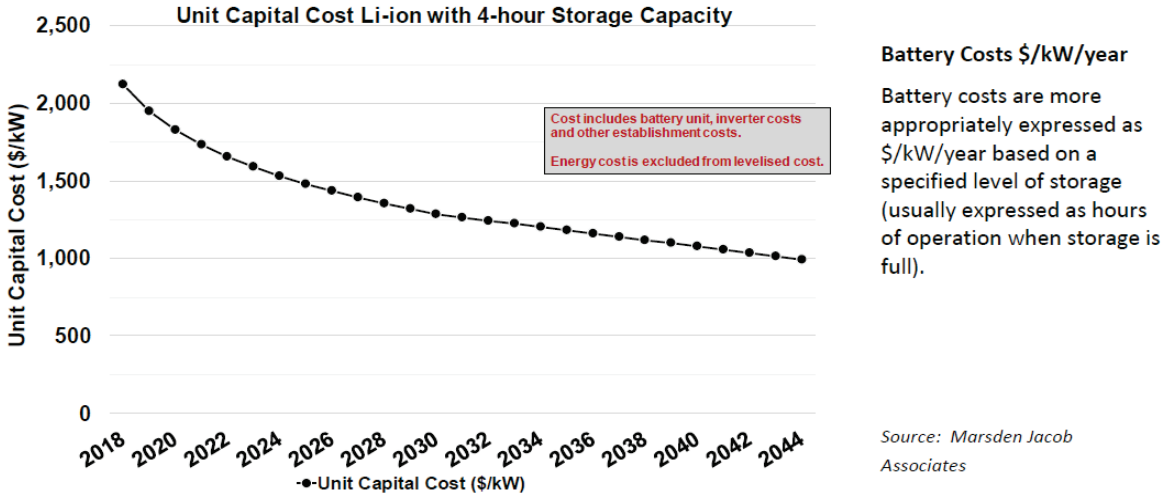


Figure 3.9 MJA modelling – Lithium ion learning cost curve

The development of battery storage is complex. The issue with battery storage is that battery storage (with limited hours of storage) is and will likely continue to enter despite batteries currently not being economic and an outlook (based on the forward cost curves) that batteries will not be economic until past 2040 (for storage with hours of storage over about four hours).

On the basis that batteries will be required to support VRE entry, the analysis concluded batteries will likely enter through the following means:

- limited storage with a solar or wind generator to smooth the VRE profile;
- government-sponsored for reliability and security;
- by regulation. This would require VRE enter to be with a battery for daily smoothing (such as to address minimum load issues) and security post 2030. This would be influenced by other storage such as Snowy 2.0.

The economics of batteries would require very high arbitrage revenues and it is unlikely that there would be a surplus of battery storage competing for VRE charging energy. Consequently, gas generation would form an important component of firming and price setting.

vii OCGT and CCGT gas as the next best alternative

OCGT and CCGT gas generation will likely be needed to provide the firm capacity shortage resulting from the closure of coal plant and the limited expected battery development. MJA economic modelling shows that gas generation is the next best alternative under most scenarios rather than Lithium Ion battery technology due to the latter's constrained energy duration.

viii Summary of key benefits

Snowy 2.0 would result in benefits distributed to the wholesale market, retailers, and consumers. The scale and centralised location of Snowy 2.0 in the NEM enables the system stability, energy reliability and firming capability benefits to be enjoyed by all segments of the NEM as summarised in Figure 3.10.

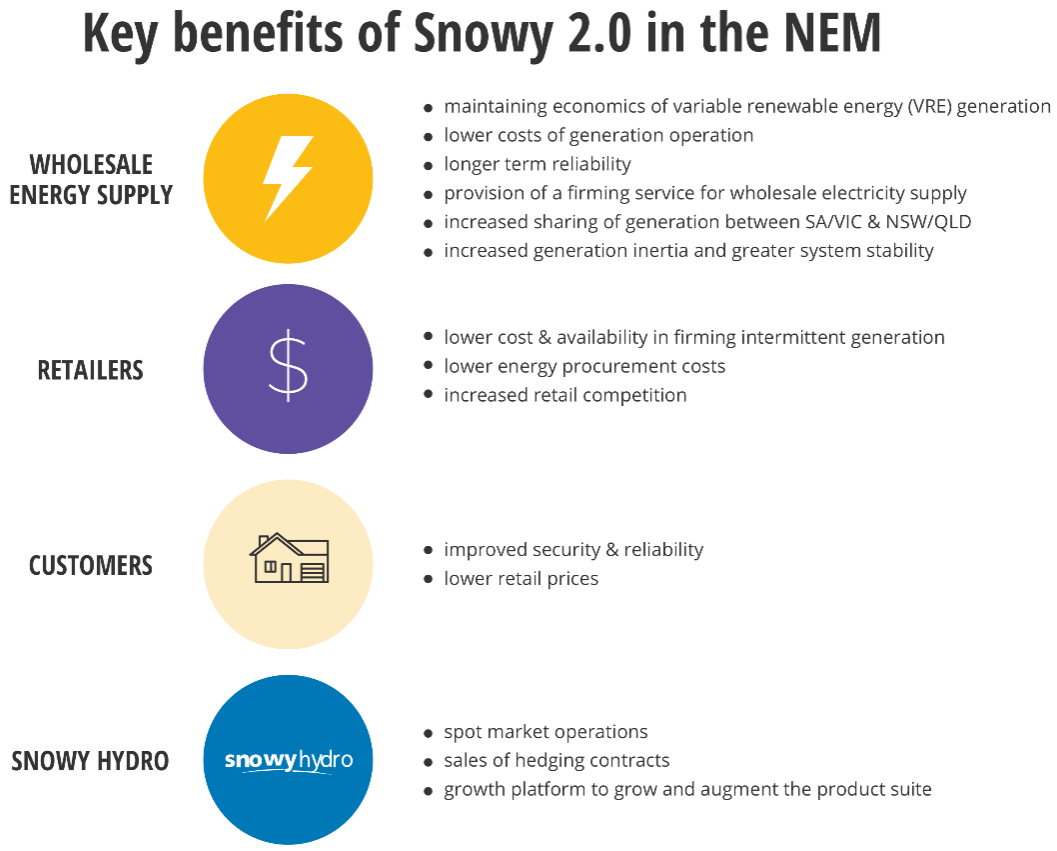


Figure 3.10 Benefits of Snowy 2.0 by market segment

3.2.3 Support for Snowy 2.0

There is strong support for Snowy 2.0 in the community. As part of the stakeholder engagement and community consultation formal surveys were undertaken. Responses identified the areas considered most important by the community, they include:

- the reliability of the electricity network;
- lower energy prices;
- increasing and expanding sources of reliable, renewable energy and minimising reliance on traditional fossil fuels (cleaner energy);
- minimising potential environmental impacts of Snowy 2.0 construction; and
- the economic benefits of Snowy 2.0 for the local communities.

Snowy Hydro's Independent Board of Directors made its FID on 12 December 2018 to proceed with Snowy 2.0, again confirming the project is economic, technically feasible and financeable. As the sole shareholder, the Australian Government provided shareholder approval for Snowy Hydro to proceed with Snowy 2.0 and committed up to $1.38 B by way of an equity injection in Snowy Hydro.

3.2.4 Proposed segment factory

The tunnels for Snowy 2.0 would be constructed using TBMs. These tunnels are required to be lined with concrete tunnel segments that are proposed to be produced at the proposed segment factory.

The alternatives for provision of the segments have been discussed in Section 1.5. This concludes that the site and layout of the proposed segment factory was chosen by Snowy Hydro and the FGJV as the preferred option because it:

- locates the factory outside of the KNP and thereby reduces the amount of land (and, in turn, amount of clearing) otherwise required in the KNP;
- is likely to provide the best opportunities for the local community with regards to direct employment and additional flow on economic benefits from using other local companies and facilities;
- minimises environmental impacts on the site, particularly to native grasslands and operational noise to nearby residents; and
- minimises travel distance for raw material supply.

3.3 Statutory context

3.3.1 New South Wales

i Critical State significant infrastructure

The EP&A Act and EP&A Regulation form the statutory framework for environmental assessment and planning approval in NSW.

Part 5, Division 5.2 of the EP&A Act establishes the assessment and approval regime for SSI and CSSI. Sections 5.12 and 5.13 of Part 5 of the EP&A Act provide for the declaration of SSI and CSSI, respectively.

A SEPP may declare development to be SSI (section 5.12(2)) provided the development is permitted by a SEPP to be carried out without development consent under Part 4 and is either infrastructure or other development for which the proponent is also the determining authority and would require an EIS under Division 5.1 (section 5.12(3)). Despite this, specified development on specified land may be specifically declared to be SSI by a SEPP or by an order of the NSW Minister for Planning and Public Spaces to amend a SEPP (section 5.12(4)).

Section 5.13 of the EP&A Act enables the NSW Minister for Planning and Public Spaces to declare SSI to be CSSI if 'it is of a category that, in the opinion of the Minister, is essential for the State for economic, environmental or social reasons'.

On 7 March 2018 the former NSW Minister for Planning declared the 'Snowy 2.0 and Transmission Project' to be CSSI because it would provide security and enhance the reliability of the east coast electricity market and increase the amount of renewable energy generated in NSW. This declaration came into effect on 9 March 2018 and is included in clause 9 of Schedule 5 of the SRD SEPP, as follows.

9 Snowy 2.0 and Transmission Project

(1) The Snowy 2.0 and Transmission Project is a proposed program of works for the expansion of the generating capacity of the Snowy Mountains Hydroelectric Scheme and for associated upgrades and additions to the electricity transmission network. The object of this clause is to declare development for the purposes of the Snowy 2.0 and Transmission Project that is set out in this clause to be State significant infrastructure and critical State significant infrastructure.

(2) This clause applies to development on land in any of the following local government areas:

(a) Cootamundra-Gundagai Regional,

(b) Goulburn Mulwaree,

(c) Snowy Monaro Regional,

(d) Snowy Valleys,

(e) Upper Lachlan Shire,

(f) Yass Valley.

(3) **Snowy 2.0**

Development for the purpose of pumped hydro and generation works to be known as Snowy 2.0 on land between Tantangara Reservoir and Talbingo Reservoir that involves:

(a) the carrying out of exploratory geotechnical works or engineering investigations, and

(b) the construction and operation of an underground hydroelectric power and pump station capable of supplying approximately 2,000 megawatts of hydroelectric power, and

(c) the construction of water and access tunnels, surge tank and intake and outlet structures at and between the two reservoirs.

(4) Transmission works

Development that involves:

(a) the construction and operation of new electricity transmission lines and an electricity substation to the west of the Talbingo Reservoir to connect Snowy 2.0 to the existing electricity transmission network at Nurenmerenmong, east of Tumbarumba, and

(b) the construction and operation of new electricity transmission lines between the new substation at Nurenmerenmong and an existing substation at Bannaby, north of Marulan, and

(c) the construction and operation of new transmission lines between an existing substation at Khancoban and a location on the NSW-Victorian border generally south-west of Khancoban, and

(d) the augmentation of the existing substation at Bannaby.

(5) The development referred to in this clause does not include:

(a) the carrying out of surveys, sampling, environmental investigations, geotechnical borehole drilling, test drilling, test excavations, or other tests or investigations, for the purposes of feasibility assessment and the preliminary design of the Snowy 2.0 and Transmission Project, or

(b) the carrying out of works to upgrade or modify electricity transmission lines, works within existing switchyards, and the installation of communications infrastructure.

(6) **Ancillary development**

Development that is ancillary to any other development in this clause, including the carrying out of works to upgrade or construct access roads, utilities infrastructure, construction accommodation, construction compounds and construction power supply.

As stated above, the declaration includes in clause 9(6) development that is ancillary to Snowy 2.0 and transmission works. This includes the proposed segment factory, which is ancillary to the construction of Snowy 2.0.

Consequently, the proposed segment factory is subject to Part 5, Division 5.2 of the EP&A Act and the NSW Minister for Planning and Public Spaces is the determining authority for the proposed segment factory.

The approval process for the proposed segment factory can be seen in Figure 3.11.

3.3.2 Environmental impact statement requirements

Clause 6 and 7 of Schedule 2 of the EP&A Regulation sets out specific requirements for the preparation of an EIS, including EISs for SSI and CSSI. A summary of these requirements and where they are addressed in the EIS is provided in Table 3.1.

Table 3.1 Schedule 2 requirements for an EIS

Requirement	Where contained in the EIS
Clause 6 - Form of environmental impact statement	
(a) the name, address and professional qualifications of the person(s) by whom the statement is prepared,	Certification page at the front of this EIS
(b) the name and address of the responsible person (the applicant),	Certification page at the front of this EIS
(c) the address of the land: (i) in respect of which the development application is to be made, or (ii) on which the activity or infrastructure to which the statement relates is to be carried out,	Certification page at the front of this EIS
(d) a description of the development, activity or infrastructure to which the statement relates,	Chapter 2
(e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule,	Chapter 5 and supporting technical assessments in Appendix F to Appendix Q
(f) a declaration by the person by whom the statement is prepared to the effect that: (i) the statement has been prepared in accordance with this Schedule, and (ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and (iii) that the information contained in the statement is neither false nor misleading.	Certification page at the front of this EIS
Clause 7 - Content of environmental impact statement	
(a) a summary of the EIS,	Executive summary
(b) a statement of the objectives of the development, activity or infrastructure,	Section 1.3
(c) an analysis of feasible alternatives to the carrying out the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure,	Section 1.5
(d) an analysis of the development, activity or infrastructure, including:	
(i) a full description of the development, activity or infrastructure, and	Chapter 5
(ii) a general description of the environment likely to be affected by the development, activity or infrastructure, and	Chapter 5
(iii) the likely impact on the environment of the development, activity or infrastructure, and	Chapter 5
(iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure, and	Chapter 5
(v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out,	Section 3.3
(e) a compilation (in a single section of the EIS) of the measures referred to in item (d)(iv),	Chapter 6
(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development.	Chapter 7

3.3.3 Other State approvals and licences

Under sections 5.23 and 5.24 of the EP&A Act, certain separate approvals would not be required for the proposed segment factory (section 5.23) or would be required to be issued consistent with the planning approval, if granted, for the factory (section 5.24).

Each of these separate environmental approvals is considered in Table 3.2.

Table 3.2 Other State approvals and licences

Approval	Relevance to project	Comment
Approvals not required under section 5.23		
A permit under section 201, 205 or 219 of the NSW *Fisheries Management Act 1994* (FM Act)	Not relevant	These permits under the FM Act are normally required for projects that: • dredge or reclaim land (ie any excavation within or filling of water land) - section 201; • harm (cut, remove, damage, destroy, shade etc) marine vegetation (mangroves, seagrass and seaweeds) - section 205; and • obstruct the free passage of fish - section 219. The proposed segment factory does not involve any dredging works and will not be reclaiming land. In addition, it will not harm marine vegetation or obstruct the free passage of fish.
An approval under Part 4 or an excavation permit under section 139 of the NSW *Heritage Act 1977*	Not relevant	This approval is normally required for projects that will or are likely to result in a historic heritage item being discovered, exposed, moved, damaged or destroyed. A historic heritage assessment of the proposed segment factory has been undertaken and it indicates that it is unlikely to result in a heritage item being discovered, exposed, moved, damaged or destroyed.
An Aboriginal heritage impact permit under section 90 of the NSW *National Parks and Wildlife Act 1974*	Not relevant	This permit is normally required for projects that will or are likely to impact on items of Aboriginal heritage. An Aboriginal cultural heritage assessment (ACHA) of the proposed segment factory has been undertaken and it indicates that it is unlikely to impact on any items of Aboriginal heritage.
A bushfire safety authority under section 100B of the NSW *Rural Fires Act 1997*	Not relevant	This authority is normally required when a proponent proposes to: • subdivide bush fire prone land that could be used for residential or rural residential purposes (eg, building a house); and • undertake development that is a Special Fire Purpose development of bush fire prone land (eg, building a school, childcare centre, hotel, retirement villa). The site has not been identified as bushfire prone land, nor is the proposed segment factory defined as a Special Fire Purpose development.

Table 3.2 Other State approvals and licences

Approval	Relevance to project	Comment
A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than a groundwater interference approval) under section 91 of the NSW *Water Management Act 2000* (WM Act)	Relevant	These permits are normally only required for projects that: • use water for a particular purpose (eg irrigation) at a particular location - section 89; • construct and use a water management work (water supply work, drainage work or a flood work) at a specific location - section 90; and • undertake works within 40 m of a water course - section 91. As stated in Chapter 2, the proposed segment factory will connect to SMRC's water main for water supply and will construct a drain to divert the flows of the unnamed creek around the eastern boundary of the site. While the connection to the water supply does not require an approval under the WM Act, the construction of the diversion drain would normally require approvals under sections 90 and 91 of the WM Act. Under section 5.23 of the EP&A Act, a water management work and an activity approval under sections 90 and 91 of the WM Act, are not required for CSSI.
Approvals required to be issued consistently under section 5.24		
An aquaculture permit under section 114 of the FM Act	Not relevant	An aquaculture permit is required where aquatic species (eg fish and marine vegetation) are cultivated for sale or commercial purposes. The proposed segment factory does not involve aquaculture.
Approval under section 15 of the NSW *Mine Subsidence Compensation Act 1961*	Not relevant	Under the NSW *Mine Subsidence Compensation Act* 1961 approval is required to alter or erect improvements (eg a building) or subdivide land in an area proclaimed to be a mine subsidence district. The is not within a mine subsidence district.
A mining lease under the NSW *Mining Act 1992*	Not relevant	A mining lease is required to allow the holder exclusive right to mine for minerals over a specific area of land. The proposed segment factory does not involve mining or the extraction of minerals.
A production lease under the NSW *Petroleum (Onshore) Act 1991*	Not relevant	A production lease is required to allow the holder exclusive right to extract petroleum over a specific area of land. The proposed segment factory does not involve petroleum extraction.
An environment protection licence (EPL) under Chapter 3 of the NSW Protection *of the Environment Operations Act 1997* (POEO Act)	Relevant	The NSW Environment Protection Authority (EPA) issues EPLs to the owners or operators of various industrial premises under the POEO Act. Licence conditions generally relate to pollution prevention and monitoring. An EPL will be required from the EPA for the proposed segment factory as it is defined as a scheduled premise (concrete works) under the POEO Act. Under section 5.24 of the EP&A Act, an EPL cannot be refused if it is necessary for carrying out approved SSI (and CSSI) and is to be substantially consistent with the EP&A Act approval.
A consent under section 138 of the NSW *Roads Act 1993*	Relevant	Consents under section 138 of the NSW *Roads Act 1993* are required for the carrying out for work or erection of a structure on a public road. The proposed segment factory involves construction of the access road in the unmade road reserve, and its connection to Polo Flat Road. As such, an approval will be required from SMRC as the relevant road authority for these works. Under section 5.24 of the EP&A Act, a section 138 consent cannot be refused if it is necessary for carrying out approved SSI (and CSSI) and is to be substantially consistent with the EP&A Act approval.
A licence under the NSW *Pipelines Act 1967*	Not relevant	Licences under the NSW *Pipelines Act 1967* are required to survey, construct and operate a pipeline to convey a gaseous, liquid or solid state substance. The proposed segment factory does not involve surveying, constructing or operating of a pipeline to convey a gaseous, liquid or solid state substance.

3.3.4 Consistency with State and regional policies

Two State and regional policies are relevant to the proposed segment factory. Consideration of its consistency with these policies and plans is given in Table 3.3. It is noted that EPIs, including SEPPs, do not apply to SSI and CSSI by virtue of section 5.22(2) of the EP&A Act. Nevertheless, the SEPPs that would have otherwise applied to the proposed segment factory in the absence of section 5.22(2) of the EP&A Act are detailed in Table 3.3.

Table 3.3 Consideration of relevant State policies and plans

Policy/plan	Relevant project elements	Consistency of proposed segment factory
State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33)	Storage and transport of potentially dangerous goods	To address SEPP 33, a risk screening was undertaken in accordance with DPIE's guideline *Hazardous and Offensive Development Application Guidelines Applying SEPP 33* (Applying SEPP 33) (State of NSW, 2011). The risk screening demonstrates that there would not be any potentially hazardous materials transported, stored or handled at the proposed segment factory, and as such, it is not defined as a potentially hazardous industry. Accordingly, a Preliminary Hazard Assessment (PHA) of the proposed segment factory is not required. In addition, as a result of the outcomes of the noise, air quality and water assessments undertaken for the proposed segment factory, the risk screening also demonstrates that the factory is not defined as offensive development. The risk screening is summarised in Section 5.9 and contained in Appendix O.
State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)	Historic activities undertaken on the site have the potential to contaminate land	To address SEPP 55, a contamination assessment was undertaken of the proposed segment factory. The assessment, which included both a site inspection and intrusive investigation did not indicate the presence of significant contamination in the areas investigated, in the context of the proposed industrial use of the site. Some minor contamination was detected, including identification of some fragments of asbestos containing material (ACM) on the surface of the site. Remediation and management measures are therefore recommended to minimise impacts to site users, surrounding workers and the environment which would be documented in an environmental management plan (EMP) that would be prepared for construction and operation of the proposed segment factory. The contamination assessment is summarised in Section 5.6 and contained in Appendix K.

3.4 Commonwealth

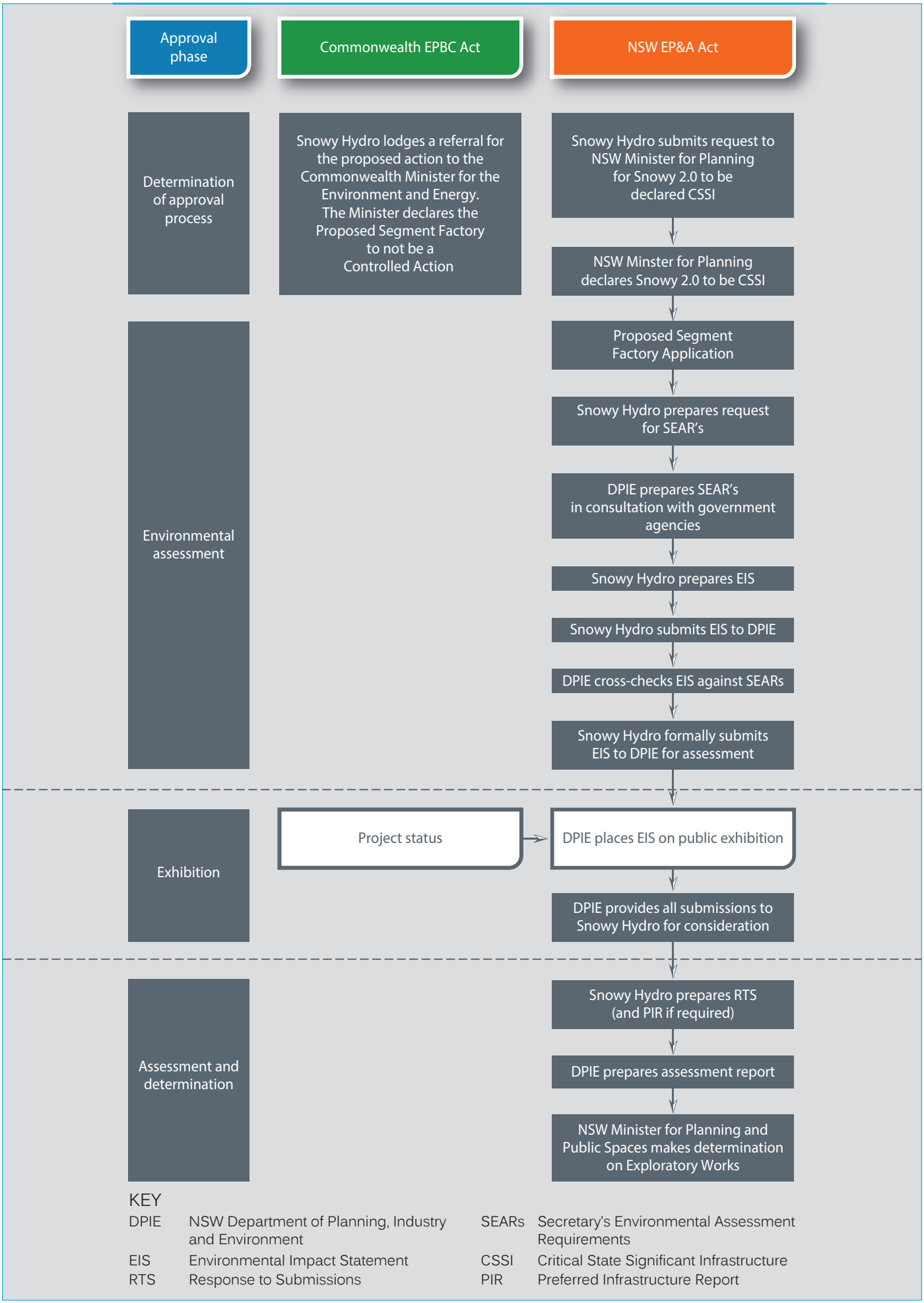
The EPBC Act is the primary Commonwealth legislation that governs the protection of the environment. Snowy Hydro became a 'Commonwealth agency' for the purposes of the EPBC Act on 2 July 2018 following the acquisition of all remaining shares of Snowy Hydro by the Commonwealth. In addition, given that Snowy Hydro owns Lot 14 and Lot 3, those parts of the site are deemed to be 'Commonwealth land'.

