LANDSCAPE AND VISUAL IMPACT ASSESSMENT







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Landscape Character and Visual Impact Assessment

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Contents

01	Introduction	1	13
	1.1	Preamble	13
	1.2	Project Location	15
	1.3	Proponent	16
	1.4	Purpose of this report	16
	1.5	Related projects	17
	1.6	Other relevant reports	17
02	Project Desc	ription	21
	2.1	Overview of the Snowy 2.0	21
	2.2	Construction of the Snowy 2.0	24
	2.3	Operation of Snowy 2.0	26
	2.4	Rehabilitation and final land use	27
	2.5	Design assumptions and input to LCVIA	28
	2.6	Construction Areas	32
	2.7	Visual Impact Assessment Summary	38
03	Assessment	Methodology	43
	3.1	Introduction	43
	3.2	Planning Context and Background Information	43
	3.3	Landscape character and visual impact assessment	44
04	Contextual A	Analysis	49
	4.1	Natural Landscape	49
	4.2	Cultural Landscape	51
	4.3	Landscape Character Summary	53
05	Landscape (Character Assessment	57
	5.1	Landscape Character Zones	57
	5.2	Landscape Character Impact Assessment	/1
	5.3	Landscape Unaracter Impact Summary	88
	5.4	Dynamic visual impact and community views	89
	5.5	other considerations	90
06	Visual Impac	t Assessment	93
	6.1	Overview	93
	6.2	Observer Locations	94
	6.3	Visual Impact Summary	132
07	Cumulative	mpact Assessment	137
	7.1	Transmission Connection Project	137
	7.2	Light Pollution	138
	7.3	Climate change	140
	7.4	Cumulative Impact Assessment Summary	141
80	Mitigation S	trategy	147
	8.1	Introduction	147
	8.2	Primary Mitigation Measures	147
	8.3	Secondary Mitigation Measures	147
	8.4	Standard Management Measures	148
09	Annexures		151
	9.1	Zone of Theoretical Visibility and Observer Locations	151

List of Figures

Figure 1.1	Regional Setting	13
Figure 2.1	Snowy 2.0 Project overview	22
Figure 2.2	Snowy 2.0 construction areas – Talbingo Reservoir	32
Figure 2.3	Snowy 2.0 construction areas – Lobs Hole	33
Figure 2.4	Snowy 2.0 construction areas – Marica	34
Figure 2.5	Snowy 2.0 construction areas – Gooandra Plateau	35
Figure 2.6	Snowy 2.0 construction areas – Tantangara Reservoir & Foreshore	36
Figure 2.7	Snowy 2.0 construction areas – Rock Forest	37
Figure 4.1	Aerial context	50
Figure 4.2	Landscape topography	52
Figure 5.1	Landscape Character Zones (LCZs)	57
Figure 5.2	LCZ 1 Location Map	73
Figure 5.3	LCZ 2 Location Map	76
Figure 5.4	LCZ 3 Location Map	79
Figure 5.5	LCZ 4 Location Map	81
Figure 5.6	LCZ 5 Location Map	83
Figure 5.7	LCZ 6 Location Map	85
Figure 5.8	LCZ 7 Location Map	87
Figure 5.9	#talbingo results via Instagram	89
Figure 5.10	#tantangara results via Instagram	89
Figure 6.1	Talbingo Observer Locations 1 of 3	94
Figure 6.2	Gooandra Observer Locations 2 of 3	95
Figure 6.3	Tantangara Observer Locations 3 of 3	96
Figure 7.1	Cumulative Impact Context Overview	136
Figure 7.2	Light pollution map of the KNP taken in 2017	139
Figure 7.3	Light pollution map of the KNP taken in 2018	139

4

List of Tables

Table 1.1	SEARs relevant to LCVIA	16
Table 2.1	Overview of the Snowy 2.0 Main Works	21
Table 2.2	Snowy 2.0 Construction Elements	24
Table 2.3	The Snowy 2.0 Main Works Permanent Operational Elements	28
Table 2.4	Snowy 2.0 Temporary Operational Elements	30
Table 2.5	The Snowy 2.0 Main Works Access Roads	31
Table 2.6	Visual Impact Assessment Summary	38
Table 3.1	Landscape Character and Visual Impact Grading Matrix	44
Table 5.1	Landscape Character Zone Sensitivity Summary	71
Table 6.1	Visual Impact of Snowy 2.0 Operation.	132
Table 6.2	Visual Impact of Snowy 2.0 Construction.	133
Table 7.1	Cumulative visual impact summary by LCZ	141
Table 7.2	Cumulative landscape character impact summary by Viewpoint	142

List of Plates

Plate 5-1	LCZ1 Talbingo Reservoir	58
Plate 5-2	LCZ1 Talbingo Reservoir	59
Plate 5-3	LCZ1 Talbingo Reservoir	59
Plate 5-4	LCZ2 Talbingo Rugged Woodland - showing 380km transmission easement	60
Plate 5-5	LCZ2 Talbingo Rugged Woodland	61
Plate 5-6	LCZ2 Talbingo Rugged Woodland	61
Plate 5-7	LCZ3 Lobs Hole	62
Plate 5-8	LCZ3 Lobs Hole	63
Plate 5-9	LCZ3 Lobs Hole	63
Plate 5-10	LCZ4 Gooandra Plateau	64
Plate 5-11	LCZ4 Gooandra Plateau	65
Plate 5-12	LCZ4 Gooandra Plateau	65
Plate 5-13	LCZ5 Tantangara Woodland	66
Plate 5-14	LCZ5 Tantangara Woodland	67
Plate 5-15	LCZ5 Tantangara Woodland	67
Plate 5-16	LCZ6 Tantangara Reservoir and Foreshore	68
Plate 5-17	LCZ6 Tantangara Reservoir and Foreshore	69
Plate 5-18	LCZ6 Tantangara Reservoir and Foreshore	69
Plate 5-19	LCZ7 Rock Forest	70
Plate 6-1	Viewpoint 1: LCZ 1	97
Plate 6-2	Viewpoint 2: LCZ 1	98
Plate 6-3	Viewpoint 3: Existing view from water, edge of public exclusion zone (indicative)	100
Plate 6-4	Viewpoint 3: During construction - Typical operating level	100
Plate 6-5	Viewpoint 3: During first year post-commission (Operation) - Full Supply Level	101
Plate 6-6	Viewpoint 3: 15 year operation - Typical operating level	101
Plate 6-7	Viewpoint 3: 15 year operation - 20% Minimum Operation Level (Rare occurrence)	102
Plate 6-8	Viewpoint 4: Existing view from Lobs Hole	104
Plate 6-9	Viewpoint 4: During construction - Typical operating level	104
Plate 6-10	Viewpoint 4: Commissioning - Full Supply Level	105
Plate 6-11	Viewpoint 4: 15 year operation - Typical operating level	105
Plate 6-12	Viewpoint 4: 15 year operation - 20% Minimum Operation Level (Rare occurrence)	106
Plate 6-13	Viewpoint 5: LCZ 2	107
Plate 6-14	Viewpoint 6: LCZ 2	108
Plate 6-15	Viewpoint 7: LCZ 3	109
Plate 6-16	Viewpoint 8: LCZ 2	110
Plate 6-17	Viewpoint 9: LCZ 5	111
Plate 6-18	Viewpoint 10: LCZ 5	112
Plate 6-19	Viewpoint 11: LCZ 5	113
Plate 6-20	Viewpoint 12: Existing view from water on edge of public exclusion zone (indicative)	115
Plate 6-21	Viewpoint 12: During construction - Typical operating level	115
Plate 6-22	Viewpoint 12: Commissioning - Full Supply Level	116
Plate 6-23	Viewpoint 12: 15 year operation - Typical operating level	116

List of Plates (Continued)

Plate 6-24	Viewpoint 12: 15 year operation - 20% Minimum Operation Level (Rare occurrence)	117
Plate 6-25	Viewpoint 13: Existing view from road to boat ramp	119
Plate 6-26	Viewpoint 13: During construction - Typical operating level	119
Plate 6-27	Viewpoint 13: Commissioning - Full Supply Level	120
Plate 6-28	Viewpoint 13: 15 year operation - Typical operating level	120
Plate 6-29	Viewpoint 13: 15 year operation - 20% Minimum Operation Level (Rare occurrence)	121
Plate 6-30	Viewpoint 14: LCZ 5	122
Plate 6-31	Viewpoint 15: Existing view from Pockets Saddle Road	124
Plate 6-32	Viewpoint 15: During construction - Typical operating level	124
Plate 6-33	Viewpoint 15: Commissioning - Full Supply Level	125
Plate 6-34	Viewpoint 15: 15 year operation - Typical operating level	125
Plate 6-35	Viewpoint 15: 15 year operation - 20% Minimum Operation Level (Rare occurrence)	126
Plate 6-36	Viewpoint 16: Existing view	128
Plate 6-37	Viewpoint 16: During construction - Typical operating level	128
Plate 6-38	Viewpoint 16: Commissioning - Full Supply Level	129
Plate 6-39	Viewpoint 16: 15 year operation - Typical operating level	129
Plate 6-40	Viewpoint 16: 15 year operation - 20% Minimum Operation Level (Rare occurrence)	130
Plate 6-41	Viewpoint 17: LCZ 5	131
Plate 9-1	101 - Talbingo Intake: ZTV	151
Plate 9-2	102 - Talbingo Control Building: ZTV	152
Plate 9-3	103 - Talbingo Barge Ramps: ZTV	152
Plate 9-4	104 - Lobs Hole Substation: ZTV	153
Plate 9-5	105 - ECVT Portal and Cable Yard: ZTV	153
Plate 9-6	106 - MAT Portal: ZTV	154
Plate 9-7	107 - Marica Ventillation Shaft: ZTV	154
Plate 9-8	108 - Upstream Surge Shaft: ZTV	155
Plate 9-9	109 - Tantangara Intake: ZTV	155
Plate 9-10	110 - Tantangara Control Building: ZTV	156
Plate 9-11	111 - Tantangara Shoreline Excavated rock placement: ZTV	156
Plate 9-12	112 - Talbingo Shoreline Ravine Bay placement area: ZTV	157
Plate 9-13	ZTV Existing Transmission Line 01	157
Plate 9-15	ZTV Existing Transmission Line 02	158
Plate 9-14	ZTV Existing Transmission Line 03	158
Plate 9-16	ZTV Proposed Transgrid Transmission Line	159

List of Abbreviations

CSSI	Critical State Significant Infrastructure
DPIE	Department of Planning, Industry and Environment
DSM	Digital Surface Model
DTM	Digital Terrain Model
ECVT	Emergency egress, communication, and ventilation tunnel
EIS	Environmental Impact Statement
FGJV	Future Generation Joint Venture
FSL	Full Supply Level
GLVIA	Guidelines for Landscape & Visual Impact Assessment
KNP	Kosciuszko National Park
LCVIA	Landscape Character Visual Impact Assessment
LCZ	Landscape Character Zones
LLOS	Linear Line of Sight Analysis
MAT	Main Access Tunnel
MOF	Materials Offloading Facility
MOL	Minimum Operating Level
NEM	National Electricity Market
NPWS	National Parks and Wildlife Service
RLOS	Radial line of Sight Analysis
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SHL	Snowy Hydro Limited
ТВМ	Tunnel Boring Machine
ZTV	Zone of Theoretical Visibility

Glossary

EIA	Environmental Impact Assessment		
EIS	Environmental Impact Statement		
Full Supply Level (FSL)	The normal maximum operating water level of a water storage when not affected by floods.		
Guidelines for Landscape & Visual Impact Assessment (GLVIA)	Guideline outlining the process of assessing the landscape and visual effects of developments and their significance		
Impact	The effect of a proposal, which can be adverse or beneficial, when measured against an existing condition.		
Impact Assessment	Broadly, the process of describing and characterising the expected effects of a proposal. In the context of an EIS or REF, impact assessment will also lead to the identification of mitigation measures and safeguards which would be addressed if the proposal were approved.		
Landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure.		
Landscape Architecture	A profession involved with the assessment, design and management of the built and natural environment.		
Landscape Character	The combined quality of built, natural and cultural aspects which make up an area and provide character its unique sense of place.		
Landscape Character Zones (LCZ)	An area of landscape with similar properties or strongly defined spatial qualities, distinct from character zone areas immediately nearby.		
Landscape Character Type	Multiple similar landscape character zones repeated within a larger study area, grouped to avoid repetition in their description.		
Magnitude	The measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer. Combined with sensitivity, magnitude provides a measurement of impact.		
Minimum Operating Level (MOL)	The lowest level to which the reservoir is drawn down under normal operating conditions.		
Secretary's Environmental Assessment Requirements (SEARs)	The environmental assessment requirements of the Secretary of the Department of Planning and Environment for State Significant Infrastructure projects. The SEARs for Roads and Maritime projects will normally include specific requirements for landscape character impact and visual impact.		
Sensitivity	The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.		
Significant	In the context of EIA, after analysing the extent (type, size, scope, intensity and duration) and nature (predictability, resilience of the environment, reversibility, ability to manage/mitigate, level of public interest) of a proposal, an expected level of impact of a proposal which requires an EIS to be undertaken. The term should be avoided in landscape character and visual impact assessments if the expected level of impact is below this threshold.		
Urban Design	Urban design in Roads and Maritime is the process and product of designing projects so they: fit sensitively with the built natural and community environment; contribute to the functioning of the community; and contribute to the quality of the public domain for the community and road users. Architects, engineers, environmental experts, landscape architects, planners and urban designers are all involved in urban design. Urban designers are generally landscape architects and architects who have extended their expertise into the field of urban design.		
View	The sight or prospect of a landscape or scene.		
Visibility	The state or fact of being visible or seen.		
Visual Impact	The impact on the views from residences, workplaces and public places.		
Zone of Theoretical Visibility (ZTV)	The area within which a project can be seen at eye level above ground. Its extent will usually be defined by a combination of landform, vegetation and built elements.		

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Introduction

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Introduction

1.1 Preamble

The following 'Landscape Character and Visual Impact Assessment' (LCVIA) has been prepared by Spackman Mossop Michaels (SMM). It forms part of the EIS prepared by EMM Consulting (EMM) for Snowy 2.0 Main Works. The LCVIA assesses and documents the potential landscape character and visual impacts of Snowy 2.0 Main Works, based on designs and construction methods developed by Future Generation Joint Venture (FutureGen), the contractor appointed by Snowy Hydro Limited (Snowy Hydro) for the detailed design and construction of the project. The assessment is therefore based on a conceptual design that is subject to refinement during future design stages.

Snowy Hydro proposes to develop Snowy 2.0, a largescale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). Snowy 2.0 is the largest committed renewable energy project in Australia and is critical to underpinning system security and reliability as Australia transitions to a decarbonised economy. Snowy 2.0 will link the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and a new hydro-electric power station will be built underground. Refer Figure 1.1.

Snowy 2.0 has been declared to be State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) by the former NSW Minister for Planning under Part 5 of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) and is defined as CSSI in clause 9 of Schedule 5 of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). CSSI is infrastructure that is deemed by the NSW Minister to be essential for the State for economic, environmental or social reasons. An application for CSSI must be accompanied by an environmental impact statement (EIS).



Figure 1.1 Regional Setting

Source: EMM FINAL

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Separate applications are being submitted by Snowy Hydro for different stages of Snowy 2.0 under Part 5, Division 5.2 of the EP&A Act. This includes the preceding first stage of Snowy 2.0, Exploratory Works for Snowy 2.0 (the Exploratory Works) and the stage subject of this current application, Snowy 2.0 Main Works (the Main Works). In addition, an application under Part 5, Division 5.2 of the EP&A Act is also being submitted by Snowy Hydro for a segment factory that will make tunnel segments for both the Exploratory Works and Main Works stages of Snowy 2.0.

The first stage of Snowy 2.0, the Exploratory Works, 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).

This landscape character and visual impact assessment (LCVIA) has been prepared to accompany an application and supporting EIS for the Snowy 2.0 Main Works. As the title suggests, this stage of the project 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 excavated rock material and establishing supporting infrastructure (such as road upgrades and extensions, water and sewage treatment infrastructure, and the provision of construction power). Snowy 2.0

Snowy 2.0 Main Works is shown in Figure 2.1. If approved, the Snowy 2.0 Main Works would commence before completion of Exploratory Works.

The Snowy 2.0 Main Works do not include the transmission works proposed by TransGrid (TransGrid 2018) that provide connection between the cableyard and the NEM. These transmission works will provide the ability for Snowy 2.0 (and other generators) to efficiently

and reliably transmit additional renewable energy to major load centres during periods of peak demand, as well as enable a supply of renewable energy to pump water from Talbingo Reservoir to Tantangara Reservoir during periods of low demand. While the upgrade works to the wider transmission network and connection between the cableyard and the network form part of the CSSI declaration for Snowy 2.0 and Transmission Project, they do not form part of this application and will be subject to separate application and approval processes, managed by TransGrid. This project is known as the HumeLink and is part of AEMO's Integrated System Plan.

With respect to the provisions of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), on 30 October 2018 Snowy Hydro referred the Snowy 2.0 Main Works to the Commonwealth Department of the Environment and Energy (DoEE) and, on a precautionary basis, nominated that Snowy 2.0 Main Works has potential to have a significant impact on MNES and the environment generally.

On 5 December 2018, Snowy 2.0 Main Works were deemed a controlled action by the Assistant Secretary of the DoEE. It was also determined that potential impacts of the project will be assessed by accredited assessment under Part 5, Division 5.2 of the EP&A Act. This accredited process will enable the NSW Department of Planning, Industry and Environment (DPIE) to manage the assessment of Snowy 2.0 Main Works, including the issuing of the assessment requirements for the EIS. Once the assessment has been completed, the Commonwealth Minister for the Environment will make a determination under the EPBC Act.

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1.2 Project Location

Snowy 2.0 Main Works are within the Australian Alps, in southern NSW, about mid-way between Canberra and Albury. Snowy 2.0 Main Works is within both the Snowy Valleys and Snowy Monaro Regional local government areas (LGAs).

The nearest large towns to Snowy 2.0 Main Works are Cooma and Tumut. Cooma is located about 50 kilometres (km) south east of the project area (or 70 km by road from Providence Portal at the southern edge of the project area), and Tumut is located about 35 km north west of the project areas (or 45 km by road from Tumut 3 power station at the northern edge of the project area). Other townships near the project area include Talbingo, Cabramurra, Adaminaby and Tumbarumba. Talbingo and Cabramurra were built for the original Snowy Scheme workers and their families, while Adaminaby was relocated in 1957 to make way for the establishment of Lake Eucumbene.

The location of Snowy 2.0 Main Works with respect to the region is shown in Figure 1.1.

The pumped hydro-electric scheme elements of Snowy 2.0 Main Works are mostly underground between the southern ends of Tantangara and Talbingo reservoirs, a straight-line distance of 27 km. Surface works will also occur at locations on and between the two reservoirs. Key locations for surface works include:

- Tantangara Reservoir at a full supply level (FSL) of about 1,229 metres (m) to Australian Height Datum (AHD), Tantangara Reservoir will be the upper reservoir for Snowy 2.0 and include the headrace tunnel and intake structure. The site will also be used for a temporary construction compound, accommodation camp and other temporary ancillary activities,
- Marica this site will be used primarily for construction including construction of vertical shafts to the underground power station (ventilation shaft) and headrace tunnel (surge shaft), and a temporary accommodation camp,
- Lobs Hole the site will be used primarily for construction but will also become the main entrance to the power station during operation.
 Lobs Hole will provide access to the Exploratory Works tunnel, which will be refitted to become the main access tunnel (MAT), as well as the location of the emergency egress, cable and ventilation tunnel (ECVT), portal, associated services and accommodation camp, and
- Talbingo Reservoir at a FSL of about 546 m AHD, Talbingo Reservoir will be the lower reservoir for Snowy 2.0 and will include the tailrace tunnel and water intake structure. The site will also be used for temporary construction compounds and other temporary ancillary activities.

Works will also be required within the two reservoirs for the placement of excavated rock and surplus cut material. Supporting infrastructure will include establishing or upgrading access tracks and roads and electricity connections to construction sites. Most of the proposed pumped hydro-electric and temporary construction elements and most of the supporting infrastructure for Snowy 2.0 Main Works are located within the boundaries of KNP, although the disturbance footprint for the project during construction is less than 0.25% of the total KNP area. Some of the supporting infrastructure and construction sites and activities (including sections of road upgrade, power and communications infrastructure) extends beyond the national park boundaries. These sections of infrastructure are primarily located to the east and south of Tantangara Reservoir. One temporary construction site is located beyond the national park along the Snowy Mountains Highway about 3 km east of Providence Portal (referred to as Rock Forest).

The project is described in more detail in Section 2.

1.2.1 Project area

The project area for Snowy 2.0 Main Works has been identified and includes all the elements of the project, including all construction and operational elements. The project area is shown on Figure 2.1. Key features of the project area are:

- the water bodies of Tantangara and Talbingo reservoirs, covering areas of 19.4 square kilometres (km2) and 21.2 km2 respectively. The reservoirs provide the water to be utilised in Snowy 2.0
- major watercourses including the Yarrangobilly, Eucumbene and Murrumbidgee rivers and some of their tributaries,
- KNP, within which the majority of the project area is located. Within the project area, KNP is characterised by two key zones: upper slopes and inverted treelines in the west of the project area (referred to as the 'ravine') and associated subalpine treeless flats and valleys in the east of the project area (referred to as the 'plateau'), and
- farm land southeast of KNP at Rock Forest.

The project area is interspersed with built infrastructure including recreational sites and facilities, main roads as well as unsealed access tracks, hiking trails, farm land, electricity infrastructure, and infrastructure associated with the Snowy Scheme.

1.2.2 Study area

The study area for Snowy 2.0 Main Works has been identified and includes the project area and seven landscape typologies or Landscape Character Zones (LCZ). The LCZ's extend beyond the project area and reflect differentiation in terms of vegetation and landform.

The seven LCZs identified for the Snowy 2.0 Main Works are:

- LCZ 1 Talbingo Reservoir
- LCZ 2 Talbingo Rugged Woodland
- LCZ 3 Lobs Hole
- LCZ 4 Gooandra Plateau
- LCZ 5 Tantangara Woodland
- LCZ 6 Tantangara Reservoir and Foreshore
- LCZ 7 Rock Forest

1.3 Proponent

Snowy Hydro is the proponent for the Snowy 2.0 Main Works. 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.

1.4 Purpose of this report

This LCVIA supports the EIS for the Snowy 2.0 Main Works. It documents the potential landscape character and visual impacts of Snowy 2.0 Main Works, based on designs and construction methods developed by FGJV, and operational requirements specified by Snowy Hydro.

The scope of assessment included in this LCVIA covers the Snowy 2.0 project area outlined in Figure 1.1 on the previous page and assesses the following:

- The existing natural landscape including landform, geology, water and vegetation,
- The existing cultural landscape including heritage values, land uses, infrastructure and recreation,
- The landscape character and character zones,
- · The sensitivity of the setting,

- The magnitude of change as a result of the proposed elements,
- The visual catchment of all proposed surface elements via radial line of sight analysis (RLOS),
- The observational visibility of surface elements via linear line of sight analysis (LLOS) and
- The visual impact of all proposed surface elements.

The scope of assessment would also discuss:

- The cumulative landscape character impact,
- The cumulative visual impact, and
- Measures to mitigate visual impacts of proposed elements.

1.4.1 Assessment guidelines and requirements

As Snowy 2.0 has been declared CSSI, the NSW Department of Planning, Industry and Environment (DPIE) has issued Secretary's Environmental Assessment Requirements (SEARs) that are to be addressed by the EIS for Snowy 2.0 Main Works. The SEARs were issued on 31st July 2019. The SEARs relevant to this LCVIA are provided in Table 1.1. below.

Relevant SEAR's	Reference in this report
An assessment of the visual impacts of the project, including lighting impacts and potential impacts on views of the project from key vantage points in the	Section 05: Visual Impact Assessment
Kosciuszko National Park	Section 07: Cumulative Visual Impact Assessment
An assessment of the predicted impacts of the project, including any cumulative impacts	Section 07: Cumulative Impact Assessment
A strategy to offset the impacts of the project on users of the Kosciuszko National Park	Section 08: Mitigation Strategies
A strategy to manage the progressive rehabilitation of the land disturbed by the project and enhance any new landforms created.	Section 08: Mitigation Strategies

Table 1.1SEARs relevant to LCVIA

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1.5 Related projects

There are three other projects related to Snowy 2.0 Main Works, they are:

- Snowy 2.0 Exploratory Works (SSI-9208) a Snowy Hydro project with Minister's approval;
- Snowy 2.0 Transmission Connect Project (SSI-9717) a project proposed by TransGrid; and
- Snowy 2.0 Segment Factory (SSI-10034) a project proposed by Snowy Hydro.

While these projects form part of the CSSI declaration for Snowy 2.0 and Transmission Project, they do not form part of Snowy Hydro's application for Snowy 2.0 Main Works. These related projects are subject to separate application and approval processes. Staged submission and separate approval is appropriate for a project of this magnitude, due to its complexity and funding and procurement processes. However, cumulative impacts have been considered in this report where relevant.

1.6 Other relevant reports

This LCVIA has been prepared with reference to other technical reports that were prepared as part of the Snowy 2.0 Main Works EIS. The other relevant reports reviewed in preparing this LCVIA are listed below

- Snowy 2.0 Main Works Scoping Report (EMM 2019)
- Snowy 2.0 EIS Community Survey Results 2017 and 2019 (Snowy Hydro)
- Snowy 2.0 Exploratory Works Recreational User Impacts Assessment (TRC Tourism 2018) and Snowy 2.0 Main Works Recreational User Impacts Assessment (TRC Tourism 2019)
- Snowy 2.0 Main Works Historic Heritage report (NSW Archaeology 2019)
- Snowy 2.0 Geodiversity studies (Percival 2019 and Troedson 2019)
- Snowy 2.0 Social Impact Assessment (Elton Consulting 2019)
- Snowy 2.0 Rehabilitation Strategy (SLR 2019)

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Project Description

Section 02

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 $\mathbf{02}$

Project Description

This chapter provides a summary of the Snowy 2.0 Main Works project. It outlines the functional infrastructure required to operate Snowy 2.0, as well as the key construction elements and activities required to build it. A more comprehensive detailed description of the project is provided in Chapter 2 (Project description) of the EIS, which has been relied upon for the basis of this technical assessment.

2.1 Overview of the Snowy 2.0

Snowy 2.0 will link the existing Tantangara and Talbingo Reservoirs within the present Snowy Scheme through a series of new underground tunnels and a hydro electric power station, to be constructed within a cavern. Most of the project's facilities would be underground. An overview of Snowy 2.0 is shown on Figure 2.1, and the key project elements of Snowy 2.0 are summarised in Table 2.1.

Project element	Summary of the project			
Project area	The project area is the broader region within which Snowy 2.0 will be built and operated, and the extent within which direct impacts from Snowy 2.0 Main Works are anticipated.			
Permanent infrastructure	• Snowy 2.0 infrastructure to be built and operated for the life of the assets include the:			
	 intake and gate structures and surface buildings at Tantangara and Talbingo reservoirs, 			
	 power waterway tunnels primarily comprising the headrace tunnel, headrace surge structure, inclined pressure tunnel, pressure pipelines, tailrace surge tank and tailrace tunnel, 			
	 underground power station complex comprising the machine hall, transformer hall, ventilation shaft and minor connecting tunnels, 			
	 access tunnels (and tunnel portals) to the underground power station comprising the main access tunnel (MAT) and emergency egress, communication, and ventilation tunnel (ECVT), 			
	 establishment of a portal building and helipad at the MAT portal, 			
	 communication, water and power supply including the continued use of the Lobs Hole substation, 			
	 cable yard adjacent to the ECVT portal to facilitate the connection of Snowy 2.0 to the NEM, and 			
	 access roads and permanent bridge structures and barge launch ramps needed for the operation and maintenance of Snowy 2.0 infrastructure, and 			
	• fish control structures on Tantangara Creek and near Tantangara Reservoir wall.			
Temporary infrastructure	 Temporary infrastructure required during the construction phase of Snowy 2.0 Main Works are: 			
	construction compounds, laydown, ancillary facilities and helipads,			
	 accommodation camps for construction workforce, 			
	 construction portals and adits to facilitate tunnelling activities, 			
	 barge launch ramps, 			
	 water and wastewater management infrastructure (treatment plants and pipelines), 			
	 communication and power supply, and 			
	 temporary access roads. 			