An approval under the EPBC Act would be required for Snowy Hydro, which is a Commonwealth agency for the purposes of the EPBC Act, to undertake the proposed segment factory if that action is determined to be a 'controlled action' because:

- it will have or is likely to have a significant impact on MNES; or

- it will have or is likely to have a significant impact on the environment inside or outside the Australian jurisdiction.

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 EPBC Act. On 13 August 2019, the proposed segment factory was determined by the Acting Assistant Secretary Assessments and Waste Branch of DEE, as delegate to the Minister, to be 'not a controlled action' and therefore does not require further assessment or approval under the EPBC Act.



snowy 2.0

EMM creating opportunities

Approvals assessment process

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 3.11

CHAPTER 4

ENGAGEMENT

4 Stakeholder engagement

4.1 Introduction

Stakeholder engagement and consultation for Snowy 2.0 commenced in mid to late 2017 and has been ongoing. Stakeholder activities have been led by Snowy Hydro with the support of EMM, FGJV and technical specialists as required.

4.2 Overview of engagement activities undertaken during the preparation of the EIS

Snowy Hydro has adopted a proactive and flexible stakeholder engagement strategy for Snowy 2.0, which is applicable to all phases of the project, including the proposed segment factory. It aims to meet the demands of a diverse range of stakeholders with changing needs. The strategy has been designed to deliver the following objectives:

- create awareness of Snowy 2.0, what the project will involve, potential impacts on stakeholders and the role the project will play in the NEM among key stakeholder groups;
- retain and build stakeholder support for Snowy 2.0 and encourage positive collaboration between Snowy Hydro and stakeholders;
- build strategic relationships and work in partnership with key stakeholders to ensure the matters impacting Snowy 2.0 can be mitigated or managed;
- identify and manage emerging issues through effective two-way engagement; and
- be customisable, flexible, and dynamic to ensure engagement strategies meet the needs of stakeholders.

Like other stages of Snowy 2.0, the specific objectives of stakeholder engagement for the proposed segment factory are to ensure identified stakeholders have a sufficient understanding of:

- the scope of the proposed segment factory;
- how the proposed segment factory may affect them;
- how engagement contributes to the overall approval process for the proposed segment factory;
- how they can participate in the approval process and be informed and consulted;
- collect qualitative and quantitative data, evidence and insights for scoping the EIS, in ways that maximise diversity and representativeness;
- understand the interests that stakeholders have in the proposed segment factory, and how potential impacts are predicted to be experienced from their perspective;
- consider the views of stakeholders in a meaningful way and using these insights to inform project planning, mitigation and enhancement measures, and monitoring and management frameworks; and
- respect people's privacy, allowing them to communicate their views anonymously if they desire.

To address these objectives, Snowy Hydro has developed an end-to-end framework for stakeholder engagement summarised in Figure 4.1. This framework has and will be applied to the EIS for the proposed segment factory and throughout the lifespan of Snowy 2.0. It will include the ability to adapt as Snowy 2.0 progresses and as and when stakeholder requirements change, while remaining consistent with the overarching objectives.

The key phases are summarised below and in Figure 4.1:

1. identify - identification of stakeholders and impacts;

2. design and prepare - definition of desired level of engagement (to inform, consult, involve, or collaborate), and the development of corresponding stakeholder engagement tools and methods;

3. engage - commence stakeholder engagement in line with the level identified in the previous phase, and implement relevant methods;

4. provide feedback - create mechanisms for timely two-way feedback on stakeholder needs and concerns; and

5. review - implement a continuous improvement loop to assess the adequacy and effectiveness of engagement, and where required, change the nature of engagement.

4.2.1 Identified stakeholders – who was engaged

Snowy Hydro identified four key stakeholder groups for engagement on the proposed segment factory, being governments, local community, industry groups and media.

Targeted methods of consultation and were identified to match the needs of each stakeholder group and supported by four levels as follows:

1. Inform - create awareness amongst stakeholders and communicate progress of Snowy 2.0 and the proposed segment factory in a timely manner;

2. Consult - proactively seek feedback through formal and informal mechanisms to identify and mitigate potential concerns; and establish processes for ongoing dialogue and complaints management;

3. Involve - in cases where feedback is provided on direct impacts, consider feedback when designing relevant activities; and

4. Collaborate - actively seek and incorporate stakeholder input into the design and implementation of that stakeholder-centric project activity.

Snowy Hydro has designed its approach with the intention to suit the identified stakeholder needs, with the level of engagement, communication tools, and activities tailored for each group, and periodically reviewed to ensure they remain fit-for-purpose.

Snowy Hydro recognises that stakeholder groups such as irrigators, environment groups and tourism operators, which have been categorised as community during the implementation of their stakeholder engagement framework could also be categorised as industry groups as well.

1. Identify

Four key stakeholder groups that require engagement have been identified:
- government
- local community
- industry groups
- media

A range of potential impacts both positive and negative, by Main Works were identified:
- impacts and opportunities on local employment, businesses, recreation, tourism and roads
- impacts and benefits to towns, localities and services in the region
- impacts on the environment and heritage

2. Design and prepare

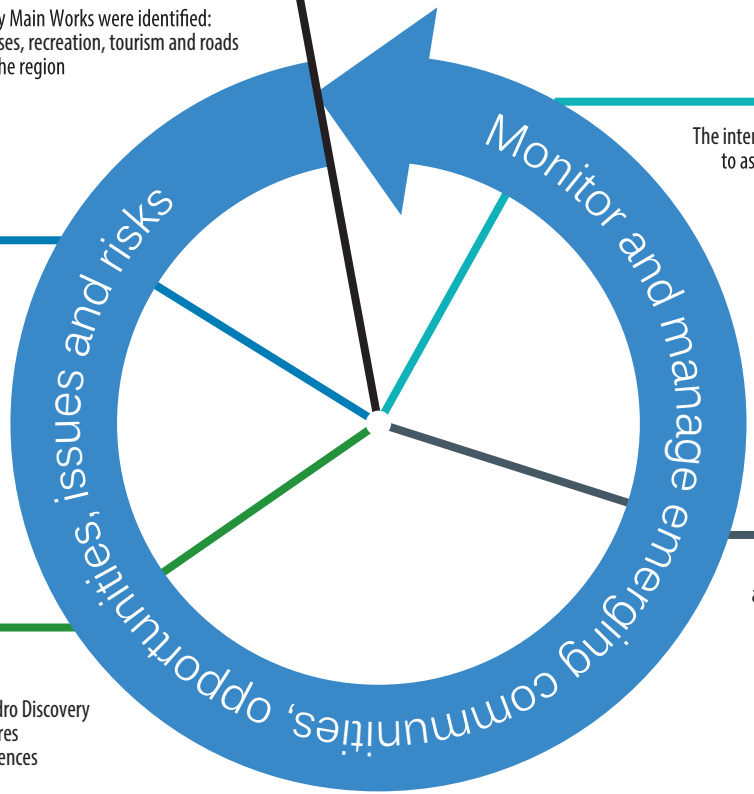
Four levels of engagement were assigned to each stakeholder group; they include:
1. Inform
create awareness amongst stakeholders and communicate progress
2. Consult
proactively seek feedback through formal and informal mechanisms, mitigate potential concerns and establish dialogue
3. Involve
in cases where feedback is provided on direct impacts, consider feedback when designing relevant activities
4. Collaborate –
actively seek and incorporate stakeholder input into the design and implementation

3. Engage

The following engagement activities have been undertaken by Snowy Hydro:
- Community consultations in local townships
- Surveys
- Community information booklets
- Focus groups
- Media engagement
- Utilising the Snowy Hydro Discovery Centre and Visitor Centres
- Presentations at conferences
- Regular updates to the company website about the project
- Snowy Hydro's quarterly newsletter
- Ongoing consultation with NPWS, DP&E, local councils (Snowy Valleys & Snowy Monaro Regional Council)
- Ongoing consultation with key stakeholders such as Aboriginal groups
- Briefings and engagement with local communities and community stakeholders obtained through existing relationships with the community; and
- Briefings and engagement with industry groups

A range of permanent engagement channels have been established for Snowy 2.0 to seek input from stakeholders and to support stakeholder engagement on an ongoing basis

A range of tools continue to be used to support communication and engagement for Snowy 2.0 and Main Works, including: publications and information materials, community consultation sessions, presentations, meetings, workshops, media releases, articles, interviews, website updates and surveys



4. Feedback

Purpose is to capture feedback during stakeholder engagement and to identify issues by the stakeholders to address throughout Snowy 2.0

Opportunities for future feedback will include the exhibition period for the Main Works EIS

5. Review

The intent of this phase is to implement a continuous improvement loop to assess the adequacy and effectiveness of engagement, and where required, change the nature of engagement

Snowy Hydro has undertaken the following activities:
- research into better practice in community engagement
- validation and testing with key internal stakeholders

snowy 2.0

EMM

Stakeholder engagement framework
Snowy 2.0
Environmental Impact Statement
Proposed segment factory
Figure 4.1

4.2.2 Engagement activities and tools – how and when engagement occurred

i General

Engagement activities targeted specifically for the proposed segment factory have comprised of the following initiatives, with further detail on each activity provided in this section:

- the distribution of information sheets on the proposed segment factory;
- the development of a survey;
- consultation sessions with the community;
- Social Impact Assessment (SIA) workshops;
- general community consultation such as face-to-face meetings;
- engagement such as meetings with State and Commonwealth government agencies, and SMRC and Snowy Valleys Council (SVC); and
- engagement with Indigenous leaders, groups, and organisations around mobilisation for opportunities associated with the proposed segment factory.

ii Information sheets

An information sheet was prepared that provided an overview of the proposed segment factory, map of the site, outlined the assessment process and the requirements of the SIA. The information sheet also provided links to the scoping report on the DPIE website and the online survey.

There were 168 Information sheets distributed to businesses and residents along Polo Flat Road, Monaro Highway, Sharp Street and Snowy Mountains Highway. Businesses along Sharp Street were delivered information sheets in person.

iii Survey

An online survey was administered to provide community input to the identification of potential social impacts as a consequence of the proposed segment factory (ie for the SIA). The survey provided both quantitative and qualitative data on the community's views about the project. It included multiple choice answers as well as opportunities to provide additional comments.

Identified community stakeholders were informed of the online survey through email and phone invitation. The survey was also advertised on Snowy Hydro's website and distributed in print form at consultation events facilitated by Snowy Hydro and FGJV (outlined further in the sections below). Businesses were also informed of the online survey during the interview phases.

The survey had 48 respondents, 50% male, 48% female and 2% identified as other. There was a reasonable representation of respondents from different age groups except those under the age of 25.

iv Consultation sessions

Snowy Hydro and FGJV organised and ran three consultation sessions with the local community to inform them on the proposed segment factory. Letter invites were sent to residents and landowners residing in, or owning properties in the local area.

A total of 315 letters were issued and provided residents and landowners the option to attend one of three consultation sessions on the proposed segment factory and engage with the project team. The consultation session dates and locations are provided in Table 4.1.

A formal and informal question and answer session was held after the presentation from the project team and all attendees were also requested to complete the 'Concrete Segment Factory Project Social Impact Survey' (also referred to as the online survey) to provide important feedback to the team. The surveys were completed onsite at the meetings and attendees were informed that the survey was also available online.

The project team provided a short presentation at each session outlining information on several key areas including:

- Snowy 2.0 fast facts;
- site history;
- proposed segment factory design layout;
- proposed segment factory key facts;
- segment production key facts;
- estimated traffic movements;
- proposed EIS requirements;
- EIS issues considered;
- potential regional impacts;
- possible alternate transport routes; and
- approvals process for the possible alternate route.

Table 4.1 Business consultation session details

Date/time	Location	Number of attendees	Number of surveys received
24 July 2019 (6-8 pm)	H Hardware, Polo Flat	80 people	14
30 July 2019 (6-8 pm)	Shannons Flat Hall, Shannons Flat	23 people	15
31 July 2019 (6-8 pm)	Snowy Scheme Museum, Adaminaby	15 people	6

Source: FGJV

Additionally, on 14 August 2019, Snowy Hydro and FGJV representatives attended five face-to-face meetings with residents on Carlaminda Road and one business (Monbeeef) potentially affected by noise from the operation of the proposed segment factory.

The purpose of the meetings was to provide further information on the general layout of the proposed segment factory, designed noise mitigation measures, truck movements (on-site and off-site) and the preliminary results of noise modelling. All participants noted that they already experience noise from existing truck movements with little impact, and were not concerned with additional noise impacts.

v Social Impact Assessment workshops

Two community workshops (see Table 4.2) were held on 23 and 24 July 2019 as part of the SIA field study. These workshops were held to consult with residents, service providers, local businesses and community organisations regarding the current status of the proposed segment factory, the role of SIA, and the potential social impacts associated with the proposed segment factory.

The workshops began with an overview of the proposed segment factory, followed by details of the assessment process (including information pertaining to SIA specifically), and included a discussion of the community's values, strengths, and vulnerabilities, as well as the opportunities and impacts related to the proposed project.

Table 4.2 Community workshops

Location	Date	Time	Venue	No of participants
Cooma	23 July 2019	5.30 pm to 7.30 pm	Cooma Ex-Services Club	6
Cooma	24 July 2019	9.30 am to 11.30 am	Cooma Ex-Services Club	11

Source: FGJV

Participation in the workshops was promoted through phone and email invitations. The attendees for both workshops comprised a diverse range of stakeholders involved with the study area. Participants included representatives from:

- educational institutions;
- real estate and local businesses;
- Cooma Chamber of Commerce;
- tourist accommodation;
- NSW Rural Fire Services (RFS);
- charity organisations;
- State government; and
- residents of the local area.

Further information on the outcomes of these workshops are reported within Appendix P.

vi General community consultation

In addition to formal community workshops, Snowy Hydro has been conducting ongoing community consultation with residents and business owners whenever requested, including meetings face-to-face and phone calls.

Table 4.3 provides an overview of the additional consultation undertaken for the proposed segment factory.

Table 4.3 Community engagement activities

Date	Consulted party	Consultation method
5 December 2018	Cooma Chamber of Commerce	Face-to-face briefing
23 July 2019	Owner of business adjoining site	Face-to-face briefing
20 July 2019	Polo Flat business owner	Face-to-face briefing
22 July 2019	Land owner adjoining the site	Phone
29 July 201919	Land owner adjoining the site	Phone
31 July 2019	Closest resident to the site	Phone
14 August	Residents along Carlaminda Road	Face-to-face briefing

vii Engagement with Indigenous leaders, groups, and organisations

On the 23 July 2019 Snowy Hydro met with a member of a local Aboriginal group to discuss the proposed segment factory. The member indicated that there is general support for the project but expressed the need for Aboriginal engagement regarding both jobs and potential heritage impacts.

Registered Aboriginal Parties (RAPs) for Snowy 2.0 were also consulted about the proposed segment factory via NSW Archaeology Pty Limited who was engaged by Snowy Hydro to prepare the ACHA for the project. Details of the consultation with RAPs is provided in Section 5.8 and Appendix N.

viii Key engagement activities with government agencies

Table 4.4 provides a summary of key government agencies consulted in relation to the proposed segment factory. These consultation activities are in addition to the over-arching consultation activities undertaken for Snowy 2.0.

Table 4.4 Key engagement activities with government agencies

Date	Government agencies	Consultation method
27 November 2018	• SMRC • SVC	Face-to-face briefing
22 May 2019	• SMRC	Face-to-face briefing
21 June 2019	• SMRC • SVC • DPIE • DEE • EPA • NSW National Parks Wildlife Services (NPWS) • Department of Primary Industries – Fisheries	Face-to-face briefing
24 June 2019	• DEE	Teleconference
10 July 2019	• SMRC • SVC • Emergency services • NSW Department of Premier and Cabinet (DPC)	Face-to-face briefing
11 July 2019	• NSW Roads and Maritime Services (RMS)	Site meeting and inspection of traffic route
12 July 2019	• RMS	Face-to-face briefing

Table 4.4 Key engagement activities with government agencies

Date	Government agencies	Consultation method
16 July 2019	• NSW Treasury • NSW Police • DPIE • DPC • NSW Family and Community Services (FACs) • NSW Department of Education and Training (DET)	Face-to-face briefing
23 July 2019	• SMRC • NSW Police • DPC • Destination NSW • RMS • NPWS	Face-to-face briefing
24 July 2019	• Regional Development Australia – Southern Inland]	Face-to-face briefing
26 July 2019	• EPA	Videoconference
1 August 2019	• NSW Police	Face-to-face briefing
2 August 2019	• RMS	Face-to-face briefing
2 August 2019	• DPIE	Videoconference
13 August 2019	• SMRC	Face to face briefing

4.3 Key issues raised

4.3.1 Key issues raised by government agencies

i Councils

As Table 4.4 demonstrates, a number of meetings and briefings have been held with the two councils in which the Snowy 2.0 project area is located; SMRC and SVC. Given the proposed segment factory's location within the Polo Flat industrial area adjacent to Cooma, these meetings and briefings have mainly involved SMRC. Meetings and briefings with SVC have mainly been for information purposes.

It is evident as a result of the consultation with SMRC that both professional staff and elected representatives are overwhelmingly supportive of the proposed segment factory because of the economic benefits that it would bring to Cooma and surrounding communities.

Notwithstanding this some concerns were raised in relation to potential impacts related to traffic generated by the project, and potential impacts related to additional demand on a relatively short supply of housing and accommodation. Some minor concerns were also raised in relation to the project 'draining' the local workforce which would result in a need for 'backfilling' the vacated jobs. SMRC noted that these matters could be addressed through implementation of mitigation measures by both Snowy Hydro and FGJV, and government.

ii Commonwealth government

DEE were briefed on the project before and during the Department's assessment of the referral under the EPBC Act. Key issues raised related to potential impacts on native grasslands on the site. As previously discussed, DEE determined that the project was not a controlled action, and therefore does not require an approval under the EPBC Act.

iii State government

a DPIE

Consultation with DPIE has been ongoing from the preparation of the scoping report for the receipt of SEARs and the preparation of this EIS.

Key matters raised by the planning section of DPIE are reflected in the SEARs, but also included the same issues raised by SMRC; that is, traffic and housing related impacts. DPIE's planning section also raised potential noise related impacts from the operational phase of the proposed segment factory as a matter requiring detailed consideration during the preparation of the EIS.

The key matter raised by DPIE's environment section related to potential impacts on native grasslands and potential threatened species that may inhabit these grasslands. Following a briefing on the results of heritage surveys, no issues were raised by DPIE's environment section in relation to potential impacts on Aboriginal or historic heritage.

b EPA

Consultation with EPA has been ongoing from the preparation of the scoping report for the receipt of SEARs and the preparation of this EIS. The key issue raised by the EPA was in relation to potential noise impacts of the proposed segment factory during both the construction and operation phases of the project.

c RMS

Throughout the development of EIS, numerous consultation sessions with RMS have been undertaken. The consultation around the site was included within sessions about Snowy 2.0 Main Works, as they the two projects are intrinsically linked. The key issues raised relate to upgrades of various intersections along the proposed traffic route, as well as issues regarding roundabouts.

4.3.2 Survey

Those who responded to the survey had existing knowledge of Snowy Hydro with 87% having had interactions with the company.

Respondents were asked to rank potential social impacts of the proposed segment factory as either negative, neutral or positive, with the results presented in Figure 4.2. All responses received a majority positive or neutral response. No responses received a majority negative response.

Most potential social impacts were ranked as neutral by respondents. The potential social impacts that were ranked as positive include local business (87%), employment (86%), property prices (60%), rental or temporary accommodation (63%), community values (62%), and way of life (49%).

Respondents ranked hygienic environment (eg dust in house) (30%) as the biggest potential negative impact followed by rental or temporary accommodation was the next biggest concern (20%). All other potential impacts were ranked as negative by 10% or less of respondents.

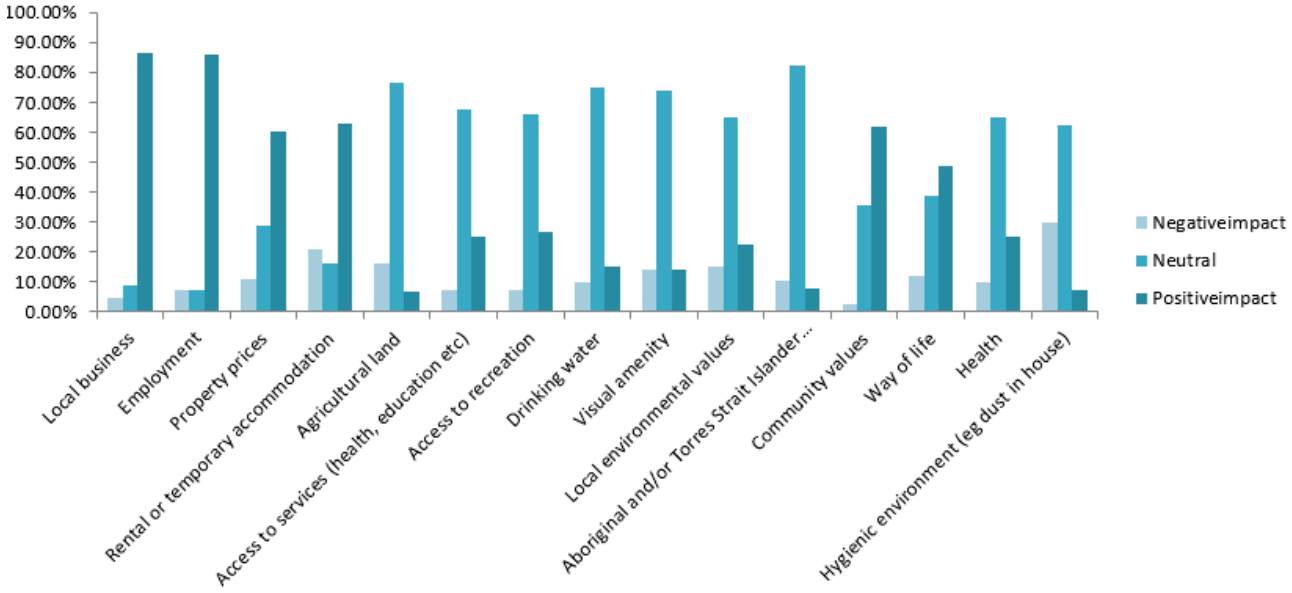


Figure 4.2 Perceived potential social impacts

4.3.3 Information sessions and meetings

The results of stakeholder engagement at the information sessions and meetings indicate that, in general, all stakeholders are supportive of the proposed segment factory. Notwithstanding this, all stakeholders raised matters or issues that they would like considered and addressed by Snowy Hydro and FGJV.

Matters relating to traffic were of the main issues raised throughout all engagement platforms. Participants consistently noted their concern for existing road safety and the ways in which the proposed segment factory may affect conditions and further exacerbate existing conditions. Reductions in speed limits was among the most frequent request for addressing traffic concerns. In addition, concerns were raised regarding increased highway traffic and the safe movement of agricultural stock.

Participants generally viewed the proposed segment factory as having a potentially positive effect on employment and business opportunities, especially the possibility of increased traineeship opportunities and business expansion in the area. However, some expressed their concern for potential staffing competition with the proposed segment factory. The SIA community engagement activities also revealed worries throughout the community regarding a housing shortage and the inadequacy of existing housing. Other matters discussed across consultation activities include community values, service provision, access to recreation, and way of life.

4.4 Proposed approach to community engagement post approval

A large network of stakeholders and existing communication channels are in place for the Snowy 2.0 project, including the ancillary component of the proposed segment factory, providing opportunities for targeted and broad engagement and communications activities for the proposed segment factory.

Snowy Hydro and FGJV will continue to engage with adjacent landowners, and businesses and the local community in accordance with the framework outlined in FGJV's Snowy 2.0 Community and Stakeholder Engagement Plan.

As a minimum FGJV will engage with directly-affected adjacent landowners and businesses at Polo Flat and the local community in two phases:

- during construction of the proposed segment factory, future engagement may include:
  - phone engagement, followed by face-to-face meetings if required;
  - key stakeholder updates;
  - construction notifications via letterbox drop;
  - Snowy 2.0 traffic and transport updates;
  - a 1800 number and project emails for general community enquiries or complaints;
  - updates on FGJV webpage www.futuregenerationjv.com.au; and
  - a Project Information Centre located in Cooma with construction information and access to the project team for enquiries or complaints.
- during operations of the Segment Factory, future engagement may include:
  - key stakeholder updates;
  - Polo Flat operations updates in local media and Snowy Hydro publications;
  - Snowy 2.0 e-newsletter, including information on the proposed segment factory updates;
  - Snowy 2.0 traffic and transport updates;
  - updates on the FGJV webpage www.futuregenerationjv.com.au;
  - a 1800 number and project emails for general community enquiries or complaints; and
  - a Project Information Centre located in Cooma with operational information and access to the project team for enquiries or complaints.

CHAPTER 5

ENVIRONMENTAL IMPACT ASSESSMENT

5 Environmental impact assessment

5.1 Introduction

This chapter provides a summary of the key environmental matters associated with the construction and operation of the proposed segment factory. This chapter is supported by a number of technical assessments which include further detailed information and are appended to the EIS from Appendix F to Q.

All technical assessments have been prepared in accordance with the SEARs.

5.2 Transport

A Traffic and Transport Assessment (TTA) was prepared by SCT Consulting to determine potential traffic and transport impacts of the project. The assessment includes 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 residual impacts that are not able to be avoided.

The full TTA is provided in Appendix F.

5.2.1 Context

An overview of the existing environment as it relates to traffic and transport is provided in Table 5.1, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.1 Context for traffic and transport

Existing environment	**General** The assessment addressed the impacts of the proposed segment factory on the capacity, condition, safety and efficiency of the local, national park and State road network in accordance with the SEARs. The assessment included a road safety audit of the haulage route between the site of the proposed segment factory at Polo Flat and the construction sites within KNP. **Main traffic routes and key intersections** The assessment focused on the sections of the Snowy Mountains and Monaro highways, as well as the connecting local road network (including Polo Flat, Tantangara, Link and Lobs Hole Ravine roads), that comprise the haulage route between the site of the proposed segment factory at Polo Flat and the construction sites within KNP. Key intersections included the Snowy Mountains Highway/Kosciuszko Road intersection, the Sharp Street intersections with Bombala and Vale streets and the Monaro Highway/Polo Flat Road (north end). The road condition/safety assessment identified some sections of road, including sections of Link Road which will be relied on for use by project vehicles, do not comply with current Austroads design standards, while some intersections, in particular Snowy Mountains Highway and Tantangara Road, failed the safe intersection sight distance review.

Table 5.1 Context for traffic and transport

Existing environment	**Current traffic volumes** Daily and seasonal traffic volumes were determined using available RMS traffic counts (where available) and project specific mid-block and intersection counts. Seasonality of traffic flow was determined by undertaking mid-week, off-peak counts, as well as counts during peak periods during the winter school holidays and the June long weekend that in 2019 coincided with an early start to the snow season. Counts were undertaken at key intersections (as listed above) and key locations (such as along Link Road) that provides access for winter holiday recreational traffic to parts of the KNP and the Selwyn Snow Resort. The number of heavy vehicles were derived directly from survey data or as required as a percentage from previous traffic counts. Baseline average daily traffic numbers (for total vehicles and heavy vehicles) are summarised on figures at Annexure A of the TTA contained at Appendix F of this EIS.
Community and stakeholder views	As set out in Chapter 4, traffic and transport issues were raised regularly at stakeholder and community events, with participants consistently noting their concern for existing road safety and the ways in which the proposed segment factory may affect existing conditions. Government agencies that raised traffic and transport issues included SMRC and DPIE (impacts of traffic generated by the project) and RMS (including requirement for upgrades of various intersections and the issues regarding roundabouts). Key traffic and transport issues raised at SIA workshops were: • concerns about the impacts of heavy vehicle use and increased traffic in school areas; • insufficient pedestrian crossing infrastructure; and • potential impacts on roads. Key traffic and transport issues raised through government agency engagement were: • impacts of heavy truck movements on retailers along Sharp Street and the main roundabout; • reduction of speed limits on Polo Flat Road; • potential impacts on tourism traffic; • potential lack of escort vehicles for wide loads if there is an influx of vehicles; • need to upgrade the route through Shannon's Flat; • need to coordinate work during summer to allow effective sealing; and • need to develop an effective communication strategy addressing safety issues. Key traffic and transport issues raised through general community engagement were: • the need for reduced speed limits on Polo Flat Road; • no support for driveway access to the proposed factory opposite residential premises; and • the condition of Polo Flat Road and the proposed works.
Avoidance and minimisation through design	Early network assessment identified capacity and amenity issues associated with the use of Bombala Street and the roundabout at the intersection of Sharp and Bombala streets. As a result, a designated heavy vehicle route was recommended for use by project-related traffic, primarily the vehicles that will transport precast concrete segments between Polo Flat and the TBM launch sites. The designated route includes the use of Polo Flat Road (north), Monaro Highway (north), Sharp Street and the Snowy Mountains Highway, thereby avoiding the use of Bombala Street and the need for turning movements at this intersection. As stated at Section 2.4.9, there have also been early discussions regarding the viability of an alternative route that runs between Polo Flat and Adaminaby and avoids the use of Sharp Street through the Cooma town centre. This has been referred to as the Shannon's Flat alternative route that would use of Yallakool, Mittagang, Shannon's Flat and Bobeyan roads to the north of the Cooma township. Existing road conditions currently limit its use for project-related vehicle use.

5.2.2 Predicted impacts

Predicted traffic and transport impacts were based on estimates of vehicle movements for the operation of the proposed segment factory and for the construction of the Exploratory and Main Works. Estimates were provided on a monthly basis and comprised both light and heavy vehicles.

A project-based worst-case traffic and transport scenario was developed and potential traffic and transport impacts determined by undertaking:

- an intersection warrant review;
- SIDRA intersection modelling; and
- a safe intersection sight distance (SISD) review.

In addition, Snowy Mountains Highway/Kosciuszko Road, Sharp Street/Bombala Street, Sharp Street/Vale Street and Monaro Highway/Polo Flat Road (north end) were assessed for winter peak conditions.

Predicted traffic and transport impacts include:

- the intersections of Monaro Highway/Yallakool Road and Monaro Highway/Polo Flat Road will require upgrades based on the forecast growth of the corridor specified by RMS, even without the consideration of construction vehicles during typical (non-winter) traffic conditions;
- some upgrades are required to the existing roundabout intersection of Sharp Street/Bombala Street in Cooma to provide adequate performance during winter peak conditions when considered together with construction traffic. It should be noted that this roundabout is expected to fail (i.e. perform poorly) under existing winter peak traffic conditions (during the peak hours on the weekends of the snow season) regardless of construction traffic;
- In addition to the external intersections to be considered for upgrades, two new (BAR/BAL) intersections will be created for access to the project worksites at the following locations:
    - Snowy Mountains Highway/Rock Forest Access; and
    - Polo Flat Road/New Road to proposed segment factory.

Further and more detailed impacts have been identified in the Road Safety Audit, contained in full at Annexure C and summarised at Section 3.6 of the TTA contained at Appendix F of this EIS.

5.2.3 Mitigation measures

Mitigation measures to be implemented for transport impacts are summarised in Table 5.2. A full suite of mitigation measures would need to be prepared in parallel with proposed upgrades and road widenings. Mitigation measures would be determined in consultation with the relevant road authorities (RMS and SMRC) prior to operations.

Table 5.2 Mitigation measures for transport

Impact/risk	ID#	Measure(s)
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.

5.2.4 Summary and conclusion

The TTA that was undertaken addresses the impacts of the proposed segment factory on the capacity, condition, safety and efficiency of the local, national park and State road network in accordance with the SEARs. The assessment included a Road Safety Audit.

Through this TTA:

- it was determined that consideration should be given to upgrades to identified intersections, including the roundabouts at the intersections of Sharp Street with Bombala and Vale streets;
- it was noted that the project will require two new intersections providing access to project worksites (at Polo Flat and the Rock Forest sites); and
- residual impacts will require a range of mitigation responses.

It should be noted that consultation between agencies and the project, are on-going. Further discussion on traffic and transport matters may result in the identification of additional issues and the need for additional works to those set out in this report.

This includes the outcomes of the Road Safety Audit which covered the extent 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.

Snowy Hydro is continuing to engage with roads authorities (RMS and SMRC) 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 the TTA.

5.3 Amenity

5.3.1 Noise and vibration

A Noise and Vibration Impact Assessment (NVIA) of the proposed segment factory was prepared by EMM, and the full assessment is provided in Appendix G. The NVIA covered operational noise, construction noise, construction vibration and road traffic noise, and was prepared in accordance with relevant guidelines, policies and standards. These included:

- NSW Department of Environment Climate Change (DECC) 2009, *The Interim Construction Noise Guideline* (ICNG);
- EPA 2017, NSW Noise Policy for Industry (NPfI);
- NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP) and associated application notes; and
- Department of Environment and Conservation (DEC) NSW 2006*, Assessing Vibration: a technical guideline*.

Operational and construction noise levels were calculated using Brüel & Kjær's Predictor model and based on worst-case assumptions concerning the location of equipment. For road traffic two methods were used:

- the United Kingdom Department of the Environment's Calculation of Road Traffic Noise (CoRTN); and
- US EPA's Federal Highways methods (FHWA), again in conjunction with conservative assumptions.

i Context

An overview of the existing environment as it relates to noise and vibration is provided in Table 5.3, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.3 Context for noise and vibration

Existing environment	The site is in the Polo Flat industrial area to the east of Cooma. It is generally surrounded by industrial properties and operations to the north and west and vacant land to the east and south. An abattoir with approval to operate 24 hours a day is located immediately to the east. There is an isolated industrial operation containing a residence located about 150 m to the south-south-west of the site on the opposite side of Carlaminda Road. The nearest rural residence is located about 450 m to the south-east of the site on the opposite side of Carlaminda Road. The nearest residences within Cooma are located about 1 km to the west of the site. Assessment locations used for the NVIA can be seen in Figure 5.1. These locations include the residences on Carlaminda Road (R2 and R15 to R17), isolated residences in the industrial area (R18 to R20) and representative locations for residences on the eastern side of Cooma (R1, R3 to R14). To establish the existing ambient noise environment, monitoring was conducted at four locations considered to be representative of the range of noise levels likely to be experienced by residential assessment locations in the vicinity of the site. Noise monitoring demonstrated typically low ambient L_{Aeq} and background L_{A90} noise levels for most of the residential assessment locations with limited human activity during the evening and night resulting in the application of minimum thresholds in accordance with procedures of the NPfI.

Table 5.3 Context for noise and vibration

Community and stakeholder views	No concerns or issues relating to noise and vibration impacts were raised by the general community during consultation activities. On 14 August 2019, representatives from Snowy Hydro and FGJV held face-to-face meetings with residents on Carlaminda Road and a representative from the adjoining abattoir (Monbeef) to provide information on the proposed segment factory. All residents and the representative from the abattoir indicated that they were not concerned with any additional noise impacts. All residents noted that they already experienced noise from existing truck movements with little impact and were less concerned noting all truck movements were confined to Polo Flat Road and not Carlaminda Road DPIE and the EPA raised potential noise impacts from the proposed segment factory as a key issue that needed to be addressed in this EIS.
Avoidance and minimisation through design	Preliminary noise modelling of the proposed segment factory indicated the potential for significant noise impacts to residents on Carlaminda Road. As a result, the design and operational management of the factory was amended to minimise noise impacts and involved: • relocation of the CBP to the northern side of the precast building (originally it was located on the southern side of the building); • enclosure of the CBP with an acoustic cladding; • reconfiguration of raw materials storage and load hopper area to the western side of the CBP; • reduction of utilisation of fork trucks operating externally during the evening and night; and • relocation of truck/trailer storage to north and west of main precast building.

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
- Rail line
- Main road
- Local road or track
- Watercourse
- Assessment location
- Monitoring location
- 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

Noise monitoring and assessment locations

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.1

snowy 2.0

EMM creating opportunities

ii Predicted impacts

a Construction noise

Construction is proposed over an approximate five-month period (estimated to start March 2020). 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.

The ICNG recommends standard construction hours where noise from construction activities is audible at residential premises (ie assessment locations), as follows:

- Monday to Friday 7 am to 6 pm;
- Saturday 8 am to 1 pm; and
- no construction work is to take place on Sundays or public holidays.

The ICNG acknowledges that works outside standard hours may be necessary.

Accordingly, proposed construction activities for the proposed segment factory (excluding pre-starts and toolbox talks) that fall outside of the recommended standard construction hours are only 5 hours on a Saturday (7 am to 8 am and 1 pm to 5 pm) for a period of about 3.5 months.

Construction noise from the project were predicted to satisfy noise management levels (NMLs) at all assessment locations during standard construction hours except at one residential location to the south-east of the site on Carlaminda Road (R16), where an exceedance of 2 dB is predicted. An exceedance of 2 dB is considered to be negligible as changes to noise levels +/-2 db are not discernible to the average noise receiver.

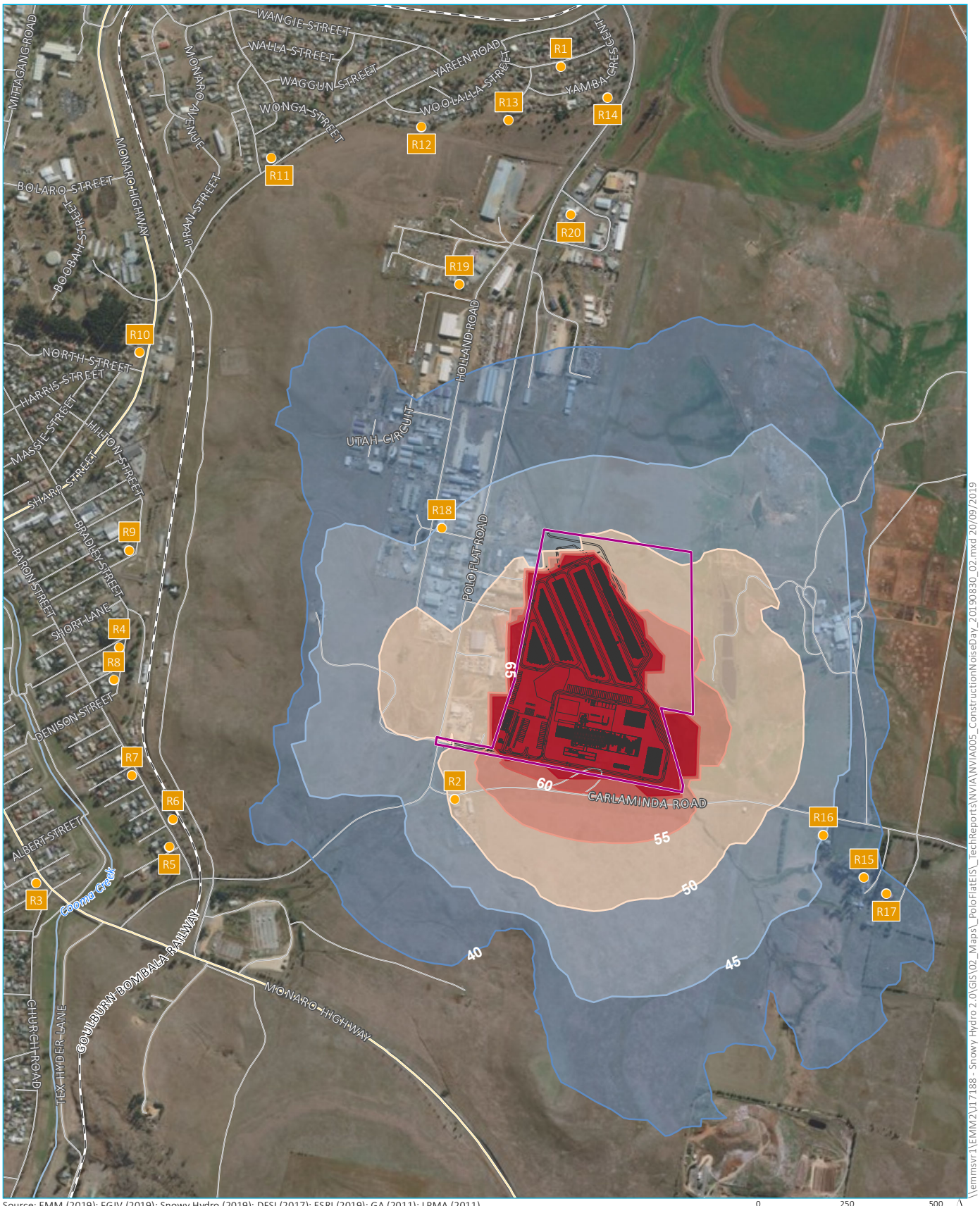
Construction noise levels outside of standard construction hours (ie Saturday morning from 7 am to 8 am and Saturday afternoon from 1 pm to 5 pm) are predicted to satisfy NMLs at all assessment locations except at three residences located to the south-east of the site on Carlaminda Road (R15, R16 and R17), where exceedances of 2 - 7 dB were predicted during out-of-hours work periods, as follows:

- R15 +2 dB;
- R16 +7 dB; and
- R17 +2 dB.

The results of the construction noise modelling can be seen in Figure 5.2. These show noise level contours in 5 dB increments from 65 dB to 40 dB.

Given the limited construction period outside of standard construction hours and given this period is during the day, the exceedance of the NMLs at the three residences on Carlaminda Road is unlikely to result in significant impact. Nonetheless, residents will be notified prior to works commencing.

The project will notify the residents of the construction works and noise monitoring during the initial stages of construction will be undertaken to determine if actual construction noise levels are above the NMLs.



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

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KEY

	Noise level contour	Noise level contour range
Site boundary	40 dB(A)	40 - 44 dB(A)
Indicative site layout	45 dB(A)	45 - 49 dB(A)
Assessment location	50 dB(A)	50 - 54 dB(A)
Rail line	55 dB(A)	55 - 59 dB(A)
Main road	60 dB(A)	60 - 64 dB(A)
Local road or track	65 dB(A)	65 + dB(A)
Watercourse		

Construction noise contours, day, ISO9613

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.2

snowy 2.0

EMM creating opportunities

b Construction vibration

The nearest assessment location (R2) is located approximately 180 m from the closest proposed construction activities, and beyond the safe working distances for human response. Vibration impacts from construction at residential assessment locations are therefore highly unlikely.

c Operational noise

Project noise trigger levels (PNTLs) would be satisfied at all assessment locations during daytime operations. A 2 dB exceedance of the PNTL was predicted at one assessment location (R16) on Carlaminda Road during evening/night operations and after the implementation of all feasible and reasonable mitigation measures.

Operational noise sources contributing to the exceedance of the PNTL included the operation of a front-end loader near the precast building feeding the CBP hopper with raw materials, forklift trucks transferring segments from the precast building to temporary storage areas, and low-loader movements for transfer of segments to main storage area. However, this exceedance would be considered negligible, would not be discernible by the average listener, and would therefore not warrant mitigation at the assessment location.

The modelling of intermittent (L_{Amax}) noise events confirmed compliance with the sleep disturbance screening level of 52 dBA for all assessment locations.

The results of the operational noise modelling for the day and night can be seen in Figure 5.3 and Figure 5.4 respectively. For the day, these show noise level isopleths or contours in 5 dB increments from 65 dB to 40 dB. For the night, these show noise level isopleths or contours in 5 dB increments from 60 dB to 35 dB.

d Road traffic noise

Road traffic noise would be associated with the transport of raw materials for segment production, employee travel, and the distribution of segments to KNP.

A road traffic noise assessment was undertaken based on predicted average and peak traffic volumes for the proposed segment factory. The assessment shows that for average traffic volumes, day ($L_{Aeq,15hour}$) and night traffic ($L_{Aeq,9hour}$) predictions would comply with the RNP <2 dB allowance criterion for all road sections likely to be used by vehicles associated with the proposed segment factory.

For peak traffic volumes, which are expected to occur for a discrete period of 2-3 months over the operational life of the proposed segment factory, the assessment of day ($L_{Aeq,15hour}$) traffic predictions confirmed compliance with the RNP <2 dB allowance criterion for all road sections likely to be used by vehicles associated with the factory. Assessment of night ($L_{Aeq,9hour}$) traffic predictions confirmed compliance with the RNP <2 dB allowance criterion for Polo Flat Road (south) and Monaro Highway (south).

For Snowy Mountains Highway (south) and Polo Flat Road (north), the predicted increases in peak road traffic noise were 5.5 dB and 2.4 dB respectively, resulting in an exceedance of RNP requirements given that existing traffic noises level are above the baseline of 55 dB(A). Similarly, for Monaro Highway (north) an exceedance of 1.2 dB of the <2 dB allowance criterion was predicted for the closest residence.

Given the exceedances of the RNP would occur on discrete sections of the transport routes and for a discrete period of time (2-3 months), the exceedances are considered to be acceptable.

e Decommissioning

Decommissioning activities are expected to be limited to removal of plant and equipment during standard day hours in accordance with the ICNG. Noise from these activities would be less than levels predicted for construction activities and are not anticipated to result in any adverse noise impacts at the identified assessment locations.

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

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KEY

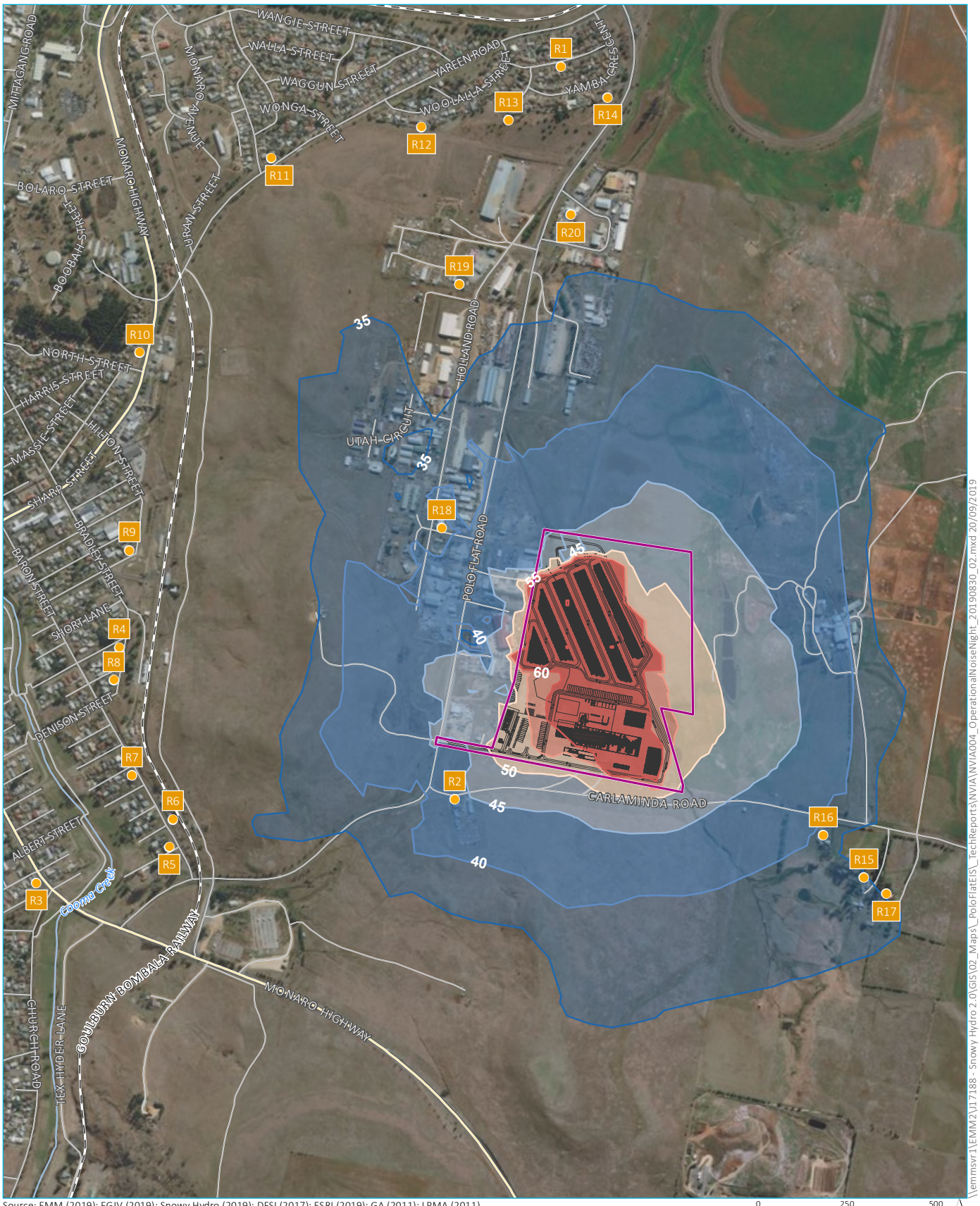
Site boundary	Noise level contour	Noise level contour range
Indicative site layout	40 dB(A)	40 - 44 dB(A)
Assessment location	45 dB(A)	45 - 49 dB(A)
Rail line	50 dB(A)	50 - 54 dB(A)
Main road	55 dB(A)	55 - 59 dB(A)
Local road or track	60 dB(A)	60 - 64 dB(A)
Watercourse	65 dB(A)	65 + dB(A)

Operational noise contours, day, ISO9613

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.3

snowy 2.0

EMM creating opportunities



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

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KEY

Site boundary	Noise level contour	Noise level contour range
Indicative site layout	35 dB(A)	35 - 39 dB(A)
Assessment location	40 dB(A)	40 - 44 dB(A)
Rail line	45 dB(A)	45 - 49 dB(A)
Main road	50 dB(A)	50 - 54 dB(A)
Local road or track	55 dB(A)	55 - 59 dB(A)
Watercourse	60 dB(A)	60 - 64 dB(A)

Operational noise contours, evening/night, ISO9613

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.4

snowy 2.0

EMM creating opportunities

iii Mitigation measures

Mitigation measures to be implemented for noise and vibration impacts are summarised in Table 5.4.