Figure 2.1 Snowy 2.0 Project overview

22

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Disturbance area	The disturbance area is the extent of construction works required to build Snowy 2.0. The maximum disturbance area is about 1,680 hectares (ha), less than 0.25% of the total area of KNP. Parts of the disturbance area will be rehabilitated and landformed and other parts will be retained permanently for operation (operational footprint).	
Operational footprint	The operational footprint is the area required for permanent infrastructure to operate Snowy 2.0. The maximum operational footprint is about 99 ha. This is 0.01% of the total area of KNP.	
Tunnelling and excavation method	The primary tunnelling method for the power waterway is by tunnel boring machine (TBM), with portals and adits using drill and blast methods. Excavation for other underground caverns, chambers and shafts will be via combinations of drill and blast, blind sink, and/or raise bore techniques.	
Excavated rock management	Excavated rock will be generated as a result of tunnelling activities and earthworks. The material produced through these activities will be stockpiled and either reused by the contractor (or NPWS), placed permanently within Tantangara or Talbingo reservoirs, used in final land forming and rehabilitation of construction pads in Lobs Hole, or transported offsite.	
Construction water and wastewater management	Water supply for construction will be from the two existing reservoirs (Talbingo and Tantangara) and reticulated via buried pipelines (along access roads). Raw water will be treated as necessary wherever potable water is required (eg at accommodation camps). Water to be discharged (comprising process water, wastewater and stormwater) will be treated before discharge to the two existing reservoirs (Talbingo and Tantangara) as follows:	
	 treated process water will be reused onsite where possible to reduce the amount of discharge to reservoirs, however excess treated water will be discharged to the reservoirs, 	
	 collected sewage will be treated at sewage treatment plants to meet the specified discharge limits before discharge and/or disposal, and 	
	 stormwater will be captured and reused as much as possible. 	
Rehabilitation	Rehabilitation of areas disturbed during construction including reshaping to natural appearing landforms or returning to pre-disturbance condition, as agreed with NPWS and determined by the rehabilitation strategy. This includes construction areas at Lobs Hole which comprise surplus cut materials that are required for the construction. Areas to be used by Snowy Hydro in the long- term may be re-shaped and rehabilitated to maintain access and operational capabilities (eg intakes and portal entrances).	
Construction workforce	The construction workforce for the project is expected to peak at around 2,000 personnel.	
Operational life	The operational life of the project is estimated to be 100 years.	
Operational workforce	The operational workforce is expected to be 8-16 staff, with fluctuations of additional workforce required during major maintenance activities.	
Hours of operation	Construction of Snowy 2.0 will be 24/7 and 365 days per year. Operation of Snowy 2.0 will be 24/7 and 365 days per year.	
Capital investment value	Estimated to be \$4.6 billion.	

Table 2.1. Overview of the Snowy 2.0 Main Works (Continued)

2.2 Construction of the Snowy 2.0

A number of construction activities will be carried out concurrently, and across a number of different sites. Specific details on these activities as well as an indicative schedule of construction activities is provided in Chapter 2 (Project description) of the EIS. This section summarises the key construction elements of the project. Table 2.2 provides an overview of the construction elements, their purpose and location within the project area.

Construction Element	Purpose	Location
Construction sites	Due to the remoteness of Snowy 2.0, construction sites are generally needed to:	Each construction site needed for Snowy 2.0 is shown on Figures 2.2
	 Provide ancillary facilities such as concrete batching plants, mixing plants and on-site manufacturing, 	to Figure 2.7.
	 Store machinery, equipment and materials to be used in construction, 	
	• Provide access to underground construction sites, and	
	 Provide onsite accommodation for the construction workforce. 	
Substations and power connection	One substation is required to provide permanent power to Snowy 2.0, at Lobs Hole. This substation is proposed as part of a modification to the Exploratory Works with a capacity of 80 mega volt amp (MVA). It will continue to be used for Main Works, however requires the establishment of further power supply cables to provide power to the work sites and TBM at Tantangara, as well as Talbingo, in particular to power the TBMs via the MAT, ECVT, Talbingo and Tantangara portals.	The supporting high voltage cable route mostly follows access roads to each of the work sites, using a combination of aerial and buried arrangements.
Communications system	Communications infrastructure will connect infrastructure at Tantangara and Talbingo reservoirs to the existing communications system at the Tumut 3 power station (via the submarine communications cable in Talbingo Reservoir established during Exploratory Works) and to Snowy Hydro's existing communications infrastructure at Cabramurra.	The cable will be trenched and buried in conduits within access roads. Crossing of watercourses and other environmentally sensitive areas will be carried out in a manner that minimises environmental impacts where possible, such as bridging or underboring.

 Table 2.2
 Snowy 2.0 Construction Elements

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Water and waste water servicing	 Drinking water will be provided via water treatment plants located at accommodation camps. Water for treatment will be sourced from the nearest reservoir. There are three main wastewater streams that require some form of treatment before discharging to the environment, including: Tunnel seepage and construction wastewater (process water), Domestic sewer (wastewater), and Construction site stormwater (stormwater). 	Utility pipelines generally follow access roads. Water treatment plants (drinking water) will be needed for the accommodation camps and will be located in proximity. Waste water treatment plants will similarly be located near accommodation camps. Process water treatment plants will be at construction compounds and adits where needed to manage tunnel seepage and water during construction.
Temporary and permanent access roads	 Access road works are required to: provide for the transport of excavated material between the tunnel portals and the excavated rock emplacement areas, accommodate the transport of oversized loads as required, and facilitate the safe movement of plant, equipment, materials and construction workers into and out of construction sites. The access road upgrades and establishment requirements are shown on Figure 2.2 to Figure 2.6. These roads will be used throughout construction including use of deliveries to and from site and the external road network. Some additional temporary roads will also be required within the footprint to reach excavation fronts such as various elevations of the intakes excavation or higher benches along the permanent roads. 	The access road upgrades and establishment requirements are shown across the project area. Main access and haulage to site will be via Snowy Mountains Highway, Link Road and Lobs Hole Ravine Road (for access to Lobs Hole), and via Snowy Mountains Highway and Tantangara Road (for access to Tantangara Reservoir) (see Figure 2.1).
Excavated rock management	Approximately 9 million m3 (unbulked) of excavated material will be generated by construction and require management. The strategy for management of excavated rock will aim to maximise beneficial reuse of materials for construction activities. Beneficial re-use of excavated material may include use for road base, construction pad establishment, selected fill and tunnel backfill and rock armour as part of site establishment for construction. Excess excavated material that cannot be re-used during construction will be disposed of within Talbingo and Tantangara reservoirs, used in permanent rehabilitation of construction pads to be left in situ in Lobs Hole, or transported for on-land disposal if required.	Placement areas are shown on Figure 2.2 and Figure 2.7.

Table 2.2 The Snowy 2.0 Main Works Construction Elements (Continued)

Barge launch facilities	Barge launch facilities on Talbingo Reservoir will have already been established during Exploratory Works for the placement of the submarine communications cable, and will continued to be used for Main Works for construction works associated with the Talbingo intake structure. The Main Works will require the establishment of barge launch facilities on Tantangara Reservoir to enable these similar works (removal of the intake plug).	Barge launch sites are shown on Figure 2.2 and Figure 2.7.
Construction workforce	The construction workforce will be accommodated entirely on site, typically with a FIFO/DIDO roster. Private vehicles will generally not be permitted and the workforce bused to and from site.	Access to site will be via Snowy Mountains Highway

2.2.1 Construction Areas

The key areas of construction are shown on Figure 2.2 to Figure 2.7 and can be described across the following locations:

- Talbingo Reservoir Talbingo Reservoir provides the lower reservoir for the pumped hydro-electric project and will include the tailrace tunnel and water intake structure. The site will also be used for temporary construction compounds and other temporary ancillary activities,
- Lobs Hole this site will be used primarily for construction (including construction of the MAT and ECVT portals and tunnels to the underground power station and the headrace tunnel (and headrace tunnel surge shaft), underground tailrace surge shaft and a temporary accommodation camp),
- Marica the site will be used primarily for construction to excavate the ventilation shaft to the underground power station as well as for the excavation and construction of the headrace surge shaft,
- Plateau the land area between Snowy Mountains Highway and Tantangara Reservoir is referred to as the Plateau. The Plateau will be used to access and construct a utility corridor and construct a fish weir on Tantangara Creek,
- Tantangara Reservoir Tantangara Reservoir will be the upper reservoir for the pumped hydro project and include the headrace tunnel and intake structure. The site will also be used for a temporary construction compound, accommodation camp and other temporary ancillary activities, and
- Rock Forest a site to be used temporarily for logistics and staging during construction. It is located beyond the KNP along the Snowy Mountains Highway about 3 km east of Providence Portal.

During the construction phase, all work sites will be restricted access and closed to the public. This includes existing road access to Lobs Hole via Lobs Hole Ravine Road. Restrictions to water-based access and activities will also be implemented for public safety and to allow safe construction of the intakes within the reservoirs. Access to Tantangara Reservoir via Tantangara Road will be strictly subject to compliance with the safety requirements established by the contractor.

A key construction element for the project is the excavation and tunnelling for underground infrastructure including the power station, power waterway (headrace and tailrace tunnels) and associated shafts. The primary methods of excavation are shown in Figure 2.1 with further detail on construction methods provided at Appendix D of the EIS.

2.3 Operation of Snowy 2.0

2.3.1 Scheme operation and reservoir management

Snowy 2.0 would operate within the northern Snowy-Tumut Development, connecting the existing Tantangara and Talbingo reservoirs.

Tantangara Reservoir currently has the following operational functions within the Snowy Scheme:

- collects releases from the Murrumbidgee River and the Goodradigbee River Aqueduct,
- provides a means for storage and diversion of water to Lake Eucumbene via the Murrumbidgee-Eucumbene Tunnel, and
- provides environmental releases through the Tantangara Reservoir river outlet gates to the Murrumbidgee River.

Talbingo Reservoir currently has the following operational functions:

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- collects releases from Tumut 2 power station,
- collects releases from the Yarrangobilly and Tumut rivers,
- acts as head storage for water pumped up from Jounama Pondage, and
- acts as head storage for generation at Tumut 3 power station.

Due to its historic relationship to both the upstream Tumut 2 power station and downstream Tumut 3 power station, Talbingo Reservoir has had more operational functions than Tantangara Reservoir in the current Snowy Scheme.

Following the commencement of the operation of Snowy 2.0, both Tantangara and Talbingo reservoirs will have increased operational functions. Tantangara Reservoir will have the additional operational functions of acting as a head storage for generation from the Snowy 2.0 power station and also acting as a storage for water pumped up from Talbingo Reservoir. Talbingo Reservoir will have the additional operational function of acting as a tail storage from Snowy 2.0 generation.

As a result of the operation of Snowy 2.0, the water level in Tantangara Reservoir will be more variable than historically. Notwithstanding this, operations will not affect release obligations under the Snowy Water Licence nor will it involve any change to the currently imposed Full Supply Levels (FSLs). No additional land will be affected by virtue of the inundation of the reservoirs through Snowy 2.0 operations. Water storages will continue to be held wholly within the footprint of the existing FSLs.

2.3.2 Permanent access

Permanent access to Snowy 2.0 infrastructure is required. During operation, a number of service roads established during construction will be used to access surface infrastructure including the power station's ventilation shaft, water intake structures and gates, and the headrace tunnel surge shaft. Permanent access tunnels (the MAT and ECVT) will be used to enter and exit the power station. For some roads, permanent access by Snowy Hydro will require restricted public access arrangements.

2.3.3 Maintenance requirements

Maintenance activities required for Snowy 2.0 will be integrated with the maintenance of the existing Snowy Scheme. Maintenance activities that will be required include:

- maintenance of equipment and systems within the power station complex, intake structures, gates and control buildings;
- maintenance of access roads (vegetation clearing, pavement works, snow clearing);
- dewatering of the tailrace and headrace tunnel (estimated at once every 15 to 50 years, or as required); and
- maintenance of electricity infrastructure (cables, cable yard, cable tunnel).

2.4 Rehabilitation and final land use

A Rehabilitation Strategy has been prepared for Snowy 2.0 Main Works and appended to the EIS.

It is proposed that all areas not retained for permanent infrastructure will be revegetated and rehabilitated. At Lobs Hole, final landform design and planning has been undertaken to identify opportunities for the reuse of excavated material in rehabilitation to provide landforms which complement the surrounding topography in the KNP.

Given that most of Snowy 2.0 Main Works is within the boundaries of the KNP, Snowy Hydro will liaise closely with NPWS to determine the extent of decommissioning of temporary construction facilities and rehabilitation activities to be undertaken following the construction of Snowy 2.0 Main Works.

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2.5 Design assumptions and input to LCVIA

As previously stated, Snowy Hydro has appointed a contractor (FutureGen) for the design and construction of Snowy 2.0. The EIS and this LCVIA is based on the design provided by FutureGen, noting that a concurrent detailed design process is underway. While project components are generally fixed, there may be some refinements to the physical layout or design of certain components of the project following further investigation and design.

The following tables provide an overview of the key assumptions made for the purpose of this assessment, noting that some flexibility is required by the contractor to respond to outcomes of further investigation and design.

No.	Element	Height	Approximate Footprint	Access	Surface Treatment/Description
101	Talbingo Intake	100m	52,000sqm	Middle Bay Road. No public access. Water Access restricted, exact extent is unknown but will be determined to meet safety requirements	A natural rock surface has been proposed below the full supply level to ensure the landform is visually compatible with the existing lake edge. A vegetated trafficable surface has been proposed on the intake platform to allow maintenance access and the establishment of grass seeding to reduce visual impact. The Talbingo Intake Cut would be around 100m tall, but a portion of that would be underwater at any given time. The intake structure itself would be around 20-30m tall and fully submerged at all times. Exposed natural rock with local cut slope stabilisation treatment extends to the top of the cut.
102	Talbingo Control Building	4m	500sqm	Middle Bay Road. No public access	Hammered concrete, Glass, Powdercoated steel. Black perimeter fencing with barbed wire
103	Talbingo Barge Ramps	15m	15,000sqm	Middle Bay Road. No public access. Water Access restricted to approx 1km north of Intake	Precast Concrete Piers and planks. From the top of the barge ramp to the MOL would be around 15m.
104	Lobs Hole Substation	40m	10,000sqm	Lobs Hole Ravine Road. Public Access	Gas Insulated Switchgear (GIS) building approx 12m height (40m stack). Building includes: switchrooms, communications and SCADA room, battery room, staff room/kitchen and toilets. Perimeter fencing black with barbed wire and signage. Building facade would be clad with project sourced stone and corrugated iron roofing. Lighting poles and CCTV cameras. Water tank