Table 5.4 Mitigation measures for noise and vibration

Impact/risk	ID#	Measure(s)
Construction noise and vibration	NV001	• The EMP for the proposed segment factory would describe how construction noise would be managed where predicted noise levels are above the NMLs. It would outline measures to monitor construction noise at early stages to validate the predictions. • Residents at assessment locations R15, R16 and R17) would be notified prior to construction.
Operational noise	NV002	• The EMP would include measures to monitor operational noise levels during commissioning (or within 3 months of operation) to validate the predicted noise levels. The EMP would also include a review of noise mitigation measures and site management to reduce levels where required. • The residents at assessment location R16 would be notified prior to commencement of operation.

iv Summary and conclusion

Following preliminary noise modelling, the design and operational management of the proposed segment factory was amended to minimise noise impacts to residences located on Carlaminda Road. As a result, modelling now demonstrates compliance with relevant construction and operational noise criteria for most of the time. Where there are exceedances, these are considered to be acceptable. In addition, during consultation residents on Carlaminda Road indicated that they were not concerned with potential noise impacts associated with the project.

Construction is proposed over an approximate 5 month period. Construction activities would be undertaken from Monday to Saturday for 10 hours per day between 7 am and 5 pm. The ICNG recommends standard construction hours where noise from construction activities is audible at residential premises between 7 am and 6 pm Monday to Friday, and between 8 am and 1 pm on Saturdays. Accordingly, construction activities for the proposed segment factory that fall outside of the recommended standard construction hours are only 5 hours on a Saturday (7 am to 8 am and 1 pm to 5 pm) for a period of about 5 months.

Construction noise from the project were predicted to satisfy NMLs at all assessment locations except for standard construction hours except at one residential location to the south-east of the site on Carlaminda Road (R16), where a negligible exceedance of 2 dB is predicted.

Construction noise levels outside of standard construction hours are predicted to satisfy NMLs at all assessment locations except at three residences located to the south-east of the site on Carlaminda Road (R15, R16 and R17). The exceedances at R15 and R17 are a negligible 2 dB. The exceedance at R16 is 7 dB, but as stated above, is only for a 5 hour period on Saturdays for 5 months.

The project would notify R15, R16 and R17 of construction works and undertake noise monitoring during the initial stages of construction to determine actual construction noise levels.

Vibration impacts from construction at residential assessment locations are highly unlikely.

For operational noise, PNTLs are satisfied at all assessment locations during the day. A residual (but negligible) exceedance of 2 dB has been predicted at one assessment (R16) location during the evening and night after the implementation of all feasible and reasonable mitigation measures.

Road traffic noise levels are predicted to comply with the noise criteria for most of the operational period during the day and night. During the peak of operations, which are predicted to occur for 2-3 months, there is a potential for a minor exceedance of the noise criteria at night on some sections of the transport route.

5.3.2 Visual

A Landscape Character and Visual Impact Assessment (LCVIA) of the proposed segment factory was prepared by Spackman Mossop Michaels. It was prepared in accordance with the *Environmental Impact Practice Note: Guideline for Landscape Character and Visual Impact Assessment* (RMS 2018).

The LCVIA is provided in Appendix H.

i Context

An overview of the existing environment as it relates to landscape character and visual impact is provided in Table 5.5, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.5 Context for landscape character and visual

Existing environment	The LCVIA has identified four landscape character zones based on the distinctive environments covering the site and adjoining areas, as shown in Figure 5.5. **Polo Flat airfield** This zone is comprised of the Polo Flat private airfield and the site is located entirely within this zone. The flat topography of this zone enables the use of this location as an airstrip. The character is open and, due to a lack of tree cover, is visually exposed. There are several examples of built form, primarily structures required for the airport operations. The ability of the zone to absorb visual change is low due to the exposed nature of the existing landscape character. Although some existing built elements screen views to the zone, these buildings are generally restricted to the western edge of the Polo Flat industrial area, and as a result the landscape character sensitivity rating is moderate. **Polo Flat surrounding grasslands** This zone incorporates a large area surrounding the private airfield and the industrial area along Polo Flat Road. It immediately adjoins the site. This zone is characterised by an extensive, undulating landscape with vegetation consisting mostly of native and non-native grasses. Due to the general open character, visual change would not be readily absorbed or concealed. The presence of infrastructure that supports electricity lines, industrial uses and transport movements are seen throughout the zone and influence the character sensitivity. The exposed undulating landform increased the range of views, with a sensitivity rating of moderate. **Polo Flat industrial area** This zone is located in fragmented areas adjacent to the site. There are several examples of built form within this character zone including buildings associated with industrial uses, storage and parking areas that contribute to its industrial character. The footprint of the built elements within the natural undulation of the surrounding landscape contrasts dramatically, resulting in an ability of the zone to absorb visual changes that are of a similar nature. Therefore, the overall landscape sensitivity for this landscape character is low.

Table 5.5 Context for landscape character and visual

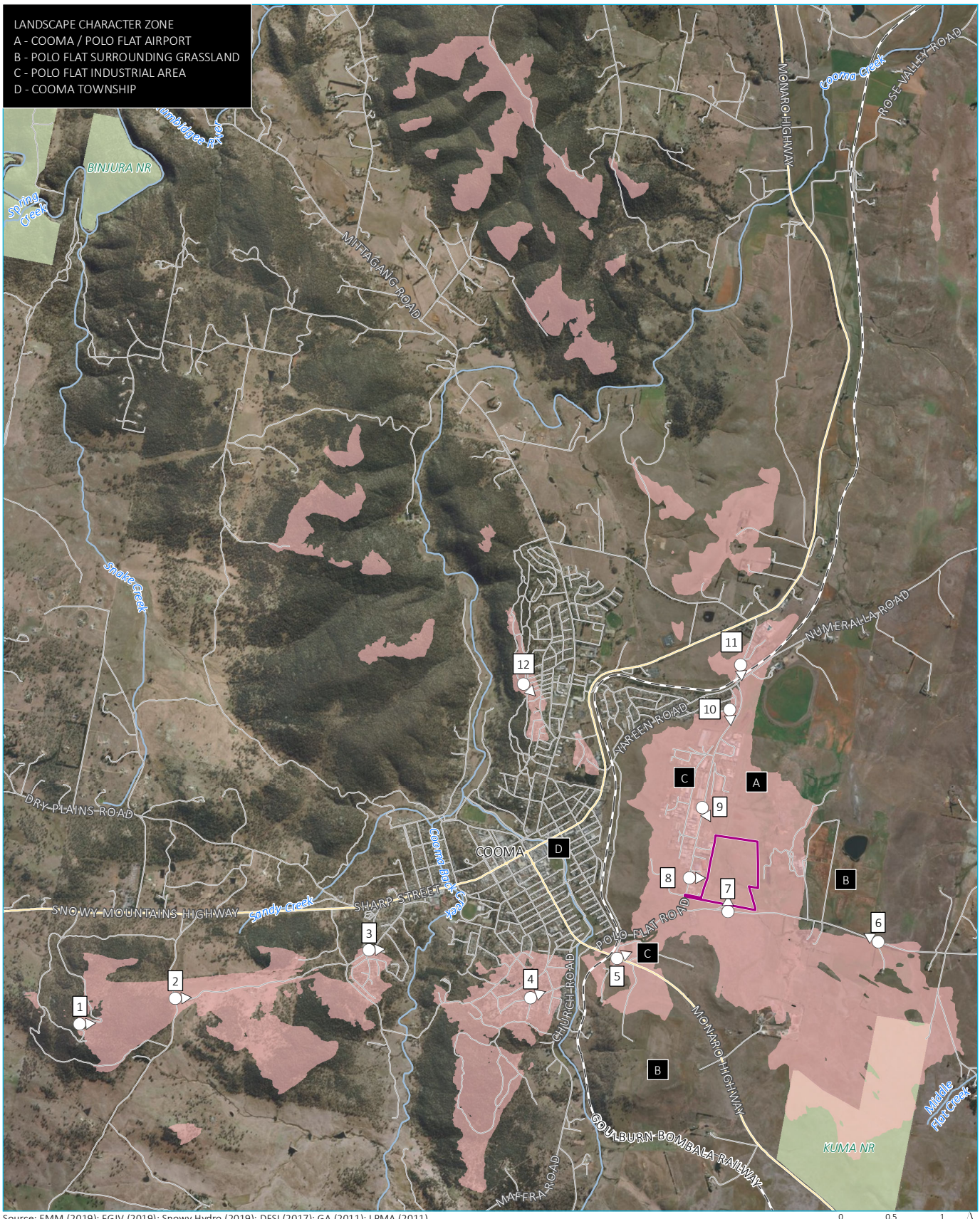
Existing environment	**Cooma township** This zone presents a large area of residential housing west of the site. The zone is characterised by low density residential housing along undulating hills, that result in views to surrounding hills and over undulating grassland. Vegetation is a mix of native trees and exotic deciduous trees that provide visually strong landscape elements and avenue planting along many of the streets within Cooma. The majority of the character zone is made up of built elements, including residential housing, churches, commercial buildings and tourism facilities. These elements add to the character of Cooma as a typical rural town with low density housing. The ability of the zone to absorb visual change is varied due to its large size, topography and existing mitigation provided due to current industrial activity adjacent to Cooma. However, the dominant residential land use of this zone results in the landscape character sensitivity rating is high.
Community and stakeholder views	Community and stakeholder views relating to amenity have been raised throughout the consultation period to date for Snowy 2.0. Potential visual impacts during construction and operation of the proposed segment factory was raised as part of the online survey. Respondents were asked to rank potential social impacts of the proposed segment factory as either negative, neutral or positive. Visual amenity was mostly ranked as neutral by respondents (70%), with positive and negative ranked equally (15% each). Potential impacts from lighting were as also raised, both lighting spill from operations at night and lighting impacts on Polo Flat Road which could reduce visibility.
Avoidance and minimisation through design	Potential landscape character and visual impacts are one of a wide series of constraints considered during project design. Measures considered during project design include site selection, access, layout and the locations and design of infrastructure elements.

ii Predicted impacts

Predicted impacts relate to changes to the landscape and visual impacts associated with construction and operation of the proposed segment factory.

Table 5.6 outlines the potential landscape and visual impacts of the proposed segment factory. The entire project extents fall within the Cooma township landscape character zone, and although the impacts are generally considered to be moderate, they would only be temporary until the completion of Snowy 2.0 and the site decommissioned. For the adjoining landscape character zones, they will be affected by increased traffic, noise and lighting as a result of this operation, with only Polo Flat industrial area having a low impact due to its existing land use and character being the same as the proposed segment factory.

When considering landscape and visual impact, a total of 12 viewpoints were considered representative of key receptors within the visual catchment of the proposed segment factory. Figure 5.5 shows the locations of these viewpoints and assessments of each are summarised in Table 5.6.



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

KEY

- Viewpoints
- Zone of theoretical visibility
- Site boundary
- Rail line
- Main road
- Local road or track
- Watercourse
- NPWS reserve

Landscape character zones and viewpoints

Snowy 2.0
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Proposed Segment Factory
Figure 5.5

snowy 2.0

EMM
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Table 5.6 Summary of visual impact

No.	Viewpoint	Landscape character zone	Representative receptor	Impact
1	Mount Gladestone Lookout, looking east toward Cooma and Polo Flat	West of Cooma township	Visitors using the Mount Gladestone Lookout.	Moderate The sensitivity of the view is high due to the elevated picturesque view. The visual effect of the project on this view would be low and would primarily be experienced at night due to light spill.
2	Greendale Road, Cooma, looking east toward Cooma and Polo Flat	Cooma township	Residential properties along Greendale Road.	Moderate – Low The combination of varied topography and vegetation cover makes this view moderately sensitive to change. The primary visual effect on this view would be as a result of 24/7 operation.
3	Chapman Street, Cooma, looking east toward Polo Flat	Cooma township	Residential properties in South West Cooma.	Moderate The combination of a large number of residential viewers with varied topography and vegetation cover makes this view highly sensitive to change. The primary visual effect on this view would be as a result of 24/7 operation.
4	Culey Avenue, Cooma, looking north-east toward Polo Flat	Cooma township	Residential properties in South West Cooma.	Moderate The combination of a large number of residential viewers with varied topography and vegetation cover makes this view highly sensitive to change. The primary visual effect on this view would be as a result of 24/7 operation.
5	Snowy Mountains Highway, Cooma, looking northeast over the saleyards toward Polo Flat	Polo Flat industrial area	Vehicles accessing Cooma to the north and Nimmitabel to the South via Snowy Mountains Highway & residential properties along Snowy Mountains Highway.	Low This view is a visually cluttered combination of existing land use and vegetation. This view would have a low sensitivity to change. The primary visual effect on this view would be as a result of 24/7 operation.
6	Carlaminda Road, looking west toward Polo Flat	Polo Flat surrounding grassland	Vehicles accessing Cooma to the west and Carlaminda to the east via Carlaminda Road & Residential properties along Carlaminda Road.	Moderate – Low The combination of varied topography the rural setting with views toward the attractive mountains backdrop and the undulating landform makes this view moderately sensitive to change. The primary visual effect on this view would be as a result of 24/7 operation.
7	Carlaminda Road, looking north toward the Cooma/Polo Flat Airport	Polo Flat surrounding grassland	Vehicles accessing Cooma to the west and Carlaminda to the east via Carlaminda Road & Residential properties along Carlaminda Road.	High – Moderate The view provides open planes that cannot absorb change easily. The combination of varied topography, the rural setting and proximity to similar land use on the western fringes, makes this view moderately sensitive to change. The magnitude of the view is high due to the large footprint and height of the factory and storage area that will be seen from this observer viewpoint.

Table 5.6 Summary of visual impact

No.	Viewpoint	Landscape character zone	Representative receptor	Impact
8	Polo Flat Road Southern Section, looking east toward the Cooma/Polo Flat Airport	Polo Flat industrial area	Vehicles accessing the Polo Flat industrial area and businesses along Polo Flat Road.	Moderate – Low The view from this observer point over natural grassland, the existence of built elements and the proximity to existing industrial land use in the east and influences the sensitivity. This view would have a low sensitivity to change. The magnitude of the view is moderate due to the large footprint of the factory and storage area that will be seen from this observer viewpoint.
9	Polo Flat Road Central, looking south-east toward the Cooma/Polo Flat Airport	Polo Flat industrial area	Vehicles accessing the Polo Flat industrial area and businesses along Polo Flat Road.	Moderate The open exposed topography offers limited potential for screening, resulting in the view being moderately sensitive to change. Due to a combination of many horizontal project elements and distance reducing the size of the project elements, the magnitude would be moderate.
10	Yamba Crescent, Cooma, looking south toward the Polo Flat industrial area and Cooma/Polo Flat Airport	Cooma township	Residencies along Yamba Crescent	High-Moderate The combination of a large number of residential viewers with varied undulating topography and a mix of industrial buildings and sheds makes this view highly sensitive to change. This element will be partially screened by the mature vegetation that exists between the residencies and the existing industrial presence.
11	Polo Flat Road Northern Section, looking south toward the Polo Flat industrial area and Cooma/Polo Flat Airport	Polo Flat surrounding grassland	Vehicles accessing the Polo Flat industrial area, Cooma, businesses and residencies along Polo Flat Road	Low The sensitivity of the view is low, given the ability for this viewpoint to absorb change being high. The magnitude of the view is low due to the existing screening by vegetation between the proposed factory and the observer point. The new works would not be substantially uncharacteristic with the existing visual character from the existing view.
12	Cooma North Reserve near Doondoo Place, looking south-east toward the Polo Flat industrial area and Cooma/Polo Flat	Cooma township	Walkers and residencies along the fringes of Cooma North Reserve	Moderate – Low The combination of a large number of residential viewers with a mix of attractive woodlands and rolling topography contrasting with the quality of the building stock detracts from the view. Making this view moderately sensitive to change. The magnitude of the view is low due to the existing screening by dense vegetation between the proposed factory and the observer point.

iii Mitigation measures

Recommended mitigation measures to be implemented as part of the detailed design of the segment factory for landscape and visual impacts are summarised in Table 5.7.

Table 5.7 Mitigation measures for landscape and visual

Impact/risk	ID#	Measure(s)
Surface reflectivity	LV01	• The use of non-reflective paint on buildings should be used where possible to avoid glare and surface reflectivity.
Surface reflectivity	LV02	• The use of dark colours should be used where possible as they are usually better absorbed within natural areas. Greys and charcoal colours generally provide less visual contrast to the colours of the Australian landscape and complement the hues of the alpine environment.
Surface reflectivity	LV03	• The use of textures on large surfaces is recommended where possible to reduce the contrast between built elements and the surrounding (textured) natural environment and reduce the potential for glare.
Lighting	LV04	• Lighting would be designed in accordance with *AS4282-1997 Control of obtrusive effects of outdoor lighting* to minimise light spill.

iv Summary and conclusion

A LCVIA has been undertaken for the proposed segment factory.

The impact to the landscape character for the site and surrounds would be moderate, and the extent of the impact would only be temporary until the completion of Snowy 2.0. The Polo Flat industrial character zone would have a low impact due to its existing land use and character being the same as that of the proposed segment factory.

When considering visual impacts in relation to the proposed segment factory, higher impact ratings occur in closer proximity and where there is no screening from landform, vegetation or dwellings to clearly expose the proposed segment factory in this greenfield setting. The low to moderate-low ratings occur in areas of lower sensitivity, for example the Polo Flat industrial area.

Mitigation measures have been recommended to reduce surface reflectivity of built structures and to minimise light spill.

5.4 Air

An Air Quality Impact Assessment (AQIA)of the proposed segment factory was prepared by EMM. It was prepared in accordance with the EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (the Approved Methods).

A greenhouse gas assessment, which forms part of the AQIA, was prepared using project-specific inputs and emission factors from the National Greenhouse Accounts Factors (NGAF) workbook (DoEE 2018).

The AQIA is provided in Appendix I.

5.4.1 Context

An overview of the existing environment as it relates to air quality is provided in Table 5.8, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.8 Context for air quality

Existing environment	Existing conditions were quantified using data from the Bureau of Meteorology (BoM) Cooma Airport Automatic Weather Station (AWS) and three Australian Capital Territory (ACT) air quality monitoring stations: Civic, Florey and Monash. The surrounding landform and local climate will have a bearing on how air in the locality will move and disperse pollutants. The site is generally flat with an elevation of between 820 m and 830 m Australian Height Datum (AHD). The elevation increases to the west and south of the site, beyond the township of Cooma, and features predominately rolling terrain to the north and east. The recorded wind patterns for 2017 (the representative year modelled) were dominated by north-easterlies. The annual average wind speed at the BoM AWS at Cooma Airport for 2017 was 4.2 metres per second (m/s). Calm conditions (wind speeds less than 0.5 m/s) occurred for 6% of the hours in the year. When assessing the air quality impacts of a project against the criteria in the NSW Approved Methods, the standard approach is to add the project's modelled contribution to the existing 'background' concentration. In theory, the background concentration represents the contribution from all sources other than the modelled project. It typically includes, for example, contributions from natural sources and domestic activity. Background emissions for the project considered surrounding sources such Cooma Landfill and assorted manufacturing operations. It is expected that the adopted baseline air quality dataset developed for the AQIA is sufficiently conservative to account for the contribution of local and regional emission sources. Assessment locations were identified for the purpose of assessing potential air quality impacts. These locations are the same as the locations used in the NVIA and are shown in Figure 5.1.
Community and stakeholder views	The possibility of potential dust impacts during the construction and operation of the proposed segment factory was raised as an issue during face-to-face meetings with residents on Carlaminda Road and the representative from the adjoining abattoir, as well as during community consultation sessions and in the online survey. For the survey, respondents were asked to rank potential social impacts of the proposed segment factory as either negative, neutral or positive. Health and hygienic environment (eg dust in house) was mostly ranked as neutral by respondents (60 to 70%). Respondents ranked hygienic environment (eg dust in house) (30%) as the biggest potential negative of the proposed segment factory.
Avoidance and minimisation through design	The design of the proposed segment factory incorporated a range of dust mitigation and management measures as follows: • all vehicle transport routes (trucks, forklifts) will be paved (asphalt or concrete); • all incoming sand and aggregate will be stored in three-sided concrete bunkers; and • enclosure of the CBP and its processes (weigh hopper and central mixer) with an acoustic cladding.

5.4.2 Predicted impacts

The proposed segment factory has the potential to generate emissions of various air pollutants to the atmosphere. Air pollution emission sources will comprise of a mixture of the following:

- fugitive sources of particulate matter, such as material handling and transfer activities, movement of mobile plant and equipment, and wind erosion of sand and aggregate storages; and
- combustion sources, such as exhaust emissions from the mobile equipment fleet (ie trucks, forklifts, front end loader) and steam boilers.

Emissions estimation and dispersion modelling was completed for one operational scenario corresponding to peak operations at the proposed segment factory, using the CALPUFF modelling system. The CALPUFF modelling system is commonly used in NSW for applications where non-steady state conditions may occur (ie complex terrain or coastal locations) or when calm wind conditions are important (ie for odour assessment).

Emissions of total suspended particulates (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$) and nitrogen dioxide (NO_2) were estimated and modelled and assessed against applicable impact assessment criteria. The impact assessment criteria are designed to maintain ambient air quality that allows for the adequate protection of human health and well-being.

The results of the modelling show that the predicted concentrations and deposition rates for particulate matter (PM_{10}, $PM_{2.5}$, TSP and dust deposition) and NO_2 are below the applicable impact assessment criteria at all residential assessment locations.

Predicted annual average PM_{10}, $PM_{2.5}$, TSP and dust deposition concentrations shown as isopleths or contours can be seen in Figure 5.6 to Figure 5.9.

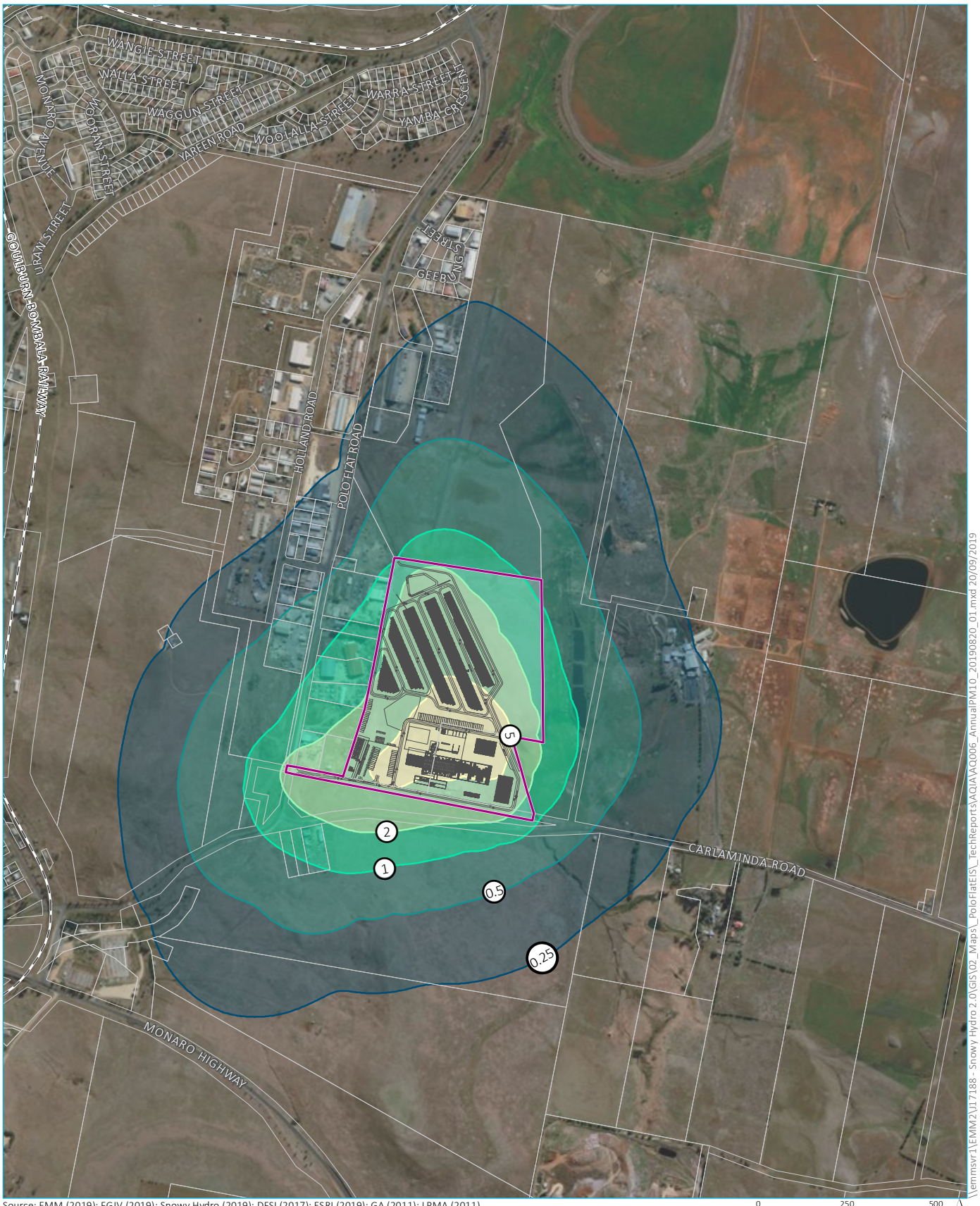
Cumulative impacts were assessed by combining modelled proposed segment factory impacts with recorded ambient background levels. The cumulative results also demonstrated compliance with applicable impact assessment criteria at all residential locations, despite a range of conservative assumptions in the emission calculations and dispersion modelling techniques. Three industrial locations were predicted to experience a maximum of two additional days over the impact assessment criterion. However, these exceedance days occurred when the background was elevated and are not considered to be significant.

A greenhouse gas (GHG) assessment was also undertaken for the proposed segment factory.

For accounting and reporting purposes, GHG emissions are defined as ‘direct’ and ‘indirect’ emissions. Direct emissions (also referred to as Scope 1 emissions) occur within the boundary of an organisation and as a result of that organisation’s activities. Indirect emissions are generated because of an organisation’s activities but are physically produced by the activities of another organisation (DEE 2018). Indirect emissions are further defined as Scope 2 and Scope 3 emissions. Scope 2 emissions occur from the generation of the electricity purchased and consumed by an organisation.

Scope 3 emissions occur from all other upstream and downstream activities, for example the downstream extraction and production of raw materials or the upstream use of products and services.

Annual average total GHG emissions (Scope 1, 2 and 3) generated by the proposed segment factory represent approximately 0.008% of total GHG emissions for NSW and 0.002% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2017. These emissions are considered to be insignificant.



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

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GDA 1994 MGA Zone 55

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KEY

- Site boundary
- Indicative site layout
- Rail line
- Cadastral boundary

PM_{10} concentration ($\mu g/m^3$)

- 0.25
- 0.5
- 1
- 2
- 5

Predicted annual average PM_{10} concentrations – site only

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Proposed Segment Factory
Figure 5.6

snowy 2.0

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

0 250 500 m

GDA 1994 MGA Zone 55

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KEY

- Site boundary
- Indicative site layout
- Rail line
- Cadastral boundary

$PM_{2.5}$ concentration ($\mu g/m^3$)

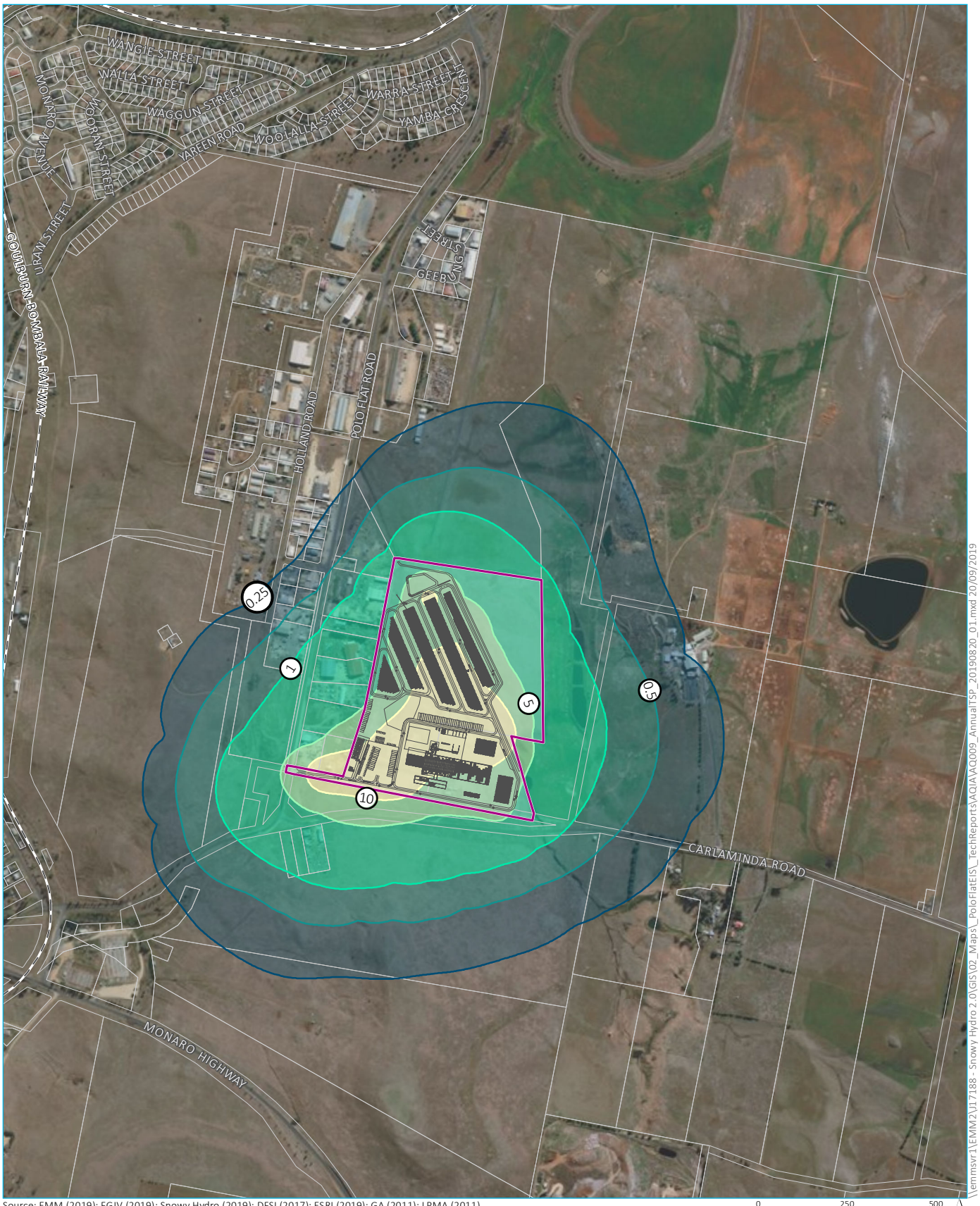
- 0.25
- 0.5
- 1
- 2

Predicted annual average $PM_{2.5}$ concentrations – site only

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.7

snowy 2.0

EMM creating opportunities



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

0 250 500 m

GDA 1994 MGA Zone 55

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KEY

- Site boundary
- Indicative site layout
- Rail line
- Cadastral boundary

$PM_{2.5}$ concentration ($\mu g/m^3$)

- 0.25
- 0.5
- 1
- 5
- 10

Predicted annual average TSP concentrations – site only

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.8

snowy 2.0

EMM creating opportunities

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

0 250 500 m

GDA 1994 MGA Zone 55

N

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KEY

- Site boundary
- Indicative site layout
- Rail line
- Cadastral boundary

Deposition level (g/m^2/month)

- 0.25
- 0.5
- 1
- 2

Predicted annual average dust deposition levels – site only

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.9

snowy 2.0

EMM creating opportunities

5.4.3 Mitigation measures

Mitigation measures to be implemented for impacts to air are summarised in Table 5.9.

Table 5.9 Mitigation measures for air

Impact/risk	ID#	Measure(s)
Dust from roads	AIR01	• All paved roads would be routinely cleaned by a street sweeper (water flushing and sweeping) as required.
Diesel particulates	AIR02	• The idling of diesel equipment would be minimised.

5.4.4 Summary and conclusion

Dust avoidance and minimisation measures were incorporated into the design of the proposed segment factory. This has resulted in improved environmental outcomes, as reflected in the AQIA predictions.

The AQIA predicted dust emissions using contemporary air dispersion modelling methods in accordance with the EPA guidelines. Emissions estimation and dispersion modelling was completed for one operational scenario corresponding to peak operations at the proposed segment factory.

The results of the modelling show that the predicted concentrations and deposition rates for particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) and NO_2 are below the applicable impact assessment criteria at all residential assessment locations.

A consideration of cumulative impacts also demonstrated compliance with applicable impact assessment criteria at residential locations.

Total GHG emissions for the proposed segment factory represent approximately 0.008% and 0.002% of total emissions for NSW and Australia respectively.

5.5 Biodiversity

A Biodiversity Development Assessment Report (BDAR) was prepared by EMM to assess potential impacts of the proposed segment factory on terrestrial biodiversity. It was undertaken in accordance with the NSW *Biodiversity Conservation Act* 2016 (BC Act), the Biodiversity Offsets Scheme (BOS) and Biodiversity Assessment Method (BAM).

The BDAR is provided in Appendix J.

5.5.1 Context

An overview of the existing environment as it relates to biodiversity is provided in Table 5.10, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.10 Context for biodiversity

Existing environment	**General** The site has historically been used as an airfield and for cattle grazing. The site may have been cultivated in the past as evidence of ploughing was observed in the east during a site survey and potentially on satellite imagery from 2013. The site is dominated by grassland. It has a significant infestation of African Lovegrass, with some areas dominated by this species with close to 100% cover. In the Monaro region, African Lovegrass is identified as a priority weed due to significant infestations of the species occurring, reducing and eliminating native species. Past land use and the African Lovegrass infestation have resulted in significant amounts of change in the grassland structure and composition of the site. Overall, the site is in poor condition and has limited ecological value. **Endangered ecological communities** One plant community type (PCT) was identified within the site; *PCT 320 Kangaroo Grass - Redleg Grass forb-rich temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion*. Patches of native grassland were defined and mapped where the percentage cover of native vascular plants (including annual and perennial species) was greater than the percentage cover of perennial exotic species. These patches were then assessed further to determine whether they met the thresholds for *the Natural Temperate Grassland of the South Eastern Highlands (Natural Temperate Grassland)* which is listed as a critically endangered ecological community (CEEC) under the EPBC Act. There are no endangered ecological communities (EECs) or CEECs within the site that are listed under the BC Act. The extant of PCT 320 on the site can be seen in Figure 5.10. **Threatened species** Natural Temperate Grassland provides potential habitat for the threatened Mauve Burr-daisy, Creeping Hop-bush, Monaro Golden Daisy, Silky Swainson-pea, Striped Legless Lizard and Grassland Earless Dragon. Preliminary flora and fauna surveys were undertaken in mid-2019, including targeted surveys for reptiles and preliminary flora surveys. Whilst no threatened species were recorded during these surveys, further surveys will be undertaken in spring and summer 2019. For the purposes of determining credits, a precautionary approach was adopted for the BDAR which assumed that these species are present within the site. Further surveys will reduce this assumed impact and resultant credit requirements.
Community and stakeholder views	Stakeholders have not directly raised any concerns or issues in relation to potential impacts to biodiversity. Notwithstanding this, through the media, a conservation group has raised concerns regarding impacts of the project on the Grassland Earless Dragon. As stated in Section 3.3.1 of this EIS, on 26 June 2019, Snowy Hydro referred the proposed segment factory to the Commonwealth Minister for the Environment under the provisions of the EPBC Act. Following an assessment of the referral, the Acting Assistant Secretary Assessments and Waste Branch of DEE, as delegate to the Minister, determined that the proposed segment is 'not a controlled action' and therefore does not require further assessment or approval under the EPBC Act. As part of DEE's assessment it was determined that the proposed segment factory would not have a significant impact on extant Natural Temperate Grassland on the site.
Avoidance and minimisation through design	The original design for the proposed segment factory was located on the northern part of Lot 14 which would have resulted in impacts on areas of higher quality Natural Temperate Grassland. As a result of the DIAA process, the proposed segment factory has been located in an area that supports the lowest quality areas of Natural Temperate Grassland on the site. These patches are heavily degraded due to weed species, support a lower abundance and diversity of non-grass species when compared to other patches of Natural Temperate Grassland and are separated (greater than 100 m) from patches that are higher in quality. Early designs also included an access road to the north, as well as a drainage detention basin impacting on a small area of poorer quality Natural Temperate Grassland. The access road and detention basin location shave been refined to avoid direct impacts to native vegetation.

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

0 100 200 m

GDA 1994 MGA Zone 55

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KEY

- The site
- Indicative site layout
- Cadastral boundary

PCT 320 - Kangaroo Grass - Redleg Grass forb-rich temperate tussock grassland of the northern Monaro, ACT and upper Lachlan River regions of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion

- High
- Poor

Plant Community Type and vegetation mapping

Snowy 2.0
Environmental Impact Statement
Proposed Segment Factory
Figure 5.10

snowy 2.0

EMM creating opportunities

5.5.2 Predicted impacts

Residual impacts following implementation of all avoidance and minimisation measures include:

- direct impacts to 0.83 ha of poor condition native vegetation;
- indirect impacts to 0.56 ha of poor condition native vegetation; and
- impacts to 0.83 ha of potential habitat for six threatened species.

A total of 22 ecosystem credits and 66 species credits are required under the BOS to offset these impacts. Snowy Hydro intends to meet the project's ecosystem and species credit requirements through one, or a combination of, the following:

- establishment of a biodiversity stewardship site, managed under a stewardship agreement;
- purchase and retire credits available on the biodiversity credit register; or
- payment into the Biodiversity Conservation Fund (BCF).

Snowy Hydro owns Lot 14. This lot supports significant areas of good quality Natural Temperate Grassland. There is an opportunity to utilise these areas to generate credits to offset impacts arising from the proposed segment factory. Snowy Hydro is currently assessing the feasibility and financial viability of using this site for this purpose. However, given the small number of credits required this may not be a feasible option.

The biodiversity credit registers associated with the BAM and former BioBanking Assessment Method (BBAM) were searched on 14 August 2019 to determine if suitable ecosystem and species credits were available. This search indicated that credits required to offset impacts to PCT 320 are available under the former offset scheme, while suitable offsets are pending review under the BAM. Suitable credits to offset impacts to the Striped Legless Lizard and Grassland Earless Dragon are also available.

Any credits that cannot be acquitted using the two options outlined above will be offset via payment into the BCF.

There is a potential for vehicles accessing the site to transfer weeds, particularly African Lovegrass, off-site. To minimise this a range of mitigation measures are proposed which are discussed in the following section.

5.5.3 Mitigation measures

Mitigation measures to be implemented for impacts to biodiversity are summarised in Table 5.11.

Table 5.11 Mitigation measures for biodiversity

Impact/risk	ID#	Measure(s)
Native grasslands	BIO01	• The patches of retained native grassland located within the site would be fenced with a post and wire fence and signed as "No-go zones – Environmentally sensitive areas".
Native grasslands	BIO02	• The access road interfacing with the retained native grassland to the south would be fenced with a post and wire fence and signed as "No-go zones – Environmentally sensitive areas".
Native grasslands	BIO03	• The retained native grassland within the site would be actively managed to reduce indirect impacts and retained the native grassland structure, including implementation of a weed monitoring and control program.
Weed management	BIO04	• A chain link fence surrounding the site, or similar, would be fitted with shade cloth, or similar, to prevent and minimise spread of weeds into the site.

Table 5.11 Mitigation measures for biodiversity

Impact/risk	ID#	Measure(s)
Weed management	BIO05	• A weed wash-down station would be constructed and operated at a suitable location on the site. Wash-down of vehicles will be completed before and after any movements on site to prevent the spread of weeds during the construction phase.
Weed management	BIO06	• A weed monitoring and control program would be implemented in accordance with NSW WeedWise (DPI 2019) which would include: – management of weeds across Lot 14; – active and intensive control within 50 m of the disturbance footprint within Snowy Hydro owned land; and – removal and appropriate disposal of weeds, including infested topsoil, to an appropriate disposal facility.
Inductions	BIO05	• The site induction for employees and contractors would contain material: – informing them of the potential presence of Striped Legless Lizard, Grassland Earless Dragon and other threatened flora and fauna species; and – procedures to be implemented should the Striped Legless Lizard, Grassland Earless Dragon be found during works.
Clearing	BIO06	• Clearing of all exotic and native vegetation would be undertaken in accordance with the procedure set out in Section 7.3 of the BDAR.

5.5.4 Summary and conclusion

The site is dominated by grassland. It has a significant infestation of African Lovegrass, with some areas dominated by this species with close to 100% cover. In the Monaro region, African Lovegrass is identified as a priority weed due to significant infestations of the species occurring, reducing and eliminating native species.

Past land use and the African Lovegrass infestation have resulted in significant amounts of change in the grassland structure and composition of the site.

Notwithstanding the above, the site contains small patches of Natural Temperate Grassland of the South Eastern Highlands (Natural Temperate Grassland) which is a grassland community listed as a CEEC under the EPBC Act. These patches are heavily degraded due to weed species, support a lower abundance and diversity of non-grass species when compared to other patches of Natural Temperate Grassland, and are separated (greater than 100 m) from patches that are higher in quality. There are no EECs or CEECs within the site that are listed under the BC Act.

The site of the proposed segment factory has been selected to avoid and minimise impacts to areas of high quality Natural Temperate Grassland. Where this could not be achieved impacts have been minimised and mitigated through implementation of appropriate controls. Residual impacts will be offset in accordance with a biodiversity offset strategy.

A range of mitigation measures are proposed to minimise the spread of weeds, particularly African Lovegrass, off-site.

5.6 Land

5.6.1 Contamination

A Contamination Assessment of the proposed segment facility was undertaken by EMM. The assessment is provided in Appendix K.

i Context

An overview of the existing environment as it relates to contamination is provided in Table 5.12, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.12 Context for contamination

Existing environment	Lot 14 has been used for aviation purposes since 1921. The site was further developed in the 1950s and 60s to service the Snowy Scheme. It contains a private airfield. Extant hangars and office, aboveground storage tank (AST) and reported former underground storage tank (UST) are in the middle of Lot 14 to the north of the site. The portion of Lot 14 which forms part of the site only contains the southern part of the runway for the airfield. Lot 3 is partially occupied by vacant and dilapidated buildings and a decommissioned communications tower. The remainder of the site is vacant and dominated by grassland. A visual and intrusive investigation was conducted on 8 and 9 April 2019 for Lot 14. The investigation involved collecting, sampling and analysing soil and groundwater samples against relevant site assessment criteria. A visual inspection of Lot 3 was undertaken on 22 August 2019. Soil and groundwater sampling locations can be seen in Figure 5.11. Soil samples reported poly fluoroalkyl substances (PFAS), hydrocarbons, metals, and sundry contaminants as present at concentrations below the relevant assessment criteria. Asbestos was not recorded as being present in soil samples, however ACM fragments were found on the surface of the site at various locations. The location of these fragments can be seen in Figure 5.12. Groundwater samples reported PFAS as present at concentrations below the relevant assessment criteria. Asbestos and hydrocarbons were not recorded as being present in groundwater samples. Concentrations of metals in all shallow groundwater bores were in reported in exceedances of the relevant assessment criteria, however deeper bore sampling reported lower concentrations. Samples taken from a bore near the hangars and former UST reported metal concentrations more elevated than all other locations.
Community and stakeholder views	Stakeholders have not raised any concerns or issues in relation to contamination.
Avoidance and minimisation through design	As a result of the DIAA process, the proposed segment factory was relocated away from the extant hangers, AST and potential UST on Lot 14.

ii Predicted impacts

A risk assessment was undertaken to assess the likelihood and impact of the creation of an exposure pathway between known or potential sources of chemical contamination and humans or the environment as a result of the proposed segment facility. Potential impacts include:

- exposure to potential ACM during the demolition of dilapidated buildings and decommissioned communications tower;
- exposure to ACM fragments on the surface soils across the site during removal of topsoil and vegetation;
- exposure to concentrations of metals and other contaminants (PFAS, PAHs, hydrocarbons and asbestos) present in soil and groundwater during excavation and earthworks;
- fuels, oils, and etc from vehicles used in the construction and operation of the facility; and
- unplanned release of materials that are considered contaminants (fuels or hazardous chemicals, such as hydraulic fluids or herbicides) and potential spills at storage locations, use locations or during transport.

After implementing appropriate mitigation measures (see below), potential impacts from contamination were assessed as being low.

iii Mitigation measures

Mitigation measures to be implemented for contamination are summarised in Table 5.13.

Table 5.13 Mitigation measures for contamination

Impact/risk	ID#	Measure(s)
Additional investigations	CON01	• Additional investigations would be undertaken on Lot 3, including: – targeted soil sampling around the buildings and transmission tower; and – hazardous materials assessment (HMA) of buildings.
Remediation	CON02	• Due to the presence of ACM fragments on the surface of the site, it is recommended that a surface clearance (emu-bob or similar) is undertaken prior to construction activities.
Re-use of material	CON03	• Any material excavated and stockpiled on-site requires further testing to confirm its suitability for re-use on the site.
Imported fill	CON04	• Any fill materials imported to the site would be certified as VENM or ENM.
Unexpected finds	CON05	• The EMP should contain an unexpected finds protocol including procedures in the event that potentially contaminated land is identified. Where signs of contamination are identified, construction work within the affected areas would cease until a contamination assessment was undertaken to advise the need for further investigation or remediation.
Handling of waste	CON06	• The EMP should contain procedures for handling and storing waste, including handling of potentially or known contaminated material and protocols for waste classification and disposal.

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

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KEY

- The site
- Indicative site layout
- Soil sampling location
- Monitoring bore*
- Cadastral boundary

*MB04A (shallow) and MB04B (deep) are nested monitoring bores

Field investigations: Soil and groundwater sampling locations

Snowy 2.0
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Proposed Segment Factory
Figure 5.11

snowy 2.0

EMM creating opportunities

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

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KEY

- The site
- Cadastral boundary
- Indicative site layout

ACM observation

- Sampled and tested
- Observed (not tested)

ACM locations

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Figure 5.12

snowy 2.0

EMM creating opportunities

iv Summary and conclusion

Soil and groundwater contaminants at the site are below the relevant assessment criteria. Some elevated concentrations of metals above the relevant assessment criteria were observed at shallow groundwater bores to the north of the site, however deeper bore sampling reported lower concentrations.

Asbestos was not recorded as being present in soil samples or groundwater, however asbestos containing material (ACM) fragments were found on the surface of the site at various locations.

A risk assessment was undertaken and found that potential contamination associated with the proposed segment facility poses a low risk after the implementation of appropriate management controls.

Further targeted soil sampling and sampling of potential ACM will be undertaken in Lot 3 prior to construction works. An HMA of the buildings on this portion of the site will also be undertaken prior to their demolition.

5.6.2 Soils

A Land and Soils Assessment (LSA) of the proposed segment factory was undertaken by EMM to assess the impacts of the proposed segment factory on land resources and soils.

The LSA is provided in Appendix L.

i Context

An overview of the existing environment as it relates to soils is provided in Table 5.14, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.14 Context for soils

Existing environment	Soils at the site have been disturbed through the development of the airfield and grazing. There is also evidence of some potential ploughing at the site Levelling and filling works were observed at the airfield and immediate surrounds with possible subsoil exposure and soil observations of a rockier profile compared to surrounding sites. A detailed soil survey was undertaken on the site between 23 and 24 May 2019 to characterise landform, vegetation, surface characteristics, topsoil, and subsoil. There are six main soil types that are mostly formed on lower slopes of basalt and dacite soils. Additionally, there is some minor alluvium soil along the unnamed drainage line. The soils types on the site can be seen in Figure 5.13. A detailed description of the soil types can be found in the LSA. Soil samples were collected and analysed. The soils were found to have moderate to high fertility, neutral to alkaline pH, and do not have any significant subsoil constraints such as salinity, acidity/alkalinity, sodicity or magnesic horizon. Further, soils were found to not tend to disperse and have a slight to high class of erosion hazard. There is a very low potential for acid sulfate soils to occur at the site. The site has been mapped as Class 4 under DPIE's land and soil capability (LSC) scheme meaning that there are moderate limitations to cropping.
Community and stakeholder views	Stakeholders have not raised any concerns or issues in relation to potential impacts to soils.
Avoidance and minimisation through design	• Selection of a site which has been previously disturbed and subject to some levelling and filling. • Selection of a site which has a planned long-term use as industry.

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

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KEY

- Site boundary
- Local road or track
- Cadastral boundary
- Soil survey site

Soil type

- Qa-DE
- Ba-DE
- Ba-TE
- Ba-VE
- Da-FE
- Da-KA

Soil types of the assessment area

Snowy 2.0
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Figure 5.13

snowy 2.0

EMM creating opportunities

ii Predicted impacts

A detailed soil survey was undertaken on the site to characterise landform, vegetation, surface characteristics, topsoil, and subsoil. The survey found that there are six main soil types that are mostly formed on lower slopes of basalt and dacite soils. Additionally, there is some minor alluvium soil along the unnamed drainage line. A detailed description of the soil types can be found in the assessment.

Soil samples were collected and analysed. The soils were found to have moderate to high fertility, neutral to alkaline pH, and do not have any significant subsoil constraints such as salinity, acidity/alkalinity, sodicity or magnesic horizon. Further, soils were found to not tend to disperse and have a slight to high class of erosion hazard.

There is a very low potential for acid sulfate soils to occur at the site.

Biodiversity and contamination surveys undertaken for the project show that the soil resource on the site, particularly topsoils, are contaminated with a high seed bank of African Lovegrass and ACM which may have weathered caused contamination of the soil. Where required, contaminated soils may need to be removed and disposed off-site or buried.