2.5.1 Permanent operational elements

 Table 2.3
 The Snowy 2.0 Main Works Permanent Operational Elements

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105	ECVT portal and cableyard	15m	55,000sqm	Mine Trail Road. The road leading to the portal would be closed to public – the exact cutoff is not known, likely from Lobs Hole Road intersection.	Large area to be rehabilitated - Hydro mulch, Native tubestock mix, stabilised batters with jute mesh with compost blanket. Asphalt Road, concrete retaining walls. Cable yard galvanised gantry and conductors
106	MAT portal and building	5m	21,500sqm	Mine Trail Road. Mine Trail Road. The road leading to the portal would be closed to public – the exact cutoff is not known, likely from Lobs Hole Road intersection.	Sealed road, concrete retaining walls to portal. Large area to be rehabilitated - Hydro mulch, Native tubestock mix, stabilised batters with jute mesh with compost blanket. Power Station, Rec area, MAT building, parking lot. Large fire water tank, diesel storage tank at portal. permanent helipad.
107	Marica Ventilation Shaft	5m	1,000sqm	Marica West Trail. No Public Access	Ventilation Shaft Only. Concrete and steel. Marica ventilation shaft building would be about 5m tall.
108	Upstream Surge Shaft	15m	3,000sqm	Marica Track. No Public Access	Galvanized Steel Grate. Black perimeter fencing with barbed wire. The shaft would be around 15m tall.
109	Tantangara Intake	44m	66,800sqm	Tantangara Intake Road. Exclusive SHL access.	Low grass and shrub planting has been proposed to the backfill slope of the intake structure to match existing landscape conditions and assist the integration of the intake into the surrounding landform. Reinforced concrete. Perimeter fencing around intake
110	Tantangara Control Building	4m	4,000sqm	Tantangara Intake Road. Exclusive SHL access.	Hammered concrete, Glass, Powder- coated steel. Black perimeter fencing with barbed wire
111	Excavated rock placement at Tantangara shoreline	> FSL	640,000sqm	Tantangara Intake Road. Exclusive SHL access.	Exposed surface of rock armouring of excavated material. Rehabilitated in accordance with the Rehabilitation Strategy and in consultation with NPWS.
112	Excavated rock placement at Talbingo	< FSL	250,000sqm	Water access	Exposed surface of rock armouring of excavated material. Rehabilitated in accordance with the Rehabilitation Strategy and in consultation with NPWS

Table 2.3 The Snowy 2.0 Main Works Permanent Operational Elements (Continued)

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2.5.2 Temporary supporting elements

No.	Element	Height	Approximate Footprint	Components
201	Talbingo Portal	24m	45,000sqm	Cleared area through cut batters, Concrete portal entrance.
202	Stockpile near Talbingo Portal	20m	40,000sqm	Stockpile area, wheeled plant area for trucks, office and amenities, B-double drop off, servicing area, garbage area
203	Stockpile near Wharf Road, Talbingo	Unknown	12,000sqm	Construction yard with materials
204	Exploratory Camp at Lobs Hole	8m	60,000sqm	Double storey temporary accommodation and facilities
205	Lobs Hole Accommodation (Main Camp)	8m	180,000sqm	Car park, approx 600 double storey accommodation units, kitchen and amenities, operational and recreational facilities
206	Lobs Hole Construction Compound (Main Yard)	15m	240,000sqm	Stockpiles, E&M storage shed and laydown, warehouse and yard, cable/electrical yard, waste disposal, mechanical workshop, crushing plant, batch plant, maintenance shed, fuel and lube storage, penstock workshop, heli-pads, crib and ablutions car park, plant equipment and storage
207	MAT Portal Construction Yard	20m	16,000sqm	Construction material storage.
208	Marica Camp	8m	55,000sqm	Car park, Double storey accommodation, kitchen and amenities, operational and recreational facilities
209	Marica Stockpile 1	Unknown	100,000sqm	Construction material storage

210	Marica Stockpile 2 (East)	Unknown	165,000sqm	Construction material storage
211	Rock Forest Construction Yard	Unknown	65,000sqm	Truck lay down, material lay down area, portable facilities.
212	Tantangara Stockpile	23m	150,000sqm	Construction material storage
213	Tantangara Portal	25m	120,000sqm	Portal and tunnelling associated construction and TBM support as well as mucking out section of the HRT, and construction lay down area for the intake
214	Tantangara Stockpile and Barge	Unknown	145,000sqm	Construction material storage
215	Tantangara Camp	8m	130,000sqm	Car park, two-storey accommodation, kitchen and amenities, operational and recreational facilities

 Table 2.4
 Snowy 2.0 Temporary Operational Elements

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2.5.3 Access Roads

No.	Road	Туре	Temporary/ Permanent	Status
301	Ravine Bay Road	Unsealed	Temporary	Part new road, part existing road being upgraded for spoil placement
302	Talbingo Spoil Access Road MCOO	Remove and rehab, unsealed	Temporary	
303	Talbingo Intake Road	Unsealed	Permanent	New road
304	Wharf Road	Unsealed	Permanent	Existing Exploratory Works Road
305	Middle Bay Road	Unsealed	Temporary	Existing Exploratory Works Road
306	Pipeline Road	Unsealed	Permanent	Existing Exploratory Works Road
307	Camp Road	Unsealed	Temporary	New road
308	Lobs Hole Ravine Road	Asphalt	Permanent	Existing road upgraded
309	Mine Trail	Asphalt	Permanent	Existing Exploratory Works Road
310	Marica West Trail	Unsealed	Permanent	New road
311	Marica Trail	Unsealed	Permanent	Existing road upgraded
312	Gooandra Trail	Unsealed	N/A	Existing road
313	Bullock Hill Trail	Unsealed	N/A	Existing road
314	Nungar Creek Trail	Unsealed	N/A	Existing road
315	Tantangara Spoil Access Road (MCNO)	Remove and rehab, unsealed	Permanent	Existing road upgraded
316	Tantangara Road	Unsealed	Temporary	
317	Quarry Trail and Pocket Saddle Road	Unsealed	Permanent	Existing road
318	Tantangara Intake Road	Unsealed	Permanent	New road

* For access arrangements during operation refer to Chapter 2 of the EIS. The final status of access arrangements for all roads will be determined in consultation with NPWS.

Table 2.5 The Snowy 2.0 Main Works Access Roads





Temporary Supporting Element

- 201 Talbingo Portal
- 202 Talbingo Stockpile
- 203 Talbingo Stockpile near Wharf Road



Recreation Attraction

Public Exclusion Zone (indicative)

- Operational Access Road
- ---- Unsealed Trail/Track
- Disturbance Zone

Figure 2.2 Snowy 2.0 construction areas – Talbingo Reservoir





Operational Access Road

--- Unsealed Trail/Track

Disturbance Zone

Figure 2.3 Snowy 2.0 construction areas – Lobs Hole

2.6.3 Marica

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Permanent Operational Element

- 107 Marica Ventalation Shaft
- 108 Upstream surge shaft

Temporary Supporting Element

- 208 Marica Camp
- 209 Marica Stockpile 1
- 210 Marica Stockpile 2

Access Roads

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- 301 Ravine Bay Road
- 302 Talbingo Spoil Access Road MC00
- 303 Talbingo Intake Road
- 304 Wharf Road: No Public Access
- 305 Middle Bay Road
- 306 Pipeline Road: Publicly Accessible
- 310 Marica West Trail

Recreation Attraction

Public Exclusion Zone (indicative)

- Operational Access Road
- Unsealed Trail/Track
- Disturbance Zone

Figure 2.4 Snowy 2.0 construction areas – Marica

0

500

1000

1500 m

$\mathbf{02}$

2.6.4 Gooandra Plateau



- 312 Gooandra Trail
- 313 Bullock Hill Trail
- 314 Nungar Creek Trail

Recreation Attraction Operational Access Road

Unsealed Trail/Track

Disturbance Zone


2.6.5 Tantangara Reservoir & Foreshore



- Unsealed Trail/Track
- Disturbance Zone

36



2.6.6 Rock Forest



	j lemporary Supporting Element					
	211 Rock Fores	st Construction Yard				
	Recreation Attraction					
\square	Public Exclusion Zone (indicative)					
	Operational Access Road					

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Unsealed Trail/Track

Disturbance Zone



tine Flows

N T

4500 m

3000

0

15<u>00</u>

2.7

Visual Impact Assessment Summary

No.	Location	LCZ	Aspect	Permanent Operational Elements	Temporary Support Elements	Access Road	Receptors	Notes
1	Ravine Bay, Talbingo Reservoir. From water.	LCZ1	North west	112 - Talbingo Shoreline Ravine Bay placement area	N/A	N/A	Visitors using the Talbingo Reservoir. Swimmers, Fishers, Boaters	Observer location outside of public exclusion zone (indicative)
2	Ravine Bay, Talbingo Reservoir. From water.	LCZ1	North	N/A	N/A	Ravine Bay Road	Visitors using the Talbingo Reservoir. Swimmers, Fishers, Boaters	Observer location outside of public exclusion zone (indicative)
3	Middle Bay, Talbingo Reservoir. From water.	LCZ1	South east	101 - Talbingo Intake, 102 - Talbingo Control Building, 103 - Talbingo Barge Ramps	201 - Talbingo Portal, 202 - Talbingo Stockpile, Barges distributing spoil.	Talbingo Intake Road, Wharf Road	Visitors using the Talbingo Reservoir. Swimmers, Fishers, Boaters	Observer location outside of public exclusion zone (indicative)
4	Lobs Hole Ravine Road, North	LCZ2	West	101 - Talbingo Intake, 102 - Talbingo Control Building, 103 - Talbingo Barge Ramps	201 - Talbingo Portal, 202 - Talbingo Stockpile, Barges distributing spoil.	Lobs Hole Ravine Road, Talbingo Intake Road, Wharf Road	Walkers, bike riders, Horse Riders, Vehicles using Lobs Hole Ravine Road.	
5	Lobs Hole	LCZ2	South	104 - Lobs Hole Substation	206 - Lobs Hole Construction Compound	Lobs Hole Ravine Road	Campers at Lobs Hole, Walkers, Bike Riders, Horse Riders, 4WD's, Visitors to the Washington Hotel Ruin	206 would be viewed as rehabilitated upon reinstatement of public access to Lobs Hole.
6	Lobs Hole Ravine Road, South	LCZ2	North	104 - Lobs Hole Substation	206 - Lobs Hole Construction Compound	Lobs Hole Ravine Road	Campers at Lobs Hole, Walkers, Bike Riders, Horse Riders, 4WD's, Visitors to the Washington Hotel Ruin	206 would be viewed as rehabilitated upon reinstatement of public access to Lobs Hole.
7	From Wallaces Creek Fire Trail	LCZ3	West	101 - Talbingo Intake, 103 - Talbingo Barge Ramps, 104 - Lobs Hole Substation, 108 - Upstream Surge Shaft	201 - Talbingo Portal, 202 - Talbingo Stockpile, 206 - Lobs Hole Construction Compound, 208 - Marica Camp, 209 - Marica Stockpile 1	Wallaces Creek Fire Trail	Walkers, Horse Riders	
8	From Wallaces Creek Lookout	LCZ2	North	N/A	N/A	Lobs Hole Ravine Road	Walkers, Campers at Lobs Hole, Visitors to the Lookout	
9	Tantangara Reservoir, north from water.	LCZ5	South	109 - Tantangara Intake, 110 - Tantangara Control Building, 111 - Tantangara Shoreline excavated rock placement	212 - Tantangara Stockpile, 213 - Tantangara Portal, 214 -Tantangara Stockpile and Barge, 215 - Tantangara Accommodation Camp	Tantangara Camp Access Road, Tantangara Spoil Access Road, Quarry Trail, Tantangara Road	Visitors using the Tantangara Reservoir. Swimmers, Fishers, Boaters, Campers.	

Table 2.6 Visual Impact Assessment Summary



2.7 Visual Impact Assessment Summary (Continued)

10	Tantangara Reservoir, north from water.	LCZ5	South west	111 - Tantangara Shoreline excavated rock placement	N/A	Tantangara Camp Access Road, Tantangara Spoil Access Road, Quarry Trail, Tantangara Road	Visitors using the Tantangara Reservoir. Swimmers, Fishers, Boaters, Campers	
11	Tantangara Reservoir, north from water.	LCZ5	South	109 - Tantangara Intake, 110 - Tantangara Control Building, 111 - Tantangara Shoreline excavated rock placement	212 - Tantangara Stockpile, 213 - Tantangara Portal, 214 -Tantangara Stockpile and Barge	Quarry Trail, Tantangara Road	Visitors using the Tantangara Reservoir. Swimmers, Fishers, Boaters.	
12	Tantangara Reservoir, centre from water.	LCZ5	South west	109 - Tantangara Intake, 110 - Tantangara Control Building	212 - Tantangara Stockpile, 213 - Tantangara Portal, 214 -Tantangara Stockpile and Barge	Quarry Trail, Tantangara Road	Visitors using the Tantangara Reservoir. Swimmers, Fishers, Boaters.	
13	Tantangara Boat Ramp,	LCZ5	North west	109 - Tantangara Intake, 110 - Tantangara Control Building, 111 - Tantangara Shoreline excavated rock placement	213 - Tantangara Portal, 214 -Tantangara Stockpile and Barge, 215 - Tantangara Accommodation Camp	Tantangara Camp Access Road, Tantangara Spoil Access Road, Quarry Trail	Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors	
14	Tantangara from eastern shoreline	LCZ5	West	111 - Tantangara Shoreline excavated rock placement	N/A	Tantangara Spoil Access Road	Campers in Tantangara, Walkers, Horse Riders, 4WD's, Visitors of the Currango Homestead	
15	Tantangara, from Pockets Saddle Road	LCZ4	West	109 - Tantangara Intake, 110 - Tantangara Control Building, 111 - Tantangara Shoreline excavated rock placement	213 - Tantangara Portal, 214 -Tantangara Stockpile and Barge	Tantangara Road, Quarry Trail	Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors of the Currango Homestead	
16	Tantangara, from the Dam Wall	LCZ4	North west	109 - Tantangara Intake, 111 - Tantangara Control Building, 111 - Tantangara Shoreline excavated rock placement	214 - Tantangara Portal, 215 -Tantangara Stockpile and Barge	Tantangara Camp Access Road, Tantangara Spoil Access Road, Quarry Trail	Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors of the Currango Homestead	
17	N/A	N/A	South	N/A	211 - Russell Lot/ Rock Forest Construction Yard	N/A	Tourists/workers/ commuters travelling along Snowy Mountains Highway, Neighbouring Properties	

 Table 2.6
 Visual Impact Assessment Summary (Continued)

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Assessment Methodology

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Assessment Methodology

3.1 Introduction

The assessment methodology adopted for this LCVIA has been informed by the following two guidelines for landscape and visual impact assessment:

Guideline for Landscape Character and Visual Impact Assessment Environmental Impact Practice Note: EIA-N04 by Roads and Maritime Services (2018); and

Guidelines for Landscape and Visual Impact Assessment Third Edition (2013) (GLVIA), prepared by the Landscape Institute and Institute of Environmental Management and Assessment.

The Roads and Maritime Practice Note is a well-developed and widely used visual impact assessment methodology in NSW, predominantly on road infrastructure.

The GLVIA is the United Kingdom industry standard and authoritative guide on the principles of landscape and visual impact assessment. It provides a useful comparison to the Roads and Maritime Practice Note. It includes a detailed and relevant tool for assessing cumulative impact and guidance in the assessment incorporating climate change. The impact grading matrix in Table 3.1 and the cumulative impact assessment found in section 06 have both been adopted from the GLVIA.

3.2 Planning Context and Background Information

A number of policies, planning documents and guidelines are of relevance to this report and have been reviewed to inform the assessment.

They are:

- Kosciuszko National Park Plan of Management 2006 (KNP PoM)
- Roads and Maritime Services (RMS) Landscape Character Visual Impact Assessment (LCVIA) Note EIA – N04, 2018
- Guidelines for Landscape & Visual Impact Assessment (GLVIA)
- The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
- NSW Heritage Office Design in Context 2005
- NSW Climate Change Framework
- Road Design Guide (Roads and Maritime Services)
 and relevant Austroads Standards
- State Environmental Planning Policy No. 55 Remediation of Land
- Australian Standard 4282 (AS4282) Control of Obtrusive Effects of Outdoor Lighting
- Land and Environment Court Photomontage Policy, 2013

3.2.1 Kosciusko National Park Plan of Management

The Kosciusko Plan of Management (KNP PoM) establishes the scheme of operations for Kosciuszko National Park and is legislated through the National Parks and Wildlife Act 1974. The purpose of the KNP PoM is:

'to provide a framework of objectives, principles and policies to guide the long-term management of the broad range of values contained in the park. This framework is translated into a suite of specific actions to be undertaken by the National Parks and Wildlife Service and other organisations during the life of [the] plan.'

This LCVIA has considered the values of KNP as they relate to landscape character and visual assessment. In particular, in determining the sensitivity of the landscape and visual catchment and how they might be impacted by the project.

3.3 Landscape character and visual impact assessment

The LCVIA provides assessment of both landscape character and views. These are differentiated (as described by Roads and Maritime 2018 as follows:

- landscape character impact assessment the assessment of impact on the aggregate of an area's built, natural and cultural character or sense of place; and
- visual impact assessment the assessment of impact on views.

Landscape character assessment helps determine the overall impact of a project on an area's character and sense of place (what people think about a place and how society values it, whether or not they are physically present at it). Visual impact assessment helps define the day to day visual effects of a project on people's views (what people see at a place, when they are there).

3.3.1 Landscape Character Assessment

Landscape character can be described as: 'The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place' (Roads and Maritime, 2013).

The assessment of landscape character involves the identification of the different landscape character zones within the project area (defined by distinct combinations of elements), and an assessment of the sensitivity of the zone and magnitude of the project within each zone.

Due to the size and complexity of the project area, breaking it down into zones of broadly homogeneous characteristics and spatial qualities helps with the assessment. The method for this involved analysing aerial imagery to distinguish different vegetation communities and growth patterns as well as topography, geology, water and infrastructure. A site visit confirmed the boundary of each zone through experiencing the landscape on foot, by boat and from the car.

Sensitivity refers to how susceptible the character of the setting is to the proposed change. Informed by background research, a judgment is made as to the quality of the landscape, its cultural and historical importance to the community, scenic quality, and overall composition of the place and its users. This can also be considered as the landscape's inherent capacity to absorb change. For example, an area with a pristine natural character would be more sensitive to change than an area that has existing infrastructure such as a road, building or urban development.

Magnitude refers to the type of project and its compatibility with the existing landscape character. The scale, form and material composition of elements, as well as their location or setting, all have a bearing on the magnitude of the physical presence of the project. For example, a large above ground building would have a greater magnitude than an access track through the same landscape.

Landscape character impact is the combination of the sensitivity and magnitude of the project in accordance with the Impact Assessment Grading Matrix in Table 3.1.

		MAGNITUDE					
		VERY HIGH	HIGH	MODERATE	LOW	NEGLIGIBLE	
SE	VERY HIGH	VERY HIGH	HIGH-VERY HIGH	HIGH	MODERATE-HIGH	NEGLIGIBLE	
NSI	HIGH	HIGH-VERY HIGH HIGH MODERATE-HIGH		MODERATE	NEGLIGIBLE		
	MODERATE	HIGH	MODERATE-HIGH	MODERATE	LOW-MODERATE	NEGLIGIBLE	
~	LOW	MODERATE-HIGH	MODERATE	LOW-MODERATE	LOW	NEGLIGIBLE	
	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	

 Table 3.1
 Landscape Character and Visual Impact Grading Matrix

(Source: EIA No. 4 Guidelines, 2013)

3.3.2 Visual Impact Assessment

The assessment of visual impact required the selection of a number of viewpoints of the project. A range of viewpoints were selected from various locations, distances and directions within the visual catchment of the project.

Visual catchment

The visual catchment of the project, referred to as the Zone of Theoretical Visibility (ZTV) was calculated through the use of an accurate spatial analysis tool and 3D Digital Terrain Model (DTM) and Digital Surface Model (DSM). The ZTV was constructed using Radial line of Sight Analysis (RLOS) and Linear Line of Sight Analysis (LLOS) whereby heights and coordinates of proposed elements were input to provide a precise visibility assessment for both an area and individual observer points and view/lines.

Selection of viewpoints

The selection of viewpoints involved a desktop assessment of the ZTVs for each proposed permanent element. The selection of each viewpoint fell within the ZTV and was based on an eye level of 1.5m above the ground. Each viewpoint was then adjusted to fall within a probable area of observation. The areas included walking tracks, camping spots, lookouts, roads etc. After all viewpoints were defined, a site visit was undertaken to confirm the final viewpoints for assessment. This involved a visit of all sites of the proposed project, elements and key visitor destinations within KNP. High definition photographs were taken of each proposed site for both temporary and permanent elements and focal length and elevation were recorded. The use of an accurate geographical positioning system (GPS) was used to verify each of the viewpoints to within 10m. Within the selection of viewpoints, several were chosen for verified views based on their visual exposure during construction and operation, as well as whether or not they would be visible from areas that were publically accessible.

Visual impact assessment

A description of the selected viewpoints and an assessment of the sensitivity and magnitude of the project was carried out to determine the likely visual impact as a result of the project (Refer Section 06).

The visual impact of the project from each viewpoint is assessed using the sensitivity of the setting and the magnitude of change (Impact Assessment Grading Matrix in Table 3.1).

Preparation of Photomontages

A number of viewpoints have been selected to become verified views as described within the GLVIA and in accordance with the Land and Environment Court Policy on Photomontages, 2013. These verified views are photomontages or Accurate Visual Representations (AVRs) produced to convey a realistic and accurate representation of a project within an existing landscape. A 3D model of the project was provided by FutureGen and was artistically rendered within a high definition photograph. The photograph showing the current, unchanged view of the landscape is provided next to the AVR to depict the existing setting for comparison. Production of AVRs is an effective tool to demonstrate the amount of potential change to landscapes as a result of the project. Sensitivity is the measure of the visual quality and importance of the view and is dependent on the distance between the observer and the Snowy 2.0 Main Works , the activity category of observer and the elements of the project that are visible.

Magnitude of change to existing views refers to the nature and scale of the Snowy 2.0 Main Works, and the extent and proximity of the view to it. Magnitude represents the contrast in scale, form and type of project to the location and context to which it is to be placed.

Visual impact is the combination of the sensitivity and magnitude rating in accordance with the Impact Assessment Grading Matrix in Table 3.1.

3.3.3 Dynamic Visual Impacts

Dynamic visual impacts relate to the visual impacts on people travelling through or over a landscape in both space and time, and also when people are viewing information about the subject area on the various forms of media including conventional TV and newspapers as well as digital media on the internet including a range of social media platforms. A review of social media was carried out through the evaluation of social media perceptions of Talbingo, Tantangara and Kosciusko National Park to determine perceived views of the landscape by broader KNP users and how the Snowy 2.0 Main Works may influence them but understanding what users post about within these areas..

3.3.4 Cumulative Impact

Cumulative impacts are defined as impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project. The cumulative impact assessment discusses visual effects of Snowy 2.0 Main Works that result from additional changes to the landscape or visual amenity caused by its proposed permanent elements in conjunction with other developments associated or separate to it. The assessment relates a combination of; other examples of the same type of development; other types of development proposed within the study area including those that may arise as an indirect consequence of Snowy 2.0 Main Works and; different scheme components or associated and ancillary development.

For Snowy 2.0, the primary development to be considered as part of the cumulative assessment is the Snowy 2.0 Transmission Connection Project. In this project, TransGrid is proposing to construct and operate a new transmission connection between the Snowy 2.0 cableyard and the existing high voltage transmission network. Key components of TransGrid's project are the new dual double-circuit overhead transmission line and towers, new and upgraded access tracks, and other ancillary activities to facilitate construction.

The approach to assessing the cumulative visual impact would involve using the ZTV of each proposed element of Snowy 2.0, as found in Annexure 1 and overlapping each map to determine where multiple elements would be seen by an observer, adding to the magnitude of visual impact. Views would be recorded and assessed via two different visual experiences: Combined and Sequential.

Combined occurs where the observer is able to see two or more developments from one viewpoint either in combination or succession. In combination being where two or more elements are or would be within the observer's arc of vision at the same time without having to move their head. In succession is where the observer has to move their head to see the various elements.

Sequential occurs when the observer has to move to another viewpoint to see the same or different developments/elements, such as along a road or walking track. This sequential view can happen either frequently, where elements appear regularly and with short time lapses between instances such as via car travel, or occasionally such as along a walking track.

The following criteria was used in assessing the significance of the cumulative impact:

- Susceptibility of observers to changes in views and visual amenity
- Value attached to each view
- Size and scale of the elements in view
- Geographical extent and
- Duration of the effect.

3.3.5 Mitigation Measures

Mitigation measures are a series of strategies, principles or treatments recommended to ameliorate the identified landscape character and visual impacts of the project. They may include ways to lessen the magnitude of the proposed works and to maximize the integration with the surrounding setting. They may also include treatments to key view corridors to reduce contrast and/or screen the project from certain viewpoints.

A characteristic of Snowy 2.0 Main Works is the extent of works required for the duration of construction, which can then be removed allowing those sites to be rehabilitated. Decommissioning and rehabilitation would be an important element of the project, which would be designed and developed in consultation with National Parks and Wildlife Service (NPWS). Recommendations for further minimising landscape and visual impacts are discussed in Section 08.

Contextual Analysis

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Contextual Analysis

Kosciuszko National Park is reserved under the NSW National Parks and Wildlife Act 1974. Section 30E of the Act states that the purpose of reserving land as a national park is to identify, protect and conserve areas containing outstanding or representative ecosystems, and natural or cultural features, landscapes or phenomena that provide opportunities for public appreciation, inspiration, sustainable visitor use and enjoyment.

The KNP PoM identifies five different management zones that each provide an overarching geographic framework of linked, but varying, management strategies. The zones are intended to provide a spectrum of recreational settings within which visitors can appreciate and enjoy the park, from relatively remote and undeveloped country to particular places where prominence is given to the provision of visitor infrastructure. The majority of the study area is situated in the Back Country Zone aside from the two reservoirs, minor and major road corridors and the Yarrangobilly karst catchment. Within the study area, the Yarrangobilly karst catchment is listed as an 'Area of Exceptional Natural and Cultural Significance'. This area contains the Yarrangobilly Caves and surrounding karst landscape, which are highly vulnerable to human induced disturbance and therefore require specific management measures to ensure their protection.

The Back Country Zone is described in the PoM as relatively unmodified country within which:

- The capacity for natural ecological processes and systems to evolve in the absence of significant human interference is preserved and enhanced; and
- Suitably experienced and equipped visitors can enjoy challenging recreational experiences in natural or natural-appearing settings.

4.1 Natural Landscape

The natural landscape of Kosciuszko National Park (KNP) is both vast and varied. It has been shaped over time as a result of the interaction of a range of natural elements including water, air, earth, fire, flora, fauna and human interaction. These natural elements are presented in varying combinations which form part of a unique aesthetic, reflective of the only true alpine environment in NSW. The key components of these combinations, forming complex ecosystems within KNP, include geology, soil, hydrology, vegetation and fauna.

4.1.1 Landform

The landform of the study area is highly diverse, ranging in elevation from about 750 metres above sea level to over 2,000 metres above sea level.

In addition to the vast variation in altitude, there are distinct zones of prevailing landforms, based on the underlying geology and its interplay with hydrological systems – also refer section 3.1.2 and section 3.1.5. They include the:

- Western wilderness
- Central Gooandra Plateau
- Tantangara high plateau.

At the heart of the study area and occupying the highest elevation is the Gooandra Plateau. Following the watershed of the Great Divide, it is a gently undulating high plateau of low hills and vast plains.

The Gooandra Plateau gives way to the west to a vastly different landscape where an extensive system of creeks and waterways has carved steep valleys, resulting in steep and rugged topography characterised by narrow valleys and steep slopes, giving the area a wilderness character. The major river is the Tumut River, dammed to form Talbingo Reservoir, and its tributaries.

At the eastern edge of the Gooandra Plateau a series of wooded hills and valleys descend steeply to a second high plain surrounding the Tantangara Reservoir, created by the damming of the Murrumbidgee River.

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4.1.2 Geology

It is the relationship between geology and water that has created the distinct spatial qualities of the KNP. These qualities are displayed as karst formations, caves, running rivers and exposed ridgelines. The study area contains three significant karst formations (described in the KNP PoM). These are:

- · Cooleman Plain approximately 10km north of Tantangara Reservoir
- Yarrangobilly in between Talbingo and Tantangara Reservoirs approximately 5km north of the alignment and
- Ravine at Lobs Hole.

These formations present unique and interesting aesthetic forms and contain geological, geomorphological, hydrological and zoological values. The Yarrangobilly Caves (located within the Yarrangobilly Karst Area) in particular are frequented year-round by tourists, locals, researchers and students. The Ravine has unusual guaternary karst features but is not frequented as a visitor destination (as they are not designated for the public). A review of significant geodiversity features within the project area has been completed separately and provided with the Snowy 2.0 Main Works EIS.

Snowy Mountains Highway

The 26kms between Tantangara Reservoir and Talbingo Reservoir exhibit a range of vegetation types and geological formations that each contribute to the landscape character of that area. These areas contain broadly homogeneous characteristics that can be categorized into seven diverse landscape character zones which define the study area as discussed in Section 05: Landscape Character Assessment.

4.1.3 Soil

A unique feature of the landscape and one of the determining elements of its form is the soil;

Kosciuszko National Park differs greatly from other alpine areas in that deep organic soils dominate, whereas in most other alpine areas around the world soil formation is limited. This characteristic has led to the Australian Alps being described as 'mountains of soil' (Costin, 2002). This deep, organic soil is a result of the diverse geology of limestone and basalt parent material that both physically shape the landscape and provide the life sustaining pathways for air, water and vegetation atop it. The range of vegetation communities found within the study area for Snowy 2.0 Main Works are a direct result of the unique geological conditions of the KNP and form the natural visual character of inverse tree lines, flat alluvial vallevs with deeply incised creeks, rolling forested hills and dramatic escarpments with deep river valleys that users continue to seek and experience.