The key risks to the soil and land resources associated with the construction and operation of the proposed segment factory are likely to relate to soil erosion and water quality related impacts, and impacts to land and soil capability.

Following the implementation of recommended mitigation measures (see Table 5.15), impacts to the soils on the site are likely to be low and manageable.

iii Mitigation measures

Mitigation measures to be implemented for soils are summarised in Table 5.15.

Table 5.15 Mitigation measures for soils

Impact/risk	ID#	Measure(s)
Soil resource	SOI01	• Soils with a seed bank of African Lovegrass should be disposed off-site or buried so they do not pose a risk of germination.
Soil resource	SOI02	• Soil requirements for landscaping and/or rehabilitation would be accurately determined before construction works begin.
Soil resource	SOI03	• An inventory of soil stripped would be prepared, so that contaminated material is identified for removal and if any significant deficit is identified, additional material can be sourced prior to landscaping and/or rehabilitation.
Topsoil management	SOI04	• Topsoil management would include the following measures: – stripped topsoil would be stockpiled separately from subsoil stockpiles where possible and practical; – topsoils would be stockpiled using methods and machinery that limit the amount of compaction so as to avoid structural decline; – stockpiles would be placed away from water discharge zones where they are not disturbed by other activities, where possible; – topsoils to be maintained for an extended period of time (eg greater than20 days) may be sprayed with a bonding agent or seeded with appropriate species and monitored for weed management; and – stockpiles would be clearly signposted.

Table 5.15 Mitigation measures for soils

Impact/risk	ID#	Measure(s)
Landscaping and/or rehabilitation	SOI05	• The following measures are designed to minimise the loss of soil during respreading on landscaped and/or rehabilitated areas and promote successful vegetation establishment: – soil would be respread in even layers at a thickness appropriate for the intended use; – topsoil would be compacted firmly but not excessively and left slightly rough (light cultivation after reinstatement may be required) to provide a suitable seed bed for revegetation; – as soon as practicable after respreading, a sterile cover crop (or other form of cover if a cover crop is unsuitable) should be established to limit erosion and soil loss; – if fertiliser is applied to aid in the reestablishment of cover it should contain as a minimum nitrogen, phosphorous, potassium and sulfur (based on the soil laboratory analysis); and – where vegetative cover has not been established the use of other cover may include mulching (organics or rocks), geofabrics (eg jute matting) or soil binding agent until suitable cover is achieved
Erosion	SOI06	• Erosion and Sediment Control Plans (ESCPs) would be prepared for the construction phase of the project.

iv Summary and conclusion

The LSA found that potential impacts to the soil and land resources can be managed through the development and implementation of soil and water mitigation and management measures, including measures to address contaminated soils.

5.7 Water

A Water Assessment for the proposed segment factory was prepared by EMM. It was prepared with consideration of the NSW Water Act 1912 (Water Act), NSW Water Management Act 2000 (WM Act) and the NSW Protection of the Environment Operations Act 1997 (POEO Act) as well as their attendant regulations and other relevant polices and guidelines.

The Water Assessment has been prepared to address the Secretary's Environmental Assessment Requirements that are relevant to surface water and groundwater. The Water Assessment is provided in Appendix M.

5.7.1 Context

An overview of the existing environment as it relates to surface water and groundwater is provided in Table 5.16.

Table 5.16 Context for water

Existing environment	**Watercourses** The proposed segment factory is located in the upper reaches of the Cooma Creek catchment. Cooma Creek flows into the Numeralla River some 40 km downstream of Cooma. There are three unnamed watercourses located in or near the site. All watercourses are known to have an ephemeral flow regime. Watercourses are detailed in Figure 5.14. Watercourse A is a third order watercourse which traverses the site, flowing generally from the south-east to the north-west. The upstream catchment is approximately 4.6 km^2 in area. This watercourse has been piped via a single 750 mm diameter culvert where it runs under the airfield runway before discharging back into a vegetated open channel located along the western edge of the site. Watercourse B is a second order watercourse with a small catchment area of approximately 0.2 km^2, consisting of a portion of the adjoining property to the east of the site. The watercourse enters the site for only a short distance along the northern boundary, and is formed generally as a shallow, grassed depression. Watercourse B joins Watercourse A approximately 100 m downstream of the site. Watercourse C is a first order watercourse that joins Watercourse B east of the site. There are no waterbodies on site. A network of piped drainage conveys stormwater from the surrounding areas into the site. Natural drainage paths follow the topography, which generally grades gently from east to west. **Water quality** Due to the ephemeral nature of the watercourses, there has been no water quality sampling undertaken to characterise water quality. No known water quality monitoring data is available for watercourses in the vicinity of the site, nor for downstream sites that are likely to be representative of these watercourses. **Rainfall** There are three BoM operated rainfall gauges in the vicinity of the proposed segment factory that provide representative records for the area. The rainfall statistics show reasonable consistency across all three gauges and indicate a median rainfall of around 470 - 560 mm/year. **Flooding** The site is located on flood prone land. Existing flooding characteristics for the site and surrounds have been established by flood modelling, which shows that a large portion of the site is currently subject to out of bank flooding in the 10% Annual Exceedance Probability (AEP) 1% AEP and Probable Maximum Flood (PMF) events. Floodwaters are predominantly associated with runoff from the upstream catchment area entering the site through Watercourse A, however there is also some flow through the eastern and western boundaries from adjacent properties. **Soils and geology** Soils across the site are broadly described as clayey silt to 0.3 m followed by moist clays of high plasticity to 0.5 m. The site is on an area with an extremely low probability of occurrence (1-5%) of acid sulfate soils. The likelihood of occurrence of salinity is also considered to be low. The surficial geology consists of alluvial layers (Quaternary Alluvium) underlaid by Tertiary Basalt. **Groundwater** A groundwater investigation was undertaken as part of the broader site contamination characterisation assessment (Appendix K). The key findings of the investigation are summarised as follows: • the groundwater flow direction is toward the west, governed by topography; • the depth to the water table within the site ranges from 5 m below ground level (BGL) towards the north-west to 10 m BGL at the eastern boundary of the site; • the groundwater system within the Tertiary Basalt is mostly unconfined and has low to moderate permeability; • the alluvium is present locally and consists of unconsolidated silty clay of very low permeability; and the groundwater quality is characterised as fresh to slightly brackish and slightly alkaline.

Table 5.16 Context for water

Community and stakeholder views	No material issues or concerns were raised by the community or businesses in relation to water. A representative from Monbeef raised concerns regarding the impact that the proposed segment factory would have on water supply to the abattoir. Consultation was undertaken with the EPA for the proposed segment factory in July 2019. The primary matter raised was potential water quality impacts including from cementitious runoff associated with the CBP.
Avoidance and minimisation through design	A water management system has been designed as part of the concept design for the proposed segment factory with the following key objectives to minimise potential flooding impacts as well as water quality impacts to both surface water and groundwater: • where practical, divert stormwater from upstream catchments around or through the site to reduce loading on the internal water management system; • provide water quality treatment and enable reuse to reduce residual water quality risks; • provide water quality controls that collectively meet industry standard pollutant load reductions; • provide detention to mitigate increases in peak flows from impervious areas; • separate potentially contaminating materials from the site stormwater system; • minimise the infiltration of potentially poor quality surface runoff into the underlying groundwater system; and • harvest stormwater to reduce stormwater overflows and demand from external water sources. To achieve the key objectives, the proposed water management system includes: • Source controls for water quality management. • Diversions that divert upstream flows around the site. This includes the diversion of Watercourse A around the proposed segment factory with capacity to convey flows for events up to the 10% AEP event. Other diversions of local stormwater runoff are proposed along the western and southern site boundaries. • A water management basin located at the north of the site. The water management basin would have a dual function to provide water quality treatment as well as detention. The water management basin would be designed to achieve industry standard pollutant reduction targets for water quality and provide detention for flows from the site for events up to the 10% AEP. • The separation of potentially cementitious runoff from the stormwater management system. This would be achieved with bunding of the cementitious area and treatment of runoff generated in the area by a first flush tank and further water quality treatment including pH dosing and dissolved air floatation to assist removal of fine sediment, if proved necessary by testing. Water supply for the project will be sourced from mains water supply and supplemented by harvested stormwater. Confirmation of suitable water quality will be required for use of harvested stormwater for concrete production. The proposed water management system is detailed in Figure 5.15.

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

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KEY

- Site boundary
- Local road or track
- Contour (1 m)
- Piped drainage
- Cadastral boundary
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order

Hydrological features

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Figure 5.14

snowy 2.0

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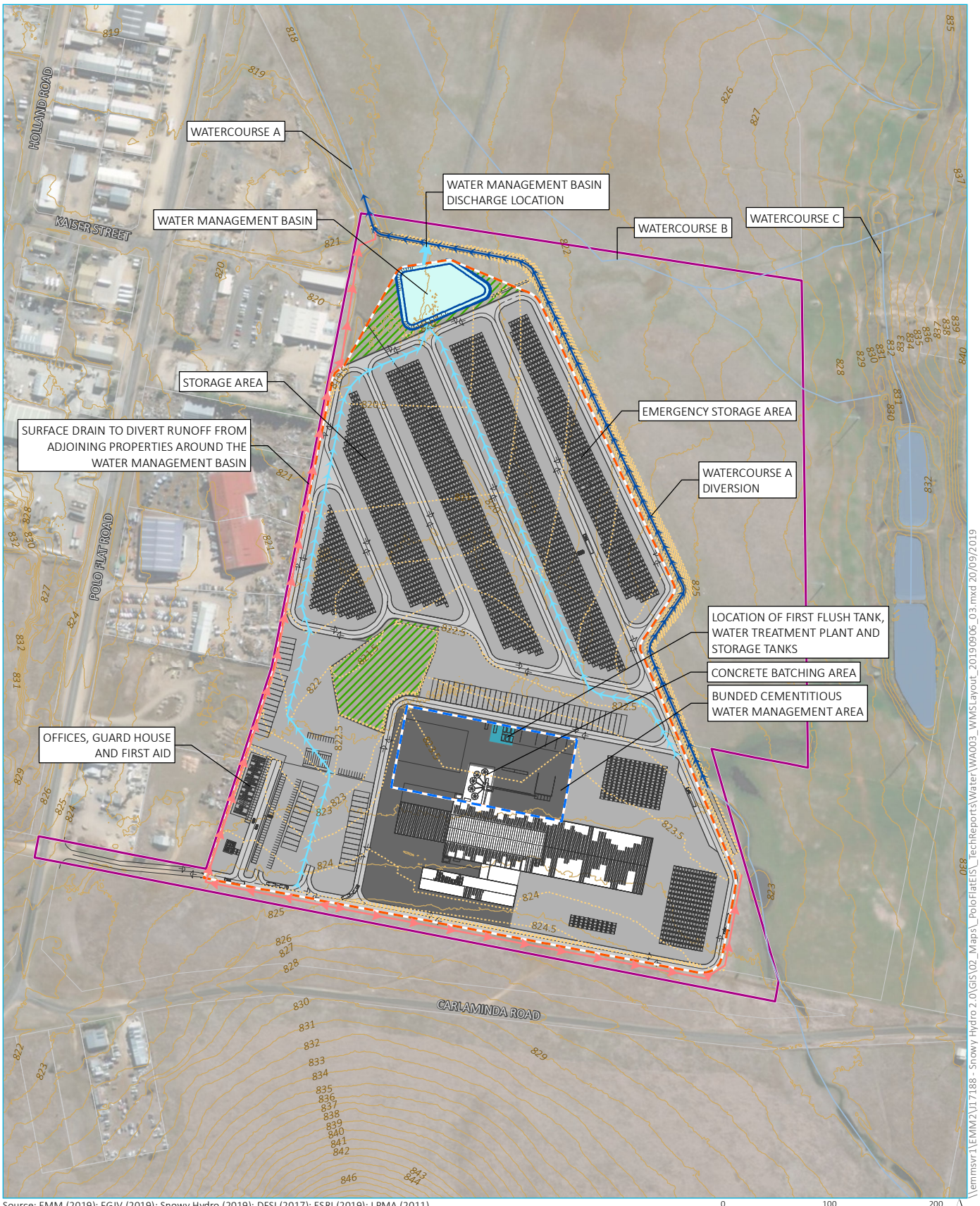

Source: EMM (2019); FGJV (2019); Snowy Hydro (2019); DFSI (2017); ESRI (2019); LPMA (2011)

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KEY

- Site boundary
- Indicative site layout
- Internal drainage contours (0.5 m)
- Contour (1 m)
- Cadastral boundary
- Waterbody

Water management system

- Watercourse
- Discharge location
- Watercourse A diversion
- Surface drain (external runoff)
- Surface drainage (internal runoff)
- Water management basin
- First flush tank

Surface material

- Asphalt
- Cement soil
- Cement soil / concrete
- Concrete
- Retained grassland

Water management areas

- Bunded cementitious area
- Stormwater management area

Proposed water management system layout

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Environmental Impact Statement
Proposed Segment Factory
Figure 5.15

snowy 2.0

EMM creating opportunities

5.7.2 Predicted impacts

The performance of the proposed water management system was assessed through water quality and water balance modelling. Water quality modelling demonstrated that industry standard pollution reduction targets were achievable for the majority of the project duration in the event that harvested stormwater is confirmed as suitable for use in concrete production.

Stormwater discharges will occur due to overflows from the water management basin. The water quality of overflows is expected to be similar to the water quality of Watercourse A and immediate downstream areas, with no significant departures expected. Hence, occasional short duration overflows from the basin are not expected to materially change or degrade the water quality of Watercourse A or immediate downstream areas. No significant impact to water quality or river flow objectives is expected.

Water balance modelling demonstrated the likely demand for water from various sources (mains supply and stormwater harvesting) under average annual rainfall conditions. Modelling demonstrated that harvesting stormwater has the potential to substantially reduce mains water demand should it prove feasible to use stormwater for concrete production.

Earthworks for the proposed segment factory are unlikely to intercept the groundwater table and areas of potential poor water quality are proposed to be sealed to minimise infiltration. The reduction in aquifer recharge due to the reduced infiltration of the developed site are demonstrated to be negligible in the context of the water source. Impacts on groundwater are therefore expected to be negligible.

A flood impact assessment assessed the impacts of the proposed site layout on flooding for the 10% AEP, 1% AEP and PMF events. The assessment determined that some impacts will be experienced on surrounding properties which includes both increases and reductions to peak flood levels and hazard, with impacts varying by frequency of flooding. Predicted increases to peak flood level were typically limited to areas adjacent to the project site and found to be in the range of 0.1 to 0.3 m for events up to 1% AEP for industrial properties to the west of the site. Slightly higher impacts in these properties to a maximum of about 0.5 m were found to occur for the PMF.

5.7.3 Mitigation measures

A proposed water management system has been designed for the segment factory and the key design elements to avoid or minimise potential impacts are detailed in Table 5.16. Additional mitigation measures to be implemented to manage potential water related impacts are summarised in Table 5.17.

Table 5.17 Mitigation measures for water

Matter	Reference	Mitigation measure
Flooding	WM01	• A flood emergency response plan will be prepared for the site that will include triggers for site preparation, evacuation and closure, protocols. The plan will also detail the following flood risk controls to be applied to the site: – waste and hazardous materials will be located outside the 1% AEP extent; – habitable buildings, electrical wiring and equipment will be located 500mm above the 1% AEP level; and – non-habitable building floor level will be a minimum of 300mm above the 1% AEP.
Flooding	WM02	• Future detailed design would have consideration to: – minimising adverse offsite flooding impacts to the extent practicable for events up to and including the 1% AEP; and – Incorporating the flood risk controls outlined in WM02 above.

5.7.4 Summary and conclusion

The Water Assessment has been developed to assess the likely impacts to surface water and groundwater, including flooding impacts, from the construction and operation of the proposed segment factory as well as address the relevant SEARs.

The Water Assessment concluded that impacts on groundwater are expected to be negligible and impacts to surface water quality would be minor and manageable with the design of the water management system and implementation of proposed mitigation measures. The assessment determined that some minor offsite flooding impacts will be experienced in industrial properties west of the site that should be minimised to the extent practicable for events up to and including the 1% AEP as part of future detailed design. A flood emergency response plan will also need to be developed to manage residual flood risks during construction and operation of the site.

5.8 Heritage

An Aboriginal and Historic Cultural Heritage Assessment Report (AHCHAR) of the proposed segment factory was undertaken by NSW Archaeology (NSWA). The content and format of the report is set out in accordance with the DPIE's *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011).

The Heritage Assessment is provided in Appendix N.

5.8.1 Context

The context for the heritage assessment is provided in Table 5.18.

Table 5.18 Context for heritage

Existing environment	**Aboriginal** The site is drained by an ephemeral third order creek which was unlikely to have provided Aboriginal land users with water other than immediately after rain. It is located at a considerable distance from a source of reliable and abundant water, the Murrumbidgee River, where focused Aboriginal occupation in the local area is expected to have occurred. In addition, it is situated within a generally amorphous landscape devoid of focal features that Aboriginal people may have been attracted to. In an Aboriginal land use context, the site possesses very low biodiversity. Given the above, the site is unlikely to have been targeted by Aboriginal people for intensive occupation which would result in significant levels of artefact discard. The site is therefore assessed to be of very low archaeological sensitivity. There are no Aboriginal objects on the site listed on DPIEs Aboriginal Heritage Information Management System (AHIMS). The nearest listing is a site about 1 km to the north-east. Further, there are no Aboriginal items listed on the site under the NSW State Heritage Inventory and the Australian Heritage Database. A comprehensive field survey was undertaken on the site on 15 March and 10 July 2019. No items of Aboriginal heritage were recorded during the survey. **Historic** Prior to development as an industrial area and airfield, the Polo Flat area was cleared pasture and utilised for stock grazing. The site forms part an airfield which was originally established in 1921. The aviation pioneer Chares Kingsford-Smith is believed to have landed at the site on a barnstorming visit to the region (The Weekly Bulletin – Rotary Club of Cooma Inc).

Table 5.18 Context for heritage

Existing environment	The airfield was developed in the late 1950s and 1960s to service the Snowy Scheme. It became the base for the Snowy Mountains Hydro-electric Authority's flying unit and aircraft (Neal 1976). By 1976 the fleet was reduced to one aeroplane, but the Polo Flat airstrip was still maintained (Neal (1976). The original hangers and terminal buildings are extant on the northern part of Lot 14. Lot 14 was sold by Snowy Hydro in 1998 where it continued use as a private airfield. Snowy Hydro purchased the land again in early 2019. There are no historic heritage items on the site that are listed on heritage registers, including the Australian Heritage Database, State Heritage Register and the State Heritage Inventory. A comprehensive field survey was undertaken on the site on 15 March and 10 July 2019. No items of historic heritage were recorded during the survey.
Community and stakeholder views	**Aboriginal** Stakeholders have not raised any concerns or issues in relation to potential impacts to Aboriginal heritage. Given that no items of Aboriginal heritage were recorded during the field survey, formal consultation under the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010) is not relevant. A copy of the draft ACHA will be provided to RAPs for Snowy 2.0 and the Merrimans Local Aboriginal Land Council for review and comment. **Historic** Stakeholders have not raised any concerns or issues in relation to potential impacts to historic heritage.
Avoidance and minimisation through design	No avoidance or minimisation through design measures were required in relation to heritage.

5.8.2 Predicted impacts

No previously recorded Aboriginal objects are known to be present at the site.

No Aboriginal items were recorded during the field survey. Artefact density has been assessed to be negligible or very low based on a consideration of the environmental and geographic context.

No historic heritage items, archaeological sites or relics are present at the site.

The field survey was comprehensive. All survey units were subject to intensive survey with regular and parallel pedestrian transects by four people made at reasonably close intervals. Nevertheless, Effective Survey Coverage (ESC) for the surveyed area is calculated to have been very low due to thick grass coverage.

The ESC achieved during the survey was considered to be insufficient to characterise the nature of artefact distribution based on a consideration of the field survey results alone. Accordingly, the assessment of the archaeological status of the project area is necessarily made via recourse to a consideration of the environmental context and the nature of prior impacts to the land surface.

The environmental context has been assessed to have provided Aboriginal land users with a limited range of resources and an ephemeral water source only. Accordingly, the nature of land use is predicted to have been intermittent and infrequent. Such occupation is likely to have resulted in very low levels of artefact discard.

Furthermore, give the high levels of previous land impacts, any artefact presence in the project area would be generally highly disturbed. It is concluded that the archaeological potential and sensitivity of the project area is very low.

While the ESC achieved during the survey was very low, given the high levels of previous disturbance and predicted low density of stone artefact distribution, subsurface test excavation is not warranted. The predictions regarding the nature of any undetected (subsurface) archaeology is made with relatively high confidence.

5.8.3 Mitigation measures

No mitigation measures are considered warranted, or have been recommended, by NSWA.

5.8.4 Summary and conclusion

An ACHA and historic heritage assessment of the proposed segment factory has been undertaken by NSWA. The assessment included two days of field survey.

No previously recorded Aboriginal objects are known to be present at the site, and no Aboriginal items were recorded during the field survey. In addition, no historic heritage items are present at the site.

While the ESC achieved during the survey was very low, given the high levels of previous disturbance and predicted low density of stone artefact distribution, subsurface test excavation is not warranted.

No mitigation measures are considered warranted, or have been recommended, by NSWA.

5.9 Hazards

To determine whether the proposed segment factory is potentially hazardous, a risk screening was undertaken in accordance with Applying SEPP 33. This risk screening considers the type and quantity of potentially hazardous materials to be stored on the site and the distance of the storage area to the nearest site boundary, as well as the expected number of transport movements, to determine whether a PHA is required to be prepared.

The risk screening is provided in Appendix O.

It should be noted that the site is not considered to be bushfire prone. Accordingly, a bushfire assessment was not undertaken. In addition, a bushfire assessment was not required by the SEARs.

5.9.1 Context

The context for hazards is summarise in Table 5.19.

Table 5.19 Context for hazards

Existing environment	The site is located in the south-eastern corner of Polo Flat on industrial zoned land. The site is generally surrounded by industrial development to the north and west, and vacant land to the south and east. The nearest residence to the site is associated with an industrial operation (on industrial zoned land) about 150 m to the south-east of the site. The site is largely vacant and dominated by grasslands. An unnamed third-order dry creek channel runs in a north-westerly direction through the site. Through use of the unmade road corridor, the site has direct access to Polo Flat Road.

Table 5.19 Context for hazards

Community and stakeholder views	Potential hazards associated with the proposed segment factory were not raised as an issue by stakeholders. Notwithstanding this, during consultation sessions with local residents and businesses, the increased risk of fire as a result of the proposed segment factory was raised.
Avoidance and minimisation through design	• Storage of chemicals associated with production of concrete in warehouse attached to the precast building. • Separation of storage of two Class 9 dangerous goods. • Volume of Class 2.1 dangerous good to be stored on the site below screening thresholds.

5.9.2 Predicted impacts

The risk screening demonstrates that there are no potentially hazardous materials, stored or handled at the proposed segment factory and therefore the factory is not a potentially hazardous industry. Accordingly, a PHA for the storage and handling of these materials is not required for proposed segment factory.

5.9.3 Mitigation measures

No mitigation measures are considered necessary for the transport, storage and handling of potentially hazardous materials associated with the proposed segment factory.

5.9.4 Summary and conclusion

To determine whether the proposed segment factory is potentially hazardous, a risk screening was undertaken in accordance with Applying SEPP 33. The risk screening demonstrates that there are no potentially hazardous materials, stored or handled at the proposed segment factory and therefore the factory is not a potentially hazardous industry. Accordingly, a PHA for the storage and handling of these materials is not required.

5.10 Social

A Social Impact Assessment (SIA) of the proposed segment factory was prepared by EMM. It was prepared in accordance with the *Social impact assessment guideline: For State significant mining, petroleum production and extractive industry development* (DPE 2017) (SIA Guideline).

The aim of the SIA is to assess the proposed change to the current social environment and develop a layered picture of the potential social impacts that are likely to arise from the proposed segment factory.

The SIA is provided in Appendix P.

5.10.1 Context

An overview of the existing environment as it relates to social impact is provided in Table 5.20, along with relevant community and stakeholder views and project design considerations relevant to the assessment.

Table 5.20 Context for social

Existing environment	**Social area of influence** The primary social area of influence (ie study area) for the proposed segment factory is Cooma township. The extended study area includes Adaminaby township. These communities have the potential to experience change during the establishment and operation of the proposed segment factory.