Gooandra Plateau Talbingo Reservoir Lobs Hole Marica Tantangara Reservoir

Figure 4.1 Aerial context 50

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4.1.4 Hydrology

The waterbodies within the study area, inclusive of Tantangara and Talbingo Reservoirs, represent high aesthetic appeal within the KNP. These waterbodies are frequented by visitors for their high aesthetic and recreational appeal. Typically, throughout the Australian Alps, during the month of August and into September are when the majority of annual stream flows occur. Over the course of summer the flows progressively reduce until the winter months. A comprehensive review of water catchments and hydrology of the project area is provided in the Water Characterisation Report provided with the Snowy 2.0 Main Works EIS.

4.1.5 Vegetation

Between the Tantangara and Talbingo Reservoirs, the Commonwealth listed, threatened ecological community, Alpine Bogs and Associated Fens is found. This, among other visually evident communities of bogs, fens and peat bed areas supply the slow flowing streams that cross the Kosciuszko plateau and are the reason for the purity of the water found in the lakes and tributaries of the Snowy River. Some 330 weed species have also been recorded in the park. Across the large study area. A comprehensive vegetation survey was carried out for the project and the findings are presented in the Biodiversity Development Assessment Report provided with the Snowy 2.0 Main Works EIS.

4.1.6 Fauna

Many different types of fauna are evident within the KNP and many of these species have extensive ranges and are visually familiar to many visitors. Animals such as kangaroos, wombats, wallabies, possums, echidnas and the elusive platypus form part of the collective sense of place. The diverse habitats of the park support populations of over 300 native terrestrial vertebrate species. Included in this number is 56 mammal and 190 bird species. Atypical of a cold climate, the park supports a diversity of cold- blooded reptiles and frogs. Eleven species of native fish have been recorded in the park. The Bogong Moth is of notable mention, congregating in the millions throughout the park and providing a food source for lizards, birds and throughout history, migrating Aboriginal people throughout the park. The Smoky mouse is a critically endangered species recorded within the site

Nearly 40% of all bird species known to occur in NSW have been recorded in the park, reflecting the remarkable diversity of habitats present (KNP PoM). In the lower valleys of the park, small groups of emus may be encountered, and soaring pairs of wedge-tailed eagles are frequently seen.

Around 66 introduced species of fauna are present in the park such as the red fox, wild cats and dogs, rabbits and visually prominent hoofed grazers such as horses and Sambar deer, and a variety of birds. Various introduced fish such as Carp and Redfin are present in the waterways.

Detailed fauna surveys were completed for the project and the findings are presented in the Biodiversity Development Assessment Report provided with the Snowy 2.0 Main Works EIS.

4.2 Cultural Landscape

The cultural landscape of the KNP is deeply embedded in Australia's Aboriginal and non-Aboriginal identity and it is the unique natural landscape that has influenced human habitation and movement throughout the region. Natural elements such as geology, climate and hydrology have been key influences in the cultural landscape both prior to and following settlement. This relationship between the cultural and natural elements of the park is central to its aesthetic appeal, character and use.

4.2.1 Pre-settlement

Aboriginal people have utilised the park for over 40,000 years and relics and artefacts found within the park support this history. Tools crafted from local rock, burial sites and cave art denote the use and patterns of movement by the Aboriginal people throughout the park. These archaeological records form the Aboriginal heritage of the park, together with non-visual spiritual meanings and associations of various natural elements of the landscape. Aboriginal language groups including the Wolgalu, Djilamatung and Ngarigo occupied the Snowy Mountains prior to European settlement (Boot 2000, Flood 2010, Tindale 1974, Wesson 2000).

4.2.2 Industry and Infrastructure

Geology and landform patterns have largely influenced the cultural landscape through the development of industry and infrastructure throughout the park. Explorers, prospectors, miners, graziers and more recently recreational uses, have impacted the landscape for over 200 years. The lure of precious metals such as gold, copper, silver and lead attracted intense periods of human activity and resulted in a network of tracks linking mines, settlements and camps. The remnant evidence of these physical effects on the landscape are present in the form of mining shafts, tunnels, sluicing works, water races, dams, quarries, huts, tramways and tracks.

The mining opportunities within the park facilitated the establishment of additional industries such as grazing, cropping and sawmilling which have also left a marked visual impact on the landscape. Numerous paved channels, small dams and drainage banks remain as physical evidence of this period. Copper mining for instance, persisted for 50 years at Lobs Hole, where visual remnants of this disturbance to the landscape still remain. Grazing has also led to the deterioration of water quality, the introduction of feral animals and widespread soil degradation. The rehabilitation of the alpine and subalpine soils of KNP following the establishment of Kosciusko State Park in 1944, is one of the less well known but important cultural stories of the area.

In addition to industry, the landform of the park has also governed the placement of infrastructure such as roads, dams and recreational use areas. The roads within study area include Lobs Hole Ravine Road, Tantangara Road and other minor roads within study area; predominantly unsealed minor roads that are open for public vehicular use. Many of these roads are suitable for conventional vehicles with only a few offering recreational driving opportunities in which a four wheel drive is required. The Snowy Mountains Highway is an arterial road that transects the study area, winding north-south between Tantangara and Talbingo Reservoirs.

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The reservoirs of Tantangara and Talbingo are the two main constructed waterbodies found within the study area and are currently visited for their aesthetic and recreation opportunities. Both reservoirs are also popular trout fishing destinations in KNP. Visitors are attracted to these waterbodies as they, due to the visually serene and naturalistic surrounding landscape, offer a place for quiet contemplation. The water within the KNP serves multiple functions for the country, beyond its intrinsic ecological and visual value. The supply of water for domestic and industrial uses, irrigation, and hydroelectric power all come from the KNP and is noted for its clarity and high quality as a result of filtration through soils within the park.

4.2.3 Snowy Mountains Scheme

The Snowy Mountains Hydro Scheme in 1949, a key piece of infrastructure in the cultural landscape, reaffirmed the attachment of the Australian public to the Snowy River. Beyond the collective pride that Australians felt in this engineering achievement and its role in reshaping national identity, the post-war influx of tens of thousands of migrants to work on the Scheme changed the ethnic composition of Australian society. The Scheme has also impacted the Snowy River by capturing and diverting around 60% of the stream flows in the park. This has further environmental and cultural impacts within the park and beyond. Rivers that have not been affected by the Snowy Hydro Scheme are limited in number and therefore high in value for aesthetic and conservation properties. Talbingo and Tantangara Reservoirs however, are not in this category. The Snowy Scheme is listed as a National Heritage Place.



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4.2.4 Recreation and Cultural Features

The variations in landform and climate experienced throughout the park also allow for a diverse range of recreation activities which are reliant on the substantial seasonal change. These include skiing and ice-climbing in winter; and bushwalking, fishing, camping, mountain biking and horse riding in summer.

The northern area of KNP (relevant to study area), in the location of the project, is predominantly known for summer recreational activities, as well as skiing at Selwyn Snow Resort during winter. Summer activities (in addition to those mentioned above) include canoeing, caving, rock climbing, abseiling, swimming, four-wheel driving, car touring/sightseeing and motorcycle riding. In the southern parts of KNP, recreational activity is more passive than the north, with moderate levels of visitation due to extensive natural areas and limited facilities. Significant cultural features located within and around the study area include camp grounds, mining sites, buildings and huts and associated infrastructure. Notable features are listed below.

Talbingo/ Lobs Hole Ravine:

- Lobs Hole Campground
- Gaslight Copper Mine
- Salt Sheds and Sheep yards
- Tolbar Trail
- Lobs Hole Cemetery
- Lobs Hole Butcher Shop
- Washington Hotel
- Yans House
- Wallace's Creek Campground
- West Pinbeyan Station

Gooandra Plateau:

- Roadman's Hut
- · Bullocks Hill Horse Campground
- Miner's Hut
- Tantangara Creek Gold Dredging

Tantangara:

- Grady's Hut
- Sanko Smith's Hut
- Tantangara Communications Tower
- Tantangara Dam Wall
- Tantangara Dam House
- Kelly's Plain Horse Campground
- Quarry Sheds
- Tantangara Sheep Station
- Currango Homestead

4.2.5 Literature

The cultural attachment to the Snowy River and tributaries found within the KNP derived from popular literature such as The Man From Snowy River, a poem by Banjo Paterson, who lived in the district and was said to have drawn inspiration from the historic Bolaro Station and scenic Yaouk Valley, in Adaminaby. The Nobel winning author Patrick White also wrote about Adaminaby as well as the Australian poet Barcroft Boake. Adaminaby is an important Australian town that represents engineering prowess and historical preservation. The existing town of Adaminaby contains relics of the Old Adaminaby – a town that was partially relocated to yield to the construction of the Snowy Hydro Scheme. The remains of Old Adaminaby were subsequently submerged by Lake Eucumbene, a product of the scheme.

Visitors of the Snowy Scheme enhance tourism numbers within the KNP. Tour operators transport busloads of visitors along the Snowy Mountains Highway, built for the Scheme, to numerous sights such as large dam walls and scenic lakes.

4.3 Landscape Character Summary

The landscape character of the KNP is the product of the existing natural elements, and the cultural forces of human use that have shaped it into the form evident today. That which was once an entirely natural landscape manipulated only through geomorphologic and climatic pressures has since become a series of altered environments curated for purpose. From the Aboriginal artefacts and sites that tell stories of our presettlement history to the engineering feats that harness the hydro-electric capabilities of the mountains through the Snowy Scheme. There are multiple and varied visual cues that denote to an observer the history of climatic change and human usage of the mountains.

The varying degree of climate, topography, manmade and natural elements experienced across the KNP attracts a multitude of different user types. Areas of unmodified country allow for natural ecological processes and systems to be preserved and enhanced through minimal human interference, where visitors enjoy solitude, isolation, inspiration and meditation amongst natural and peaceful settings. Other areas such as within the study area, allow for vehicular access, horse riding, boating and other recreational experiences in natural or natural-appearing settings. Transecting these landscapes are numerous minor and major road corridors and existing transmission lines that add to the cumulative visual character of human intervention in the park. This and other infrastructure appear to have been as so far as possible, unobtrusively designed in to the landscape with the intention to allow for opportunities for all visitors to gain first-hand experience of the range of values that the KNP has to offer. The surrounding agricultural areas and industrial sites located adjacent the KNP yield efforts to preserve the park whilst supporting the necessary maintenance and recreational opportunities within it.

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Landscape Character Assessment

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Landscape Character Assessment

5.1 Landscape Character Zones

Within the study area, seven distinct landscape typologies have been identified and are defined as separate Landscape Character Zones (LCZs) (Figure 5.1).

Each LCZ reflects broadly homogeneous visual characteristics, particularly in terms of vegetation and landform. The LCZ definition also considers historical layering or 'time depth' in the form of material remains of the past. These surviving features and their settings reflect the past interactions between people and places, which combine to present a visual manuscript to the historical uses of the zones.

The seven LCZs identified for the Snowy 2.0 Main Works are:

- LCZ 1. Talbingo Reservoir
- LCZ 2. Talbingo Rugged Woodland
- LCZ 3. Lobs Hole
- LCZ 4. Gooandra Plateau
- LCZ 5. Tantangara Woodland
- LCZ 6. Tantangara Reservoir and Foreshore
- LCZ 7. Rock Forest



Figure 5.1 Landscape Character Zones (LCZs)

5.1.1 LCZ 1: Talbingo Reservoir

LCZ 1 is comprised of the Talbingo Reservoir, with the edge of the waterbody forming the boundary of the zone. The zone is surrounded by Talbingo Rugged Woodland (LCZ 2). Talbingo Reservoir is an artificial impounded reservoir on the Tumut River sitting directly south of the town of Talbingo. The dam wall sits at the north end of the reservoir, just upstream from Talbingo, and is the tallest of sixteen major dams that comprise the existing Snowy Mountains Hydro Scheme.

Surrounded almost entirely by a natural edge, the reservoir sits within steep topography covered by woodland made up of sub-alpine eucalyptus. Typically, vegetation exists all the way to the water's edge or slightly gives way to a sandy, silty bank. The water quality and clarity are high, with visibility to submerged tree trunks below the surface. Numerous dead tree trunks protrude out of the water along the edges of the banks.

Motorised boating for fishing, sightseeing or water skiing is a popular summer activity in the reservoir. Opportunities also exist for quiet, nature-oriented or small vessel boating experiences such as kayaking or canoeing.

The water quality and clarity in the reservoir is of a very high grade and contributes to its attraction as a fishing destination. Talbingo Reservoir is renowned as a high quality trout fishery containing a variety of trout and other introduced species, the reservoir is often seen dappled with small fishing boats. Mosquito fish can be seen through the water, darting among the dense Elodea weed. Access to Talbingo Reservoir is from the boat launching ramp via the dam wall, spillway, or from Sue City Camp Ground on the western side and southern end of the lake. It is noteworthy that these entry points to the reservoir present the user with visual infrastructure that support the function of the place.

The reservoir was constructed for Snowy Hydro and it is through the combination of these supporting elements including the adjacent power-lines and cleared easement in LCZ2, that the user is reminded of both the function and underlying artificiality of the zone.

The capacity to absorb change for LCZ1, due to the natural visual aesthetic of the reservoir is very low. The crystal clear water, abundance of wildlife and meandering shoreline allows a visitor to feel fully immersed in a seemingly undisturbed environment. It is due to these reasons and predominantly the susceptibility of the character of the zone to be altered by a proposal, that the sensitivity is given a HIGH rating.

Landscape character sensitivity:

HIGH



Plate 5-1 LCZ1 Talbingo Reservoir



Plate 5-2 LCZ1 Talbingo Reservoir



Plate 5-3 LCZ1 Talbingo Reservoir

5.1.2 LCZ 2: Talbingo Rugged Woodland

The steep, rugged topography and dense Snowgum Woodland that covers the landform define LCZ 2. The boundaries of the zone are visually obvious; Talbingo Reservoir on the west of the cleared valley of Lobs Hole in the centre of the LCZ and an undulating plateau of open grassland on the east.

LCZ2 exhibits a scenic quality typical of the Australian bushland aesthetic. A variety of eucalyptus including; brittle gum, red gum, ribbon gum and snow gum blanket the rolling hills and emit the distinguishable blue haze across the landscape.

The range of elevation within LCZ 2 allows for some breathtaking lookouts and scenic vantage points across Australia's only true alpine environment. This, combined with the notable tranquility of the zone allows the visitor the perfect setting for quiet contemplation.

The topography also exhibits a suite of glacial landforms, notably the Ravine Karst area, south of Lobs Hole. The rolling hills are broken by ribbons of exposed sandstone and limestone, revealing clues about the geological movements of the past and adding to the ruggedness of the terrain.

The zone contains numerous visual infrastructure elements that support both visitation to the area and the existing Snowy Mountains Scheme. Minor road corridors such as the Lobs Hole Ravine Road and the Tolbar Trail are unsealed and open for public vehicular use. The roads in this zone predominantly provide vehicular access for recreational activities such as walking, cycling, horse riding, fishing and camping where a natural or naturalappearing setting is an important part of the visitor experience. The Snowy Mountains Highway is the major road corridor that runs through the northern area of the zone. This is a sealed road used as a major access route to key attractions throughout KNP such as the alpine resorts, Snowy Hydro visitor centres and power stations. The road corridor is up to 80m wide, where clearing, cut and fill and re-vegetation is apparent.

The Snowy Mountains Highway is managed as a showcase, in which scenic amenity is highly valued, adding to user experience and further optimising enjoyment and appreciation of the values of KNP. Travelling along the highway is a popular tourist activity.

The zone is also dissected by a 330Kv transmission line, about 40m high and with an 80m wide easement running north-south, that supports the existing Snowy Hydro Scheme. This powerline easement is highly visible from the elevated trail overlooks and appears as a large, linear clearing of trees cutting across the dense subalpine landscape.

The Australian bushland aesthetic seen in LCZ2 is so easily disturbed and broken by man-made elements within it. The susceptibility of the character of this zone is a result of this aesthetic and inability to absorb change. It is for this reason that the sensitivity rating is HIGH.

Landscape character sensitivity:

HIGH



Plate 5-4 LCZ2 Talbingo Rugged Woodland - showing 380km transmission easement



Plate 5-5 LCZ2 Talbingo Rugged Woodland



Plate 5-6 LCZ2 Talbingo Rugged Woodland

5.1.3 LCZ 3: Lobs Hole

LCZ 3 is the previously disturbed area which retains remnants of an old settlement where copper mining took place in the late 1800s/ early 1900's. Significant areas of land were cleared for a township which included a school, butcher shop, police station and hotel. The area is frequented by visitors for the attractive views, historical relics, mining and pioneer history.

The Washington Hotel, whose building footprint remains as a mud brick remnant is a feature of the zone.

Riparian vegetation is seen along the Yarrangobilly River which flows into Talbingo Reservoir and is atypical to the dense woodland seen in the neighbouring zone-Talbingo Woodland. The river is located at the southern end of the zone and flows through Ravine Campground.

Lobs Hole Ravine Road is the main access route into the zone. It is currently an unsealed track that winds through LCZ2 into LCZ3, crossing the Yarrangobilly River on the valley floor.

A cleared easement of approximately 50m in width runs below high voltage transmission lines, and adds to the net clearing seen within the zone.

Vegetation surrounding the zone and regenerating into the grassed camping areas is a mixed woodland grassland ecosystem characterised predominantly by eucalyptus trees sufficiently spaced so that the canopy does not close and allows light to reach the ground. Beneath the trees is an unbroken herbaceous layer consisting of hardy shrubs and grasses. Non-endemic vegetation is visually evident and most likely introduced to the area during the copper mining period.

The zone exhibits a mostly typical tableland bush aesthetic, however is also scattered with hints of the previous history of human settlement and disturbance to the land. Although these visual clues of past use are notable, the slow spread of endemic vegetation is also evident. The original perimeter of the settlement has, over time, become blurry and fragmented through the regenerating grasses, shrubs and eucalyptus seedlings of the neighbouring zone.

The ability of the zone to absorb visual change is higher than the other zones due to the previous disturbance of the site during the copper mine settlement. Lobs Hole is however, a popular camping area because of these interesting artefact's and the scenic qualities within and surrounding the site. The landscape sensitivity for LCZ3 is MODERATE.

Landscape character sensitivity:

MODERATE



Plate 5-7 LCZ3 Lobs Hole

12 September 2019



Plate 5-8 LCZ3 Lobs Hole



Plate 5-9 LCZ3 Lobs Hole

5.1.4 LCZ 4 : Gooandra Plateau

LCZ 4 presents a clear geomorphological change within the study area. The zone boundary begins at the edge of the Great Dividing Range and presents itself as an undulating plateau stretching across to Tantangara Woodland (LCZ 5). The clear change in topography and vegetation denotes a different, underlying soil type.

Within the zone, the Snow Gum trees transition from the woodland to the plains taking a smaller, shrub-like form and clearing into a heath landscape. Within the plains, grassland species cover the low hills, introducing colour through flowering and seasonal changes. Soft and shimmering Poa Tussock grasses grow along the creek, along with Sphagnum Moss, an indicator of the bog ecosystems found here. These plant communities play a vital role in filtering snow melt, contributing to the high quality clarity of water within the Kosciuszko National Park.

The zone contains many visible qualities like the bogs and fens that denote a fragile ecology. Threatened wildflower species such as the Monaro Golden Daisy and Mauve Burr-daisy mark the value of the zone. Wildlife in the area includes rare species such as the Gang Gang Cockatoo, which attract avid birdwatchers, and visitors can view Brumbies grazing in the grassland.

Examples of built form within the character zone are minimal. Campgrounds within this zone include Wares Yards, Ghost Gully, Bullocks Hill, Witzes Hut and Tantangara Creek Bush. The campsites are informal in character and provide a few basic utilities housed in small metal sheds which create a rustic aesthetic. As well, simple infrastructure such as earthen horse float loading ramps and hitching posts are available to support horse riding activities. A few unique heritage sites add character to the zone and point to the past uses of the land, cattle grazing and mining. The Kiandra Courthouse and Chalet and the Wolgal Hut have been restored, creating attractive examples of heritage architecture.

Many of the unique features of this zone are discovered through passive recreational activities, including bush walking, horse riding or camping. Unsealed, minor roads and paths suitable for most vehicles wind through the zone and provide access to the remote campgrounds.

The two major road corridors in the zone are for The Snowy Mountains Highway and Link Road. Other visual evidence of infrastructure within the zone include the high voltage transmission lines and easement running over and along the Snowy Mountains Highway and Tantangara Road, that each juxtapose the naturalness of the landscape.

Gooandra Plateau represents a fragile ecosystem of grasslands, open forest and bogs and fens. The ability of the zone to absorb visual change is varied due to its large size and combination of uses within it. As mentioned above, the presence of infrastructure that supports recreational use, transmission lines and transport movements are seen throughout the zone and have an effect on the character sensitivity. For these reasons, the overall landscape sensitivity for LCZ4 is MODERATE.

Landscape character sensitivity:

MODERATE



Plate 5-10 LCZ4 Gooandra Plateau



Plate 5-11 LCZ4 Gooandra Plateau



Plate 5-12 LCZ4 Gooandra Plateau

5.1.5 LCZ 5: Tantangara Woodland

LCZ 5 signals the transition from Gooandra Plateau to an undulating woodland that surrounds Tantangara Reservoir. The shallow valley exhibits clumping snow gums and tussock grasses with burnt eucalyptus trunks and stumps strewn across it. Steep changes in elevation and openings in vegetation allow for scenic views to the reservoir below.

Stands of Snow Gums mixed with native tussock grass make up much of the landscape and the presence of the kangaroo and wombat species seen feeding on native grasses exemplifies the ecological and scenic value of the zone.

The area provides intimate spaces for camping, accessible by most vehicles. Grassed clearings where small numbers of campers can set up and be screened by the surrounding wooded hills attract people seeking isolated experiences in the natural wilderness.

A number of historic sites and camping facilities attract visitors and add historic character and value to the zone. To the north is Currango Homestead constructed in 1895, now serving as a heritage site and eco-accommodation. Daffodil Cottage and The Pines Cottage are other historic sites where visitors stay in rustic cabins and from there, are able to experience the high plains on horseback, mountain bike, or on foot. The Old Snowy Campground is located at the north of the zone and is a popular horseback riding campground with standard facilities. A number of human interventions have created impacts which fragment the visual character within the zone and break up the natural landscape. Powerline easements with clearings of up to 40m along with unsealed access roads, dissect the woodlands. Tantangara Dam wall exists at the western boundary of the zone separating Tantangara Reservoir within LCZ 6 from the Murrumbidgee River, which flows to the east through LCZ 5. The high concrete dam wall creates a stark contrast to the surrounding native woodland landscape.

Two, small nondescript bridges cross over the Murrumbidgee River at Pockets Saddle Road and Tantangara Road and provide vehicular access around the zone. In the north of the zone, Port Phillip Trail provides access from The Currango Homestead and crosses Mosquito Creek via an informal and often submerged rocky trail, suitable only for 4WD's during low water levels.

The slow growth period for vegetation within LCZ 5 has resulted in a visually distinctive character. Large white Snow Gum trunks that were burnt during the 2004 bushfires are seen penetrating through a lower storey of eucalyptus seedlings, exhibiting the extremely slow growth period of the alpine region. It is for this reason that the zone is highly susceptible to change and therefore given a HIGH sensitivity rating.

Landscape character sensitivity:

HIGH



Plate 5-13 LCZ5 Tantangara Woodland



Plate 5-14 LCZ5 Tantangara Woodland



Plate 5-15 LCZ5 Tantangara Woodland

5.1.6 LCZ 6: Tantangara Reservoir and Foreshore

LCZ 6 is located to the north-east within the study area, bound by Gooandra Plateau to the west and Tantangara Woodland to the east. The zone is at a higher altitude to the neighbouring zones creating a visually serene landscape of open water and distant views to the surrounding landforms. The shoreline of the reservoir gently meanders, intersecting with the various tributaries such as the Murrumbidgee River in the south east and north-west, Mosquito Creek in the north, Mufflers Creek and Nungar Creek in the north-west, and Kelly's Plain Creek in the south.

The shoreline largely has a gentle slope with soft green grasses providing an attractive contrast to the clear blue water. The shoreline at the southern edge of the reservoir, near the dam wall, becomes steeper with rocky terraces and a muddy shoreline. This area also contains a coarse gravel boat launching ramp and quaint camping areas perched atop the terraces with excellent western views across the water of the setting afternoon sun.

The rest of the shoreline displays a far gentler grade and surface, suitable for camping. Vibrant green grass is kept short by grazing herds of brumbies and mobs of kangaroos that enhance the naturalness, felt within the zone. The reservoir provides opportunities for recreation and as a result small fishing boats, kayaks and canoes are often seen on the water. The combination of recreational uses and fauna contribute to the scenic quality of the area.

The foreshore area is largely devoid of shrubs and trees and is dominated by grasses, which creates open views across the serene landscape. The higher slopes surrounding the reservoir contain some scattered native vegetation becoming denser as the elevation increases.

Although the reservoir is a product of the Snowy Hydro Scheme, it presents itself to visitors as an open, pristine landscape.. Aside from the southern end of the zone where observers can see Tantangara Dam wall and existing powerlines, the remainder of the shoreline and reservoir presents an idyllic combination of green grass and clear water with a stunning backdrop of the Snowy Mountains. It is for this reason that the sensitivity rating for LCZ 6 is HIGH.

Landscape character sensitivity:





Plate 5-16 LCZ6 Tantangara Reservoir and Foreshore



Plate 5-17 LCZ6 Tantangara Reservoir and Foreshore



Plate 5-18 LCZ6 Tantangara Reservoir and Foreshore

5.1.7 LCZ 7: Rock Forest

LCZ 7 is located to the south of the study area, on the southern side of The Snowy Mountains Highway, north of Lake Eucumbene and just beyond the boundary of KNP.

The zone's vegetation reflects a woodland grassland ecosystem characterised by clumps of Snow Gums and Black Sally's that allow ample light to reach the ground, supporting herbaceous growth that consists primarily of grasses.

Private residential lots of small acreages are seen throughout the zone, lining the Snowy Mountains Highway, between the town of Adaminaby and the KNP.

The zone appears to have been cleared though decades of grazing with pockets of vegetation communities slowly re-establishing where conditions are optimum. The zone is experienced predominantly through vehicular use along the Snowy Mountains Highway. There is no pedestrian facility nor shoulder for cyclists beside the road, although occasionally cyclists travel along the Highway.

The ability for the zone to absorb change is moderate, and due to the private nature of uses within properties along the highway, the transient means in which observers would be experiencing the zone, and a generally grass covered landscape, the landscape character sensitivity rating is MODERATE.

Landscape character sensitivity:

MODERATE



Plate 5-19 LCZ7 Rock Forest

5.2 Landscape Character Impact Assessment

The study area has been divided into seven LCZs as discussed in 5.1 and illustrated in Figure 5.1. The sensitivity of each zone was assessed and a summary of the ratings are presented in Table 5.1. The landscape character impact assessment is the combination of the sensitivity ratings and magnitude ratings in accordance with the Impact Assessment Grading Matrix, refer Table 3.1.

For the landscape character impact assessment, the magnitude rating is affected by the type of proposed element and its compatibility with the character of the existing landscape. Elements of the project have been separated for ease of assessment into permanent operational elements and temporary supporting elements. The scale of elements (i.e. height, length) as well as its location and setting have a bearing on the magnitude of the physical presence of the project. The magnitude impact rating also considers whether the project has a positive or negative impact on the landscape character of the zone.

The magnitude ratings are gathered in regards to the permanent operational elements and temporary supporting elements that the implementation of the Snowy 2.0 Main Works would have within each LCZ. Due to the scale and complexity of Snowy 2.0 Main Works, construction activities will be carried out concurrently, and across a number of different sites.

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Specific details on these activities as well as an indicative schedule of construction activities is provided in Chapter 2 (Project description) of the EIS. The long construction schedule means that temporary supporting elements, such as construction yards and accommodation camps, have substantial magnitude ratings as their long term presence is comparable to permanent elements. During the construction phase, most of the viewpoints assessed will have restricted access with operational changes assessed for the post construction outcomes. Optional rehabilitation and mitigation strategies are discussed in Section 08, which hold the potential to reduce landscape character impact assessment ratings.

A high magnitude rating results if the element is a major development or piece of infrastructure that contrasts greatly with the surrounding landscape or entails heavy modification of the existing landscape. A moderate magnitude rating results if the project would be clearly distinguishable but not in stark contrast to the existing landscape. A low magnitude rating is given if the project is of a small scale and would integrate with low visual impact into the landscape. A negligible rating is provided if the visual impact is of the project is very low and can be integrated into the landscape with very little effect.

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix.

Soncitivity

	Landscape Character Zone	Sensitivity
LCZ 1	Talbingo Reservoir	HIGH
LCZ 2	Talbingo Rugged Woodland	HIGH
LCZ 3	Lobs Hole	MODERATE
LCZ 4	Gooandra Plateau	MODERATE
LCZ 5	Tantangara Woodland	HIGH
LCZ 6	Tantangara Reservoir and Foreshore	HIGH
LCZ 7	Rock Forest	MODERATE

 Table 5.1
 Landscape Character Zone Sensitivity Summary
5.2.1 Landscape Character Impact of the Snowy 2.0 Main Works on LCZ 1: Talbingo Reservoir Operation:

Permanent operational elements proposed within this zone are: Talbingo intake, barge launch facility (established during Exploratory Works) and placement of excavated rock in Talbingo Reservoir, between MOL and FSL to approximately 1m above FSL, shaped and rehabilitated to tie into the existing topography and vegetation.