Table 5.20 Context for social

Existing environment	**Access** The access to Cooma is primarily via the Monaro Highway. This accessibility allows large numbers of tourist visitors each year who visit Cooma for the snow seasons due to its proximity to the snowfields. The surrounding pristine rivers and lakes and natural beauty continues to attract tourists and visitors in the summer season. **Economy** Tourism provides Cooma and Adaminaby with a thriving accommodation and food services industry that provides a large number of jobs to local residents. Other industries that provide most jobs were retail, health care and social assistance and agriculture, forestry and fishing, and electricity, gas, water and waste services. Unemployment is low across the Snowy Monaro Regional LGA at 3.3% with Cooma's unemployment at 4.9% and Adaminaby was higher at 5.8%. **Disadvantaged** Although Cooma and Adaminaby have high rates of employment there are some identifiable vulnerable groups. Among those groups are a small number of people who require assistance due to a profound or severe disability. This group require support with a range of activities related to self-care, mobility and communication. The proportion of the population in both locations of people aged 65 years and over is significantly higher than NSW. The other vulnerable group are the homeless and at risk of homeless, there are 89 homeless people in the Snowy Monaro Regional LGA (ABS, 2016). **Services and businesses** Cooma is the service centre hub for the Snowy Monaro Regional LGA with a range of schools, childcare and health services, including a hospital. The health services were deemed good by residents to an extent, who then also noted that while they had GP services and a hospital there are no specialists available. Residents are required to drive to Canberra to seek specialist care. In addition, the existing GP services are at capacity with GPs running both the hospital and their own private practice. Difficulty attracting and retaining health professionals to work in a rural location was raised by residents as a contributing factor. Childcare services were also reported to be at capacity with a recent childcare centre closure. **Housing and accommodation** The availability of rental housing in both Cooma and Adaminaby is low. This is supported by rental market trends evidenced from various property websites and anecdotal evidence from the local community. Community members consistently reported a lack of quality housing, and a misalignment of the type of housing available and the expected standard of housing. Proposed housing developments are still waiting on approval (pers. comm., 2019). Although mortgage repayments and rent are less than NSW averages, median weekly income is also substantially lower. There is evidence from community residents that the cost of living in the area is increasing, contributing to issues of housing affordability for low-income individuals and families, as well as homeless populations and those at risk of homelessness. Due to the study area's location in the Snowy Mountains, temporary accommodation is high in demand with tourist engagement in seasonal attractions and activities. Accommodation owners reported that these accommodations were either at capacity or nearly at capacity during the busy snow season (pers. comm., 2019). There is anecdotal evidence that workers stay in these rooms at semi-long-term rates (pers. comm., 2019) further contributing to vacancy reduction. **Recreation** Recreation activities are abundant in the study area. The seasonal climate and existing natural environment provide the opportunity for both residents and tourists/visitors to the area to engage in several activities, including fishing, camping, horse riding, water sports, and bushwalking, as well as skiing in the wider region. Other recreational activities available in the community are a variety of sporting clubs and arts/cultural clubs

Table 5.20 Context for social

Community and stakeholder views	Consultation on Snowy 2.0, including consultation on the proposed segment factory, has demonstrated overwhelming support for the project. The support for Snowy 2.0 is largely two-fold; because of the benefits the project would deliver to the NEM, and the economic benefits generated in the local region. While the support for the proposed segment factory is intrinsically linked to the broader support for Snowy 2.0, consultation demonstrated support given perceived localised economic benefits. Stakeholders perceived that the proposed segment factory would have a positive effect on employment and business opportunities, especially the possibility of increased traineeship opportunities and business expansion in the area. Notwithstanding this, some stakeholders expressed some concern for potential staffing competition with the proposed segment factory. The SIA community engagement activities also revealed concerns throughout the community regarding a housing shortage and the inadequacy of existing housing. Other matters discussed across consultation activities include community values, service provision, access to recreation, and public safety
Avoidance and minimisation through design	Accommodation for the workforce not sourced locally is proposed to be provided in temporary accommodation to be provided at a site in Cooma (Pacific Hills site). Accommodation at the Pacific Hills site would be subject to a separate DA.

5.10.2 Predicted impacts

Social impacts were identified through an assessment of the predicted and potential changes to the social conditions as a consequence of the project against the baseline. An assessment of the community strengths, vulnerabilities, issues and opportunities was conducted to identify vulnerabilities and understand the community's capacity to cope with potential social impacts.

When assessing impacts, the level of significance of social impact (as low, moderate, high or extreme) based on a combination of likelihood and consequence was considered. Consideration of the likelihood and consequence was based on the risk matrix contained in the SIA Guideline. Both negative and positive impacts were assessed.

i Access to housing (both vulnerable groups and workforce)

Cooma has a small homeless population, 89 as at 2016, and anecdotally that number has increased.

Both SMRC and service providers reported that there are currently a small number of people sleeping in the dilapidated buildings located on the site (ie Lot 3). This provides a safe and somewhat warmer option to rough sleeping during the harshness of winter. With the potential for the project to commence in early 2020 and the lack of available and affordable housing in Cooma and the surrounds there is a likelihood that these people will be displaced.

FGJV propose to employ 80% of the construction and operational workforce locally. The other 20% would be sourced from outside Cooma and surrounding localities. For the construction and operational phases, it is expected that 6 and 25 people, respectively, would be sourced from outside Cooma and surrounding localities.

The increase in workers during construction and operations of the segment factory will make the ability to access housing for this vulnerable group more difficult. The combination of a possible housing shortage coupled with an increase in workers and their families seeking accommodation in Cooma is likely to increase the cost of housing. Should the cost of rental properties increase, with underemployment already a concern, there is potential that people could move from 'at risk' to homeless and the number of homeless could increase.

Given the current social conditions surrounding the availability and affordability of housing it is almost certain that access to affordable and adequate housing would be further exacerbated for the homeless and at risk and the consequences would be major as the services have limited ability to adapt their services to provide the required support. Therefore, the unmitigated impact has been assessed as an extreme negative impact on the homeless and at risk of homeless throughout the construction and operation phases of the proposed segment factory.

Additionally, workers may be forced to either drive longer distances to work, and/or adopt drive-in-drive out (DIDO) arrangements which would minimise time with family and negatively impact their quality of life as these arrangements often require long hours and extended time away from home. As the project would have a 5 month construction and 3.5 year operational timeframe, unmitigated impacts are not permanent. Therefore, the unmitigated impact has been assessed as a moderate negative impact on workers from outside Cooma during the construction and operational phase of the project.

To mitigate potential impacts to housing, the project proposes to:

- prior to site establishment, confirm that no homeless people are living on site and if they are, provide early notification of works; and
- construct temporary accommodation at the Pacific Hills site in Cooma, if approved.

With the provision of these measures, the mitigated impact to access to affordable housing is high negative, while the mitigated impact to access for housing for the workforce is low negative. More broadly, and irrespective of the proposed segment factory, a continuation of existing high housing demand pressure on access to affordable housing will continue to require attention from service providers.

ii Access to adequate employment

Due to the underemployment of youth with minimal skills and people aged 50 years and over it is unlikely that without support they would gain full time employment on the project during construction or operations. In addition, those who do gain full time employment would benefit beyond the life of the project due to the skills and experience gained increases ongoing full-time employment.

However, the current pilot program for youth might see limited jobs for youth and the experience of some people aged 50 may see small numbers employed. The consequence would be negligible as the additional jobs would provide limited value. As such the unenhanced impact is assessed as low positive for youth and people aged over 50 for the construction, operational phases and post closure of the project.

Snowy Hydro and FGJV have committed to provide training and apprenticeships for locals to assist with obtaining jobs on the project. With the provision of these measures, the mitigated impact is assessed as high positive.

iii Access to recreation activities

During the construction and operational phases of the project there will be an increase in daily truck movements (two-way) that will travel along the main highway through the busy main street (Sharp Street) of Cooma. The increase in traffic due to trucks and other vehicles along Sharp Street raised concern amongst residents that the combination of increased traffic, noise and dust will impact their access to cafes and shopping. This is compounded by the limited parking currently available.

Given the number of trucks, the level of inconvenience and community concern that the traffic creates along an already busy main street where residents shop and socialise it is possible that access to recreational activities will be impacted. The consequence is minor due to the short-term nature of the impacts and the community's ability to adapt and cope with the negative social impacts. The unmitigated and mitigated impact is assessed as moderate negative for Cooma residents during the construction and operational phases of the proposed segment factory.

iv Public safety

Cooma residents expressed concern for the public safety regarding the current absence of road crossings in the centre of town and around schools. The main strip in Cooma is busy and has angle parking that can hinder the ability to see approaching vehicles. The absence of safe crossings for pedestrians is of concern for children, elderly and those living with a disability.

There is currently a school zone along the highway where the traffic is reduced to 40km, however there are no safe crossings for children. Due to the lack of safe crossings, residents reported that students frequently cross the highway and there is great concern, again, there will be an accident causing serious injury or death. The consequences could be catastrophic due to broad impact it has on the residents. The magnitude of this impact is long term as the grief and loss is not limited to the time of the accident and or loss. Therefore, the unmitigated social risk is assessed as extreme high for residents of Cooma, children, elderly, and people with a disability.

There are a range of mitigation measures that could be employed to reduce the safety risk of additional traffic generated by the project, including pedestrian crossings (including crossings with a lollipop person for school crossings), speed reductions and education campaigns. Snowy Hydro and FGJV would work with relevant road authorities (SMRC and RMS) to agree and implement these strategies during the construction and operational phase of the proposed segment factory. With the implementation of these strategies, the mitigated risk to public safety would be high negative.

v Access to health and childcare services

It is possible that some workers at the proposed segment factory may move with their families to Cooma. The increase in population could place additional pressures on the health services and increase wait times for GPs and hospitals. It is possible that childcare services would not be able to take on additional enrolments.

The consequences are minor as the impact is short term and the ability for the community to adapt by seeking alternate childcare arrangements and traveling to seek medical care is evident. Therefore, the unmitigated social risk is assessed as moderate negative for residents of Cooma during the construction and operation phases of the project. With the implementation of mitigation measures the impact is assessed as moderate negative for health services and low negative for childcare services.

vi Livelihood

It is possible that the occupancy of short-term accommodation in Cooma will increase as a result of workers associated with the proposed segment factory. This would lead to increases in occupancy in other accommodation across the Snowy Monaro Regional LGA. This would likely see increased spending in Cooma and the Snowy Monaro Regional LGA not only during the tourist season but all year round during construction and operation. The consequences of increased capacity and spending would add substantial value to society. Therefore, the social risk to livelihood is assessed as high positive to businesses, particularly those in the retail and accommodation and food industries, in Cooma and the Snowy Monaro Regional LGA more broadly.

Assuming Snowy Hydro successfully encouraged workers to reside in or stay in Cooma and surrounding towns during construction and operation, and Council were able to facilitate additional housing, the benefits to Cooma would be further enhanced. If this were to occur, it is likely that business would see an increase in business activity and potential for more jobs for the underemployed. The consequence would be moderate due to the substantial value generated from increased revenue for businesses and employment and financial stability for the underemployed. As such the mitigated social benefit is high positive for business, particularly those in the retail and accommodation and food industries, and the underemployed in Cooma and the Snowy Monaro Regional LGA more broadly.

5.10.3 Mitigation measures

Mitigation measures to be implemented for potential social impacts are summarised in Table 5.21.

Table 5.21 Mitigation measures for social

Matter	Reference	Mitigation measure
Access to housing	SOC01	• Provision of temporary accommodation at the Pacific Hills site in Cooma, if approved (a separate DA would be lodged for the accommodation at this site).
Access to housing	SOC02	• Prior to site establishment, confirm that no homeless people are living on site and if they are, provide early notification of works.
Access to adequate employment	SOC03	• Provision of training and apprenticeships for local youth and people aged over 50. • Implementation of a School Based Apprenticeship Training Pilot Program.
Public safety	SOC04	• Work with road authorities such as SMRC and RMS to implement and/or advocate for measures to reduce potential impacts to public safety as a result of increased traffic movements.

5.10.4 Summary and conclusion

A study of the existing social conditions in the study area was conducted to obtain an understanding of the pre-existing community strengths and vulnerabilities against which potential social impacts from the proposed segment factory can be identified and analysed. Both potential negative and positive impacts have been considered in regard to social impacts.

Consultation on Snowy 2.0, including consultation on the proposed segment factory, has demonstrated overwhelming support for the project and there is an expectation from stakeholders that the proposed segment factory would provide economic benefit to the local area. These benefits have been quantified in the economic assessment and are likely to be significant in the context of the local economy.

The key social impacts described relate to economic benefits, but also negative impacts associated with housing, access to recreation activities and public safety. Mitigation measures have been provided to reduce the negative social impacts and enhance measures for positive impacts, however many of the negative impacts identified related to existing social issues such as lack of housing, homelessness, pressures on health services and underemployment. Factors that would be outside of the responsibility of Snowy Hydro.

As such, mitigation and management strategies have been identified for identified social impacts, along with responsible parties and potential delivery partners.

5.11 Economic

An assessment of the economic impacts of the proposed segment factory was undertaken by Gillespie Economics. The assessment is provided in Appendix Q.

5.11.1 Context

The context for the economic assessment is summarise in Table 5.22.

Table 5.22 Context for economics

Existing environment	An indication of the health of an economy can be gained from population changes. In this context, the population of the Snowy Monaro Regional LGA has grown slightly, at a rate of 3.9% since 2006, less than that for NSW as a whole (14.2% between 2006 and 2016). DPIE's population forecasts for the Snowy Monaro Regional LGA suggests small population growth in the Snowy Monaro Regional LGA. Output for the local economy is estimated at $5.0 billion (B). Value-added for the local economy is estimated at $1.3 BM, comprising $567 million (M) to households as wages and salaries and $713 M in other value value-added (OVA). The total employment in the local economy was 9,761 jobs. Comparison of the economic structure of the local economy with that for NSW indicates that that the agriculture/forest/fishing, and trade/accommodation sectors in the local economy are of greater relative importance than they are to the NSW economy, while the mining sectors, manufacturing sectors and business services sectors are of less relative importance than they are to the NSW economy. In terms of gross regional output, utilities, sheep/grains/beef/dairy cattle, accommodation/restaurants and wood manufacturing are the most significant sectors. In terms of value-added, accommodation/restaurants, sheep/grains/beef/dairy cattle and utilities are the most significant sectors. The accommodation/restaurants, retail trade, sheep/grains/beef/dairy cattle, education and sport/recreation/gambling sectors are the most significant sector in terms of local employment while the accommodation/restaurants, public administration and education sectors are the most significant sectors in terms of income. The five most significant employment providers in the region are accommodation, retail trade, food and beverage services, sheep/grains/beef/dairy cattle and sports and recreation. In the top 40 individual industry sectors by employment, 18% of the workforce resides outside the region. The sectors with the highest proportion of labour sourced from outside the region are water/pipeline and other transport (59%), arts/sport/adult/other educational services (47%), sports and recreation (46%) and accommodation (42%).
Community and stakeholder views	Community and stakeholder views on the potential economic benefits of the proposed segment factory are described in Table 5.20.
Avoidance and minimisation through design	Not applicable

5.11.2 Predicted impacts

Construction of the proposed segment factory is estimated to cost $55 M, with 35% of costs spent on site preparation and 65% spent on construction of the factory. The construction workforce is estimated to be 30 people for five months, with 80% (24) sourced locally.

To support 30 construction workers for five months, approximately $16 M of capital expenditure would be required in the non-residential building construction and construction services sectors. The direct and indirect local economic impact of this level of expenditure in the local economy is estimated to be:

- $8 M in annual direct and indirect output or business turnover;
- $3 M in annual direct and indirect value added;
- $1 M in annual direct and indirect household income; and
- 46 direct and indirect jobs.

The proposed segment factory would operate for approximately 3.5 years, employ 125 people (of which, 80% or 100 people, will be sourced locally) and have an average annual turnover of $115 M. The direct and indirect local economic impact of this level of expenditure in the local economy is estimated to be:

- $147 M in annual direct and indirect output or business turnover;
- $46 M in annual direct and indirect value-added;
- $21 M in annual direct and indirect household income; and
- 252 direct and indirect jobs.

These economic impacts are considered to be significant in the context of the local economy.

The decommissioning of the proposed segment factory may result in a contraction in local economic activity. The significance of this contraction would depend on the economic structure and trends in the local economy at the time. For example, if the decommissioning takes place in a declining economy, the impacts might be significant. Alternatively, if the decommissioning takes place in a growing diversified economy where there are other development opportunities, the ultimate cessation of the factory may have little impact.

Notwithstanding the above, Snowy Hydro aims to find an alternative industrial use of the site following the decommissioning phase. This use would be subject to a separate DA with SMRC. One of the aims of an alternative use would be to maintain, where possible, the economic stimulus that the proposed segment factory has on the local economy.

5.11.3 Mitigation measures

Measures to be implemented to maximise the economic benefits of the proposed segment factory are summarised in Table 5.23.

Table 5.23 Mitigation measures for economics

Impact/risk	ID#	Measure(s)
Local employment	ECO01	• Consideration would be given to local employees where they have the required skills and experience.
Potential business impacts	ECO02	• Collaboration would be undertaken with SMRC, economic development organisations, local chambers of commerce and State Government to: – inform local business of the goods and services required, service provision opportunities and compliance requirements of business to secure contracts; – encourage local business to meet the requirements for the supply of contracts; and – develop relevant networks to assist qualified local and local businesses tender for provision of goods and services to support the factory.

5.11.4 Summary and conclusion

The economic assessment demonstrates that the proposed segment factory would have a positive economic impact on the local economy during both its construction and operational phases. These benefits are significant and annually during the operational phase are likely to inject up to $147 M in direct and indirect output or business turnover, $46 M in annual direct and indirect value-added, and $21 M in annual direct and indirect household income. In addition, during the operational phase, the proposed segment factory will generate up to 252 direct and indirect jobs in the local economy.

In a broader context the economic benefits of Snowy 2.0 are significant. The Economic Assessment of the Snowy 2.0 Main Works indicate that it will deliver substantial economic benefits to the local region, NSW and NEM states, with key drivers being the direct investment to establish the project, wage expenditure, reduced ongoing electricity fuel costs, and reduced electricity costs. The greatest effect will be experienced by the NSW/ACT economies with GSP expected to increase by $2,692 M. The aggregated beneficial effect across the remaining NEM participants is predicted to be an increase in GSP of $4,176 M. The local economies of Snowy Monaro Regional and Snowy Valleys LGAs will also benefit from Snowy 2.0 Main Works, increasing the average annual additional wage expenditure by $8 M.

Measures would be undertaken to maximise the economic benefits of the proposed segment factory by working with government and the local community.

CHAPTER 6

MITIGATION MEASURES

6 Mitigation measures

6.1 Introduction

This chapter describes the environmental management framework for the proposed segment factory. It also summarises the mitigation measures that will be implemented for each of the key environmental matters assessed in this EIS.

6.2 Environmental management

6.2.1 Framework

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.

A summary of mitigation measures is detailed below.

6.3 Mitigation measures

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 or sub-plans as relevant. A summary of mitigation measures is provided in Table 6.1.

Table 6.1 Summary of 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.

Table 6.1 Summary of mitigation measures

Area	Impact/risk	ID#	Mitigation measures
Noise and vibration	Construction noise and vibration	NV001	• The EMP for the proposed segment factory would describe how construction noise would be managed where predicted noise levels are above the NMLs. It would outline measures to monitor construction noise at early stages to validate the predictions. • Residents at assessment locations R15, R16 and R17) would be notified prior to construction.
	Operational noise	NV002	• The EMP would include measures to monitor operational noise levels during commissioning (or within 3 months of operation) to validate the predicted noise levels. The EMP would also include a review of noise mitigation measures and site management to reduce levels where required. • The residents at assessment location R16 would be notified prior to commencement of operation.
Landscape and visual	Surface reflectivity	LV01	• The use of non-reflective paint on buildings should be used where possible to avoid glare and surface reflectivity.
	Surface reflectivity	LV02	• The use of dark colours should be used where possible as they are usually better absorbed within natural areas. Greys and charcoal colours generally provide less visual contrast to the colours of the Australian landscape and complement the hues of the alpine environment.
	Surface reflectivity	LV03	• The use of textures on large surfaces is recommended where possible to reduce the contrast between built elements and the surrounding (textured) natural environment and reduce the potential for glare.
	Lighting	LV04	• Lighting would be designed in accordance with *AS4282-1997 Control of obtrusive effects of outdoor lighting* to minimise light spill.
Air quality	Dust from roads	AIR01	• All paved roads would be routinely cleaned by a street sweeper (water flushing and sweeping) as required.
	Diesel particulates	AIR02	• The idling of diesel equipment would be minimised.
Biodiversity	Native grasslands	BIO01	• The patches of retained native grassland located within the site would be fenced with a post and wire fence and signed as “No-go zones – Environmentally sensitive areas”.
	Native grasslands	BIO02	• The access road interfacing with the retained native grassland to the south would be fenced with a post and wire fence and signed as “No-go zones – Environmentally sensitive areas”.
	Native grasslands	BIO03	• The retained native grassland within the site would be actively managed to reduce indirect impacts and retained the native grassland structure, including implementation of a weed monitoring and control program.
	Weed management	BIO04	• A chain link fence surrounding the site, or similar, would be fitted with shade cloth, or similar, to prevent and minimise spread of weeds into the site.
	Weed management	BIO05	• A weed wash-down station would be constructed and operated at a suitable location on the site. Wash-down of vehicles will be completed before and after any movements on site to prevent the spread of weeds during the construction phase.
	Weed management	BIO06	• A weed monitoring and control program would be implemented in accordance with NSW WeedWise (DPI 2019) which would include: – management of weeds across Lot 14; – active and intensive control within 50 m of the disturbance footprint within Snowy Hydro owned land; and – removal and appropriate disposal of weeds, including infested topsoil, to an appropriate disposal facility.

Table 6.1 Summary of mitigation measures

Area	Impact/risk	ID#	Mitigation measures
	Inductions	BIO05	• The site induction for employees and contractors would contain material: – informing them of the potential presence of Striped Legless Lizard, Grassland Earless Dragon and other threatened flora and fauna species; and – procedures to be implemented should the Striped Legless Lizard, Grassland Earless Dragon be found during works.
	Clearing	BIO06	• Clearing of all exotic and native vegetation would be undertaken in accordance with the procedure set out in Section 7.3 of the BDAR.
Contamination	Additional investigations	CON01	• Additional investigations would be undertaken on Lot 3, including: – targeted soil sampling around the buildings and transmission tower; and – hazardous materials assessment (HMA) of buildings.
	Remediation	CON02	• Due to the presence of ACM fragments on the surface of the site, it is recommended that a surface clearance (emu-bob or similar) is undertaken prior to construction activities.
	Re-use of material	CON03	• Any material excavated and stockpiled on-site requires further testing to confirm its suitability for re-use on the site.
	Imported fill	CON04	• Any fill materials imported to the site would be certified as VENM or ENM.
	Unexpected finds	CON05	• The EMP should contain an unexpected finds protocol including procedures in the event that potentially contaminated land is identified. Where signs of contamination are identified, construction work within the affected areas would cease until a contamination assessment was undertaken to advise the need for further investigation or remediation.
	Handling of waste	CON06	• The EMP should contain procedures for handling and storing waste, including handling of potentially or known contaminated material and protocols for waste classification and disposal.
Soils	Soil resource	SOI01	• Soils with a seed bank of African Lovegrass should be disposed off-site or buried so they do not pose a risk of germination.
	Soil resource	SOI02	• Soil requirements for landscaping and/or rehabilitation would be accurately determined before construction works begin.
	Soil resource	SOI03	• An inventory of soil stripped would be prepared, so that contaminated material is identified for removal and if any significant deficit is identified, additional material can be sourced prior to landscaping and/or rehabilitation.
	Topsoil management	SOI04	• Topsoil management would include the following measures: – stripped topsoil would be stockpiled separately from subsoil stockpiles where possible and practical; – topsoils would be stockpiled using methods and machinery that limit the amount of compaction so as to avoid structural decline; – stockpiles would be placed away from water discharge zones where they are not disturbed by other activities, where possible; – topsoils to be maintained for an extended period of time (eg greater than20 days) may be sprayed with a bonding agent or seeded with appropriate species and monitored for weed management; and stockpiles would be clearly signposted.

Table 6.1 Summary of mitigation measures

Area	Impact/risk	ID#	Mitigation measures
	Landscaping and/or rehabilitation	SOI05	• The following measures are designed to minimise the loss of soil during respreading on landscaped and/or rehabilitated areas and promote successful vegetation establishment: – soil would be respread in even layers at a thickness appropriate for the intended use; – topsoil would be compacted firmly but not excessively and left slightly rough (light cultivation after reinstatement may be required) to provide a suitable seed bed for revegetation; – as soon as practicable after respreading, a sterile cover crop (or other form of cover if a cover crop is unsuitable) should be established to limit erosion and soil loss; – if fertiliser is applied to aid in the reestablishment of cover it should contain as a minimum nitrogen, phosphorous, potassium and sulfur (based on the soil laboratory analysis); and – where vegetative cover has not been established the use of other cover may include mulching (organics or rocks), geofabrics (eg jute matting) or soil binding agent until suitable cover is achieved
	Erosion	SOI06	• Erosion and Sediment Control Plans (ESCPs) would be prepared for the construction phase of the project.
Water	Flooding	WM01	• A flood emergency response plan will be prepared for the site that will include triggers for site preparation, evacuation and closure, protocols. The plan will also detail the following flood risk controls to be applied to the site: – waste and hazardous materials will be located outside the 1% AEP extent; – habitable buildings, electrical wiring and equipment will be located 500mm above the 1% AEP level; and – non-habitable building floor level will be a minimum of 300mm above the 1% AEP.
	Flooding	WM02	• Future detailed design would have consideration to: – minimising adverse offsite flooding impacts to the extent practicable for events up to and including the 1% AEP; and – Incorporating the flood risk controls outlined in WM02 above.
Social	Access to housing	SOC01	• Provision of temporary accommodation at the Pacific Hills site in Cooma, if approved (a separate DA would be lodged for the accommodation at this site).
	Access to housing	SOC02	• Prior to site establishment, confirm that no homeless people are living on site and if they are, provide early notification of works.
	Access to adequate employment	SOC03	• Provision of training and apprenticeships for local youth and people aged over 50. • Implementation of a School Based Apprenticeship Training Pilot Program.
	Public safety	SOC04	• Work with road authorities such as SMRC and RMS to implement and/or advocate for measures to reduce potential impacts to public safety as a result of increased traffic movements.

Table 6.1 Summary of mitigation measures

Area	Impact/risk	ID#	Mitigation measures
Economics	Local employment	ECO01	• Consideration would be given to local employees where they have the required skills and experience.
	Potential business impacts	ECO02	• Collaboration would be undertaken with SMRC, economic development organisations, local chambers of commerce and State Government to: – inform local business of the goods and services required, service provision opportunities and compliance requirements of business to secure contracts; – encourage local business to meet the requirements for the supply of contracts; and – develop relevant networks to assist qualified local and local businesses tender for provision of goods and services to support the factory.

7 Evaluation and conclusion

7.1 Introduction

This chapter of the EIS provides an overall evaluation of the proposed segment factory. It considers the likely environmental, social and economic impacts of the project, and makes a recommendation as to whether, on balance, the impacts and benefits are in the public interest.

7.2 Alternatives

In developing Snowy 2.0, Snowy Hydro and FGJV considered a range of alternatives for the proposed segment factory. These included importing segments from Malaysia through the port of Eden, and siting the proposed segment factory:

- within KNP at Tantangara Dam;
- at an existing quarry at Culcairn;
- on private land adjacent to KNP; and
- at several alternative sites, including sites within the ACT.

Ultimately the site was chosen by Snowy Hydro and the FGJV as the preferred option because it:

- is located within an existing industrial zone;
- minimises travel distance for raw material supply;
- is sited outside of the KNP, and thereby reduces the amount of land (and, in turn, amount of clearing) otherwise required in the KNP; and
- is likely to provide the best opportunities for the local community with regards to direct employment and additional flow on economic benefits from using other local companies and facilities.

7.3 Project design

In developing the layout of the proposed segment factory, an iterative and risk-based design and assessment process was adopted, referred to as a DIAA. This DIAA process was undertaken with the guiding principles of avoiding and minimising environmental impacts where possible.

Through the DIA process, several alternative layouts and configurations at the site were considered by FGJV for the proposed segment factory to minimise environmental impacts, particularly impacts on native grasslands and impacts of operational noise on nearby residents, but also to maximise the efficiency of the factory.

In relation to native grasslands, this included amending the location of the proposed segment factory on Lot 14 to avoid impacts to higher quality grasslands in the middle and eastern part of the lot.

In relation to noise, this included:

- enclosing the CBP;
- relocating the CBP and associated infrastructure such as the aggregate and sand stockpiles and bins to the northern side of the precast building; and
- relocating the truck parking area in the south-western corner of the site to the north of the precast building.

7.4 Strategic context

The Snowy Scheme is the largest engineering project ever undertaken in Australia and is one of the largest and most complex hydro-electric schemes in the world. Its construction is seen by many as a defining point in Australia's history.

Snowy 2.0 involves linking Talbingo and Tantangara reservoirs within the existing Snowy Scheme, and would increase the generation capacity of the Snowy Scheme by almost 50%. Snowy 2.0 would provide an additional 2,000 MW generating capacity, and make approximately 350,000 MWh (about 175 hours at full power) of storage available to the NEM at any one time.

The development of Snowy 2.0 is consistent with Commonwealth and NSW strategic planning and policy objectives, including the NSW Renewable Action Plan. With the planned retirement of generation powered by fossil fuels, there is a need for reliable electricity supply to counteract a decline in the reserve generation capacity available in the NEM. The development of Snowy 2.0 would play a key role in helping NSW and the broader NEM achieve energy system reliability and security, with relatively low costs and emissions. Compared with other alternatives, Snowy 2.0 provides:

- increased storage capacity, longer lifespan for storage, and cheaper full life cycle cost when compared to current lithium-ion storage batteries;
- more efficient dispatch of electricity to major load centres and less emission generation when compared to traditional electricity generating plants; and
- improved security and reliability of supply when compared to the intermittency of primary renewable energy sources (such as wind and solar).

Snowy 2.0 would also increase generation competition in the NEM at peak times, and thus exert downward pressure on peak energy prices and provide economic benefits to the consumer. The Feasibility Study delivered in December 2017 confirmed that Snowy 2.0 is economic, technically feasible and financeable (Snowy Hydro 2017).

Snowy Hydro's Board made its FID on 12 December 2018 to proceed with Snowy 2.0, again confirming the project is economic, technically feasible and financeable. As a wholly owned shareholder, the Commonwealth government provided shareholder approval for Snowy Hydro to proceed with Snowy 2.0 and will commit up to $1.38 billion in an equity investment for the project.

The tunnels for Snowy 2.0 would be constructed using TBMs. These tunnels are required to be lined with concrete tunnel segments that are proposed to be produced at the proposed segment factory. The proposed segment factory is therefore critical to the successful delivery of Snowy 2.0.

7.5 Statutory context

7.5.1 NSW

In recognition of the need to manage the transition and future energy mix in the NEM, Snowy 2.0 was declared to be CSSI under the EP&A Act by the former NSW Minister for Planning on 7 March 2018. It was declared to be critical because it would provide security and enhance the reliability of the east coast electricity market and increase the amount of renewable energy generated in NSW. The declaration signifies the critical role that Snowy 2.0, together with the upgrades to the NSW transmission network, will play in providing reliable energy and large-scale storage to NSW as it transitions to a low emissions economy.

The CSSI declaration came into effect on 9 March 2018 and is included in clause 9 of Schedule 5 of the SRD SEPP. The declaration includes development that is ancillary to Snowy 2.0 and transmission works, including the proposed segment factory, which is ancillary to the construction of Snowy 2.0.

The NSW Minister for Planning and Public Spaces is the determining authority for applications for CSSI.

An application for CSSI must be accompanied by an EIS that has been prepared in accordance with the SEARs for the EIS.

On 19 June 2019, a scoping report for the proposed segment factory to DPIE. The purpose of the scoping report was to request and inform the content of the SEARs. SEARs for the proposed segment factory were issued on 31 July 2019.

This EIS has been prepared in accordance with these SEARs.

In addition to the approval from the NSW Minister for Planning and Public Spaces under the EP&A Act, two other approvals are required under NSW legislation before the proposed segment factory can be constructed and operated. The first is an approval from SMRC under section 138 of the NSW *Roads Act 1993* for the construction of the access road in the unmade road reserve, and its connection to Polo Flat Road. The second is the granting of an EPL under the POEO Act for the operation of the factory.

Under section 5.24 of the EP&A Act, a section 138 consent and an EPL cannot be refused if it is necessary for carrying out approved SSI (and CSSI) and is to be substantially consistent with the approval under the EP&A Act.

7.5.2 Commonwealth

On 26 June 2019, Snowy Hydro referred the proposed segment factory to the Commonwealth Minister for the Environment under the provisions of the EPBC Act. On 13 August 2019, the proposed segment factory was determined by the Acting Assistant Secretary Assessments and Waste Branch of DEE, as delegate to the Minister, to be 'not a controlled action' and therefore does not require further assessment or approval under the EPBC Act.

7.6 Stakeholder engagement

Stakeholder engagement on Snowy 2.0 commenced in mid to late 2017 and has been ongoing. It has been undertaken in accordance with a proactive and flexible stakeholder engagement strategy, which is applicable to all phases of Snowy 2.0, including the proposed segment factory.

Engagement activities targeted specifically for the proposed segment factory have been extensive and included:

- the distribution of information sheets;
- undertaking a survey;
- holding face-to-face meetings, community information sessions and workshops with residents;
- holding meetings with government agencies and councils; and
- engaging with Indigenous leaders, groups, and organisations.

The results of stakeholder engagement indicate that, in general, all stakeholders are supportive of the proposed segment factory due to the economic and social benefits that it would bring to the local area. Notwithstanding this, some matters were raised by stakeholders that they would like considered and addressed by Snowy Hydro and FGJV.

Matters relating to traffic were of the main issues raised throughout all engagement platforms. Participants consistently noted their concern for existing road safety and the ways in which the proposed segment factory may affect conditions and further exacerbate existing conditions. Reductions in speed limits was among the most frequent request for addressing traffic concerns.

7.7 Environmental impacts

Potential impacts of the project have been comprehensively assessed and are detailed in Chapter 6. This section provides a summary of the key predicted impacts from the proposed segment factory.

7.7.1 Transport

Predicted traffic and transport impacts were based on estimates of operational vehicle movements for the segment factory and for the construction of the Exploratory and Main Works. It was determined that consideration should be given to upgrades to identified intersections, including the roundabouts at the intersections of Sharp Street with Bombala and Vale streets.

In addition, the project will require two new intersections providing access to project worksites (at the Polo Flat and Rock Forest sites).

Elsewhere across the study area, recommendations have been made for mitigation measures to address residual impacts. These measures would be the result of detailed design, with guidelines, principles and management provisions set out in traffic management plans, determined prior to operation.

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 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 the TTA.

7.7.2 Amenity

Key amenity impacts of the proposed segment factory include noise impacts to nearby residences.

The design and management of the proposed segment factory was amended to minimise noise impacts to residences on Carlaminda Road. As a result, modelling demonstrates compliance with construction and operational noise criteria for most of the time. Where there are exceedances, these are considered to be appropriate. In addition, during consultation residents on Carlaminda Road indicated that they were not concerned with potential noise impacts associated with the project. Construction noise levels from the project are predicted to satisfy relevant criteria at all assessment locations except for three residences on Carlaminda Road (R15, R16 and R17). Exceedances at two receivers (R15 and R17) are considered to be negligible. The exceedance at R16 is larger but is limited to 5 hours on Saturdays for the 5 month construction period. The project will notify these residences of construction works and undertake noise monitoring during the initial stages of construction will be undertaken to determine actual construction noise levels.

For operational noise, criteria are satisfied at all assessment locations during the day. A residual (but negligible) exceedance of 2 dB has been predicted at one assessment (R16) location during the evening and night after the implementation of all feasible and reasonable mitigation measures.

Road traffic noise levels are predicted to comply with the noise criteria for most of the operational period during the day and night. During the peak of operations, which are predicted to occur for 2-3 months, there is a potential for a minor exceedance of the noise criteria at night on some sections of the transport route.

Vibration impacts from construction at residential assessment locations are highly unlikely.

Visual impacts to the landscape character for the site and surrounds would be moderate, and the extent of the impact would only be temporary until the completion of Snowy 2.0. Visual impacts to the Polo Flat industrial character zone would have a low impact due to its existing land use and character being the same as that of the proposed segment factory. Mitigation measures have been recommended to reduce surface reflectivity of built structures and to minimise light spill.

7.7.3 Air

Dust avoidance and minimisation measures were incorporated into the design of the proposed segment factory.

Dust emission dispersion modelling shows that the predicted concentrations and deposition rates for particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) and NO_2 are below the applicable impact assessment criteria at all residential assessment locations. A consideration of cumulative impacts also demonstrated compliance with applicable impact assessment criteria at residential locations.

Total GHG emissions for the proposed segment factory represent approximately 0.008% and 0.002% of total emissions for NSW and Australia respectively.

7.7.4 Biodiversity

The site has been heavily disturbed as a result of past land use and is dominated by weeds, particularly a significant infestation of African Lovegrass. Notwithstanding this, the site contains small patches of Natural Temperate Grassland.

The site of the proposed segment factory has been selected to avoid and minimise impacts to areas of high quality Natural Temperate Grassland. Where this could not be achieved impacts have been minimised and mitigated through implementation of appropriate controls. Residual impacts will be offset in accordance with a biodiversity offset strategy.

The proposed segment factory would result in direct impacts to 0.83 ha of poor condition native vegetation, indirect impacts to 0.56 ha of poor condition native vegetation and impacts to 0.83 ha of potential habitat for six threatened species. A total of 22 ecosystem credits and 66 species credits are required to offset these impacts.

Mitigation measures are proposed to minimise the spread of weeds, particularly African Lovegrass, off-site.

7.7.5 Land

Soil and groundwater contaminants at the site are below the relevant assessment criteria. Some elevated concentrations of metals above the relevant assessment criteria were observed at shallow groundwater bores to the north of the site, however deeper bore sampling reported lower concentrations.

Asbestos was not recorded as being present in soil samples or groundwater, however asbestos containing material (ACM) fragments were found on the surface of the site at various locations.

The potential contamination associated with the proposed segment facility poses a low risk after the implementation of appropriate management controls. Further targeted soil sampling and sampling of potential ACM will be undertaken in Lot 3 prior to construction works. A hazardous materials assessment of the buildings on this portion of the site will also be undertaken prior to their demolition.

7.7.6 Water

The Water Assessment concluded that impacts on groundwater are expected to be negligible and impacts to surface water quality would be minor and manageable with the design of the water management system and implementation of proposed mitigation measures. The assessment determined that some minor offsite flooding impacts will be experienced in industrial properties west of the site that should be minimised to the extent practicable for events up to and including the 1% AEP as part of future detailed design.

A flood emergency response plan will be developed to manage residual flood risks during construction and operation of the site

7.7.7 Heritage

No previously recorded Aboriginal objects are known to be present at the site, and no Aboriginal items were recorded during field surveys. In addition, no historic heritage items are present at the site. No mitigation measures are considered warranted for Aboriginal or historic heritage.

7.7.8 Hazards

A risk screening was undertaken in accordance with Applying SEPP 33. The risk screening demonstrates that there are no potentially hazardous materials, stored or handled at the proposed segment factory and therefore the factory is not a potentially hazardous industry.

7.7.9 Social

Consultation on Snowy 2.0, including consultation on the proposed segment factory, has demonstrated overwhelming support for the project and there is an expectation from stakeholders that the proposed segment factory would provide economic benefit to the local area. These benefits have been quantified in the economic assessment and are likely to be significant in the context of the local economy.

The key social impacts relate to economic benefits, but also negative impacts associated with housing, access to recreation activities and public safety. Mitigation measures have been provided to reduce the negative social impacts and enhance measures for positive impacts. While some of these measures are the responsibility of Snowy Hydro and FGJV, particularly the provision of temporary accommodation for workers that would not be sourced locally, some measures would be the responsibility of government.

7.7.10 Economic

The proposed segment factory would have a positive economic impact on the local economy during both its construction and operational phases. These benefits are significant and annually during the operational phase are likely to inject up to $147 M in direct and indirect output or business turnover, $46 M in annual direct and indirect value-added, and $21 M in annual direct and indirect household income. In addition, during the operational phase, the proposed segment factory will generate up to 252 direct and indirect jobs in the local economy.

Measures would be undertaken to maximise the economic benefits of the proposed segment factory by working with government and the local community.

7.8 Public interest

The proposed segment factory is critical to realise the potential benefits of Snowy 2.0, as it would produce segments that are required to line the tunnels being excavated for the project. Snowy 2.0 would provide an additional 2,000 MW of dispatchable generating capacity, and make approximately 350,000 MWh (about 175 hours at full power) of storage available to the NEM at any one time.

The development of Snowy 2.0 is consistent with Commonwealth and NSW strategic planning and policy objectives and would play a key role in helping NSW and the broader NEM achieve energy system reliability and security, with relatively low costs and emissions.

The proposed segment factory would also provide direct and indirect economic benefits to the local area during both the construction and operational phases. During construction it would generate $8 M in business turnover and 46 direct and indirect jobs. During operations it would generate $147 M in business turnover annually and 252 direct and indirect jobs.

In a broader context, the economic benefits of Snowy 2.0 are significant. The Economic Assessment of the Snowy 2.0 Main Works indicate that it will deliver substantial economic benefits to the local region, NSW and NEM states, with key drivers being the direct investment to establish the project, wage expenditure, reduced ongoing electricity fuel costs, and reduced electricity costs. The greatest effect will be experienced by the NSW/ACT economies with GSP expected to increase by $2,692 M. The aggregated beneficial effect across the remaining NEM participants is predicted to be an increase in GSP of $4,176 M. The local economies of Snowy Monaro Regional and Snowy Valleys LGAs will also benefit from Snowy 2.0 Main Works, increasing the average annual additional wage expenditure by $8 M.

Through the implementation of proposed mitigation, management and offsetting measures, this EIS demonstrates that the proposed segment factory could be undertaken without any significant impacts on the local environment. As such, the proposed segment factory is considered to be in the public interest and is recommended for approval by the NSW Minister for Planning and Public Spaces.

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ABBREVIATIONS

Abbreviations

ACHA	Aboriginal Cultural Heritage Assessment
AHCHAR	Aboriginal and Historic Cultural Heritage Assessment Report
ACM	Asbestos Containing Materials
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
AHD	Australian height datum
AHIMS	Aboriginal Heritage Management Information System
AQIA	Air Quality Impact Assessment
AS	Australian standards
AST	Aboveground storage tank
AWS	Automatic Weather Station
B	Billion
BBAM	BioBanking Assessment Method
BAM	Biodiversity assessment method
BC Act	*Biodiversity Conservation Act 2016*
BCF	Biodiversity Conservation Fund
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
BOS	Biodiversity Offset Scheme
CBP	Concrete batching plant
CCGT	Combined cycle gas turbine
CEEC	Critically endangered community
CMLEP	*Cooma-Monaro Local Environmental Plan 2013*
CoRTN	Calculation of Road Traffic Noise
CSSI	Critical State significant infrastructure
DA	Development application
DEE	Commonwealth Department of the Environment and Energy
DET	NSW Department of Education and Training
DIAA	Design integration and assessment approach
DIDO	Drive-in drive-out
DP	Deposited Plan
DPC	NSW Department of Premier and Cabinet

DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered ecology community
EIS	Environmental impact statement
EMM	EMM Consulting Pty Limited
EMP	Environmental management plan
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EP&A Regulation	*NSW Environmental Planning and Assessment Regulation 2000*
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPIs	Environmental planning instruments
EPL	Environment protection licence
ESC	Effective survey coverage
ESCPs	Erosion and Sediment Control Plans
FACs	NSW Family and Community Services
FGJV	Future Generation Joint Venture
FM Act	*Fisheries Management Act 1994*
FSL	Full supply level
FID	Final investment decision
GHG	Greenhouse gas
GL	Gigalitre
GSP	Gross state product
GWh	Gigawatt hour
ha	Hectares
HMA	Hazardous materials assessment
ICNG	Interim construction noise guideline
ISP	Integrated System Plan
km	Kilometre
KNP	Kosciuszko National Park
kVa	Kilo volt amps
L	Litre
L/day	Litres per day
L/hr	Litres per hour
LCVIA	Landscape Character and Visual Impact Assessment
LSA	Land and Soils Assessment
LSC	Land and soil capability

m	Metre
M	Million
MJA	Marsden Jacob Associates
MNES	Matters of National Environmental Significance
MOL	Minimum operating level
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NGAF	National Greenhouse Accounts Factors
NML	Noise management level
NO_2	Nitrogen dioxide
NPWS	NSW National Parks and Wildlife Service
NSW	New South Wales
NSWA	NSW Archaeology Pty Ltd
OCGT	Open cycle gas turbine
OVA	Other value-added
PCTs	Plant community types
PFAS	Poly fluoroalkyl substances
PHA	Preliminary Hazard Assessment
$PM_{2.5}$	Particulate matter smaller than 2.5 micrometres in diameter
PM_{10}	Particulate matter smaller than 10 micrometres in diameter
PNTLs	Project noise trigger levels
POEO Act	*Protection of the Environment Operations Act 1997*
RAPs	Registered Aboriginal Parties
RFS	NSW Rural Fire Service
RMS	NSW Roads and Maritime Services
SEARs	Secretary's environmental assessment requirements
SEPP	State Environmental Planning Policy
SEPP 33	*State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*
SEPP 55	*State Environmental Planning Policy No. 55 – Remediation of Land*
SHC Act	NSW *Snowy Hydro Corporatisation Act 1997*
SIA	Social Impact Assessment
SISD	Safe intersection sight distance
Snowy Scheme	Snowy Mountains Hydro-electric Scheme
Snowy Hydro	Snowy Hydro Limited

SMRC	Snowy Monaro Regional Council
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSI	State significant infrastructure
SVC	Snowy Valleys Council
t	Tonnes
TBM	Tunnel boring machine
TSP	Total suspended particulate matter
TTA	Traffic and Transport Assessment
UST	Underground storage tank
VENM	Virgin Excavated Natural Material
VRE	Variable renewable energy
WM Act	*Water Management Act 2000*
µm	micrometre

GLOSSARY

Glossary

Term	Definition
Asbestos	A naturally occurring mineral typically be found in rock, sediment or soil. It has strong fibres that are heat resistant and have effective insulating properties.
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development (OEH 2017)
Capital investment value	All costs necessary to establish and operate the project, including the design and construction of buildings, structures, associated infrastructure and fixed or mobile plant and equipment
Construction compound	A temporary site used for construction ancillary facilities and laydown
Construction footprint / disturbance area	The area subject to clearing and ground disturbance. The disturbance area is the extent of construction works required to build the proposed segment factory.
Construction phase	Demolition and removal of existing structures, and the construction of the proposed segment factory facilities
Contractor	Contractor engaged by Snowy Hydro Limited to construct Snowy 2.0
Decarbonised economy	An economy based on power sources with minimal greenhouse gas emissions
Decommissioning	At the completion of construction of Snowy 2.0, the proposed segment factory would be decommissioned, which would involve removal of all plant and equipment
Detailed design	The phase of the project where the design is refined into drawings, plans, specifications and estimates, suitable for construction
Earthworks	All works involving the loosening, excavating, placing, shaping and compacting of soil or rock
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit
Excavation	Removal of ground material to provide a level surface, establish the access roads and create the required trenches for drainage and services within the site
Exploratory Works	A program of exploratory works for Snowy 2.0, approved by the former NSW Minister for Planning on 7 February 2019 as a separate project application to DPIE (SSI 9208)
Feasibility Study	A preliminary study into the possibility of pumped hydro-electric expansion of the existing Snowy Scheme
FGJV	The Snowy 2.0 contractor - Future Generation Joint Venture
Firming capacity	Energy available within the network to respond to demand when other energy sources, such as intermittent renewables are not operating (due to low wind or low sunlight)
Full supply level	The normal maximum operating water level of a surface water storage when not affected by floods. This water level corresponds to 100% capacity
Hazardous material	Any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors
Hydro-electric	Generation of electricity using flowing water (typically from a reservoir held behind a dam or barrage) to drive a turbine which powers a generator
Minimum operating level	The lowest level to which a reservoir can be drawn down under normal operating conditions and is the lower limit of active storage
National Electricity Market (NEM)	The wholesale exchange of electricity operated by AEMO under the National Electricity Rules (NER). It is the wholesale market for the supply of electricity in all states of Australia except Western Australia and the Northern Territory.
Operational phase	When the proposed segment factory is manufacturing precast concrete segments for Snowy 2.0 Exploratory and Main Works
Polo Flat	The Polo Flat industrial area located to the east of the Cooma town centre
Power station	The 2,000MW underground pumped hydro-electric power station proposed for Snowy 2.0

Term	Definition
Precast concrete segments	Used to line the tunnels for Snowy 2.0 that would be excavated by tunnel boring machines
Project area	The area required to access and build project infrastructure
Residual impact	Those effects that remain following the application of mitigation measures to reduce adverse impacts from the project
Riparian	An area or zone within or along the banks of a stream or adjacent to a watercourse or wetland; relating to a riverbank and its environment, particularly to the vegetation.
Poly fluoroalkyl substances	A class of manufactured chemicals that have been used since the 1950s to make products that resist heat, stains, grease and water
Segment factory	A factory that would manufacture precast concrete segments exclusively to line the tunnels being excavated for Snowy 2.0, including the tunnels being excavated for Exploratory Works and Main Works
Snowy 2.0	A pumped hydro-electric expansion of the Snowy Scheme that will link the two existing reservoirs of Tantangara and Talbingo through underground tunnels, and include a new underground power station with pumping capabilities
Snowy 2.0 Transmission Connection Project	Project proposed by TransGrid to connect Snowy 2.0 with the existing high voltage transmission network subject to a separate application
Surface water	Water that flows over or is stored on the surface of the earth that includes: (a) water in a watercourse, lake or wetland and (b) any water flowing over or lying on land: (i) after having precipitated naturally or (ii) after having risen to the surface naturally from underground
Transmission	The conveyance of electric energy
Variable renewable generation	Intermittent renewable wind and solar energy sources that are non-dispatchable and fluctuating in nature

EMM
creating opportunities

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