Talbingo intake would be situated within LCZ 2, however the most visible outlook of the structure would be from within LCZ 1. The majority of the intake's concrete approach channel is located in LCZ 1, although since it would be situated within the water beneath the minimum operating level, this suggests that it would most likely not be highly visible at the majority of times. A public exclusion zone (indicative) would be created to prevent public access to the intake structure from the water. There would be some visibility from certain areas within the reservoir, which are documented, in the Section 06 - Visual impact assessment.

One permanent barge launch facility would be located immediately south of the intake, which was approved to built as part of Exploratory Works and would continue to be used during operation of Snowy 2.0. Barge access would be approximately 135m long and be able to facilitate access across all water levels, sitting at approximately 10m above full supply level.

Excavated rock placement is proposed for the Ravine Bay area, approximately 1km north of the intake.

Due to the visible nature of material placed within the reservoir and its contrast with the existing landscape setting, the magnitude of the permanent operational elements within LCZ 1 have been given a MODERATE magnitude rating. There is potential for turbidity to be caused by the commissioning and operation of the intake. However, it is understood that the detailed design will incorporate some armouring of the bed to minimise impact during operation. This rating combined with the HIGH sensitivity rating yields a landscape character impact of MODERATE - HIGH for permanent operational elements.

Construction:

Temporary supporting elements within LCZ 1 include: barge and associated marine vessels. These would be in operation up to 24 hours a day. A shallow draft pusher tug may be used for transportation of goods during construction.

There are new proposed roads adjacent to LCZ 1, however none within the zone. It is noteworthy that there will be public access exclusions proposed within and around the Intake in this zone.

The magnitude of the temporary supporting elements within LCZ 1 have been given a MODERATE magnitude rating as the temporary supporting elements including the barge is of a large scale in comparison to the existing elements within this LCZ. As well as this, the increase of marine vessels in operation 24 hours a day would also provide an increase in effect on the LCZ character. However, given the transient and mobile nature of the marine vessels and scale that is similar to current use of the reservoir, a MODERATE magnitude rating has been given. This rating combined with the HIGH sensitivity rating yields a landscape character impact of MODERATE – HIGH.

Landscape character assessment LCZ1 OPERATION

Sensitivity	HIGH
Magnitude	MODERATE
LANDSCAPE CHARACTER IMPACT	MODERATE - HIGH

Landscape character assessment LCZ1 CONSTRUCTION

Sensitivity	HIGH
Magnitude	MODERATE
LANDSCAPE CHARACTER IMPACT	MODERATE - HIGH



---- Unsealed Trail/Track

Disturbance Zone

Figure 5.2 LCZ 1 Location Map

5.2.2 Landscape Character Impact of the Snowy **2.0 Main Works on LCZ 2: Talbingo Rugged Woodland** Operation:

Permanent elements proposed within this zone are:

- Talbingo intake and control building
- Marica ventilation shaft and
- Upstream surge shaft

Talbingo intake would be comprised of engineered rock batters, cut from Talbingo Reservoir shoreline within LCZ2, an area of approximately 34,000m2 and almost 100 vertical metres from the base of the intake approach channel to the top most bench. The structure would include cement and stabilised rock.

The control building would be situated in the centre of the intake, behind the gate structure. It would be surrounded by black perimeter fencing with barbed wire. The building would be about 4m high with a hammered concrete and glass finish with a pitched roof. There would also be stair access and a crane pad located on the platform with the control building. Access to the intake and control building would be via Middle Bay Road and Talbingo Intake Road, restricted to SHL use.

Marica Ventilation Shaft is located off Marica West Trail and would be accessible only by Snowy Hydro and NPWS. It would include a small building, with black perimeter fencing surrounding the site.

The Upstream Surge Shaft would be a 15m high concrete cylinder, accessed via the Marica West Trail by SHL and NPWS exclusively. The site would require clearing of approximately 3000m2 of dense forest and would include a 2m high black perimeter fence.

New and existing (upgraded) permanent roads proposed in LCZ 2 are:

- · Lobs Hole Ravine Road
- Middle Bay Road
- Pipeline Road
- Lobs Hole Road
- Mine Trail and
- Marica West Trail

The magnitude of the permanent operational elements within LCZ2 have been given a LOW magnitude rating due to the discrete location within dense woodland areas, the smaller scale of these elements and low frequency with which they appear. Opportunities to lower this rating through mitigation strategies for colour and form are discussed in Section 08. Combining with the HIGH sensitivity rating, the landscape character impact rating is MODERATE.

Construction:

Temporary supporting elements proposed within LCZ2 are:

- Talbingo portal construction compound
- Stockpile areas at Talbingo compound and Lobs Hole
 main yard and Marica
- Lobs Hole Accommodation (Main Camp)
- Lobs Hole Construction Compound (Main Yard)
- MAT Portal Construction Yard
- · Ravine Bay Road
- · Construction of Upstream Surge Shaft
- · Construction of Marica Ventilation Shaft
- Marica Accommodation Camp

Accommodation camps would include a combination of elements to allow for workers to live within close proximity to sites. This would assist in alleviating travel time and traffic across challenging terrain and would be discussed further in chapter 07. Accommodation elements would include combinations of:

- Car Park
- Double storey accommodation
- Kitchen and Amenities
- Operational and Recreational facilities

Construction compounds would include various combinations of the following elements:

- Truck marshalling area
- · B-double container drop off point
- Wheeled plant park
- · Ramp and road access
- Forklift operating area
- · Materials stockpile
- · Fuel and lube storage
- Heavy maintenance area
- · Amenities and office buildings
- Crushing Plant
- Batch Plant
- Workshops
- · Wastewater treatment plant
- Car Park

Ravine Bay road would be a temporary unsealed road leading to the Ravine Bay placement area. This would be rehabilitated post construction.

The magnitude of the temporary supporting elements within LCZ2 have been given a MODERATE magnitude rating due to the large scale of change to the landscape that will contrast with the existing setting, and the frequency with which these changes appear. Although, this will be limited to specific areas within the larger context of the LCZ, modification to the land and subsequent use upon it by machinery, vehicles, waste treatment and temporary human settlement would see these areas deteriorate and take substantial time to re-establish vegetation and pre-construction appearances. Opportunities to lower this rating through rehabilitation and mitigation strategies are discussed in Section 08. Combining with the HIGH sensitivity rating, the landscape character impact rating is MODERATE – HIGH.

Landscape character assessment LCZ2 OPERATION

Sensitivity	HIGH
Magnitude	LOW
LANDSCAPE CHARACTER IMPACT	MODERATE

Landscape character assessment LCZ2 CONSTRUCTION

Sensitivity	HIGH
Magnitude	MODERATE
LANDSCAPE CHARACTER IMPACT	MODERATE - HIGH



Permanent Operational Element

- 102 Talbingo Control Building
- 107 Marica Ventalation Shaft
- 108 Upstream surge shaft

Temporary Supporting Element

- 202 Talbingo Stockpile
- 203 Stockpile near Wharf Road
- 209 Marica Stockpile 1
- 210 Marica Stockpile 2

Access Roads

- 301 Ravine Bay Road
- 302 Talbingo Spoil Access Road MC00
- 303 Talbingo Intake Road
- 304 Wharf Road: No Public Access 305 Middle Bay Road
- 306 Pipeline Road: Publicly Accessible Marica West Trail 310

Recreation Attraction

Public Exclusion Zone (indicative)

- **Operational Access Road**
- Unsealed Trail/Track
- Disturbance Zone

Figure 5.3 LCZ 2 Location Map 76 12 September 2019

5.2.3 Landscape Character Impact of the Snowy **2.0** Main Works on LCZ **3:** Lobs Hole Operation:

Permanent elements proposed within this zone are:

Lobs Hole Substation

Reshaping of Pad Areas as permanent landforms. Lobs Hole Substation would include a 15m gas insulated substation (GIS) building, 20m gantry and lights and 40m vertical tower conductors. The building would be clad in rock sourced from site and the gantry and conductors would be galvanized steel. Access to the substation would be via Lobs Hole Ravine Road which is open to the public.

ECVT Portal and Cableyard

ECVT Portal and Cableyard would house permanent elements similar to the Lobs Hole Substation with similar finishes. The portal would appear similar to the precedent site, Tumut 2 Portal. Proposed clearing for the site would measure approximately 55,000m2 and approximately 30m in elevation, achieved through rock cutting. A proposed trail link called Mine Trail would provide public access to the site.

Main Access Tunnel Portal

The Main Access Tunnel (MAT) Portal would also be located along Mine Trail but would not be publicly accessible. It would bear similar finishes to the ECVT Portal and would also measure approximately 30m in elevation. It would house a small power station, recreational area, operations building and covered parking lot for 15 vehicles. The area would require clearing and rock cutting with seed mixes and tubestock planting to areas, post-construction.

The reshaping of construction pad areas would involve distribution of drill and blast and TBM material onto the disused construction areas within Lobs Hole, to reshape the construction pads to mimic natural landform. The amount of rehabilitation due for this area is substantial and the opportunity to remedy further disturbance to the site, rests on the success of the revegetation.

As LCZ3 is a previously disturbed site, it is considered appropriate to leave material in situ for rehabilitation and reshaping. The landscape character of the zone has the opportunity to assimilate to the surrounding LCZ2, over time with proper landscape rehabilitation techniques following the construction of the project.

ECVT Portal and Cableyard would house permanent elements similar to the Lobs Hole Substation with similar finishes. The portal would appear similar to the precedent site, Tumut 2 Portal. Proposed clearing for the site would measure approximately 55,000m2 and approximately 30m in elevation, achieved through rock cutting. A proposed trail link called Mine Trail would provide public access to the site. The Main Access Tunnel (MAT) Portal would also be located along Mine Trail but would not be publicly accessible. It would bear similar finishes to the ECVT Portal and would also measure approximately 30m in elevation. It would house a small power station, recreational area, operations building and covered parking lot for 15 vehicles. The area would require clearing and rock cutting with seed mixes and tubestock planting to areas, post-construction.

The magnitude of the permanent operational elements within LCZ2 have been given a LOW magnitude rating due to the already disturbed nature of the zone, and as permanent landforms will be rehabilitated to be consistent with the existing landscape character as much as possible. Opportunities to lower this rating through successful mitigation and establishment of vegetation at Lobs Hole is discussed in Section 07. Combining with the MODERATE sensitivity rating, the landscape character impact rating during operation is LOW - MODERATE.

Construction:

Temporary supporting elements proposed within LCZ3 are:

- · Construction of the ECVT Portal and Cableyard
- Construction of the Main Access Tunnel Portal
- Talbingo portal construction compound
- Stockpile areas at Talbingo compound and Lobs Hole
 main yard
- Lobs Hole Accommodation (Main Camp)
- Lobs Hole Construction Compound (Main Yard)
- MAT Portal Construction Yard
- Construction of Upstream Surge Shaft
- Construction of Marica Ventilation Shaft
- Marica Accommodation Camp

Accommodation camps would include a combination of elements to allow for workers to live within close proximity to sites. This would assist in alleviating travel time and traffic across challenging terrain. Accommodation elements would include combinations of:

- Car Park
- Double storey accommodation
- Kitchen and Amenities
- Recreational facilities

Construction compounds would include various combinations of the following elements:

- Truck marshalling area
- B-double container drop off point
- Wheeled plant park
- Ramp and road access
- Forklift operating area
- Materials stockpile
- Fuel and lube storage
- Heavy maintenance area
- Amenities and office buildings
- Crushing Plant
- Batch Plant
- Workshops
- Wastewater treatment plant
- Car Park

The magnitude of the temporary supporting elements within LCZ2 have been given a HIGH magnitude rating due to the large-scale modification to the land and subsequent use upon it by machinery, vehicles, waste treatment and temporary human settlement would see these areas deteriorate and take substantial time to reestablish vegetation and pre-construction appearances. Opportunities to lower this rating through rehabilitation and mitigation strategies are discussed in Section 08. Combining with the MODERATE sensitivity rating, the landscape character impact rating during construction is MODERATE - HIGH.

Landscape character assessment LCZ3 OPERATION

Sensitivity	MODERATE
Magnitude	LOW
LANDSCAPE CHARACTER IMPACT	LOW - MODERATE

Landscape character assessment LCZ3 CONSTRUCTION

Sensitivity	MODERATE
Magnitude	HIGH
LANDSCAPE CHARACTER IMPACT	MODERATE - HIGH





Permanent Operational Element

- 104 Lobs Hole Substation
- 105 ECVT Portal and Cableyard
- MAT Portal 106

- **Temporary Supporting Element**
- 204 Exploratory Camp Lobs Hole
- 205 Lobs Hole Accommodation Camp (Main Camp)
- 206 Lobs Hole Construction Compound
- 207 MAT Portal Construction Yard

Access Roads

- 301 Ravine Bay Road
- 308 Lobs Hole Ravine Road: Publicly Accessible

Recreation Attraction

Operational Access Road

Unsealed Trail/Track

Disturbance Zone

Figure 5.4 LCZ 3 Location Map

5.2.4 Landscape Character Impact of the Snowy **2.0** Main Works on LCZ4: Gooandra Plateau Operation:

The proposed access roads within LCZ4, are for exclusive use by Snowy Hydro and NPWS. The following roads will be used for permanent operational access :

- Marica Trail (upgraded by the project)
- Gooandra Trail
- Bullock Hill Trail and
- Nungar Creek Trail

Marica Trail would be an unsealed road, spray over unbound granular material, with the purpose of minimising dust and movement during use. The remaining trails would be retained in their current form, unsealed, unbounded granular material and maintained as needed for access (in accordance with existing road maintenance agreements with NPWS). The design of the roads would include combinations of cut and fill batters and safety barriers where required with revegetated batters where possible.

The magnitude of the permanent operational elements within LCZ4 is considered to be MODERATE. This is due to the private access to the elements and the low potential for visibility by the public. The MODERATE sensitivity rating has combined with the NEGLIGIBLE magnitude to yield a NEGLIGIBLE landscape character impact rating.

Construction:

Temporary supporting elements within LCZ4 are minimal. A stockpile area is located west of the Snowy Mountains Highway adjacent to Marica Trail, partially on the edge of LCZ4 and LCZ3. The stockpile is approximately 165,000m2 and would comprise various construction materials. As well as this, construction activities in this LCZ include services burial adjacent to the access tracks.

The magnitude of these temporary supporting elements within LCZ4 have been given a LOW magnitude rating due to the low level of clearing required to house the construction stockpile and the impacts from the services burial. This combined with the MODERATE sensitivity rating gives a LOW - MODERATE landscape character impact rating.

Landscape character assessment LCZ4 OPERATION

Sensitivity	MODERATE
Magnitude	NEGLIGIBLE
LANDSCAPE CHARACTER IMPACT	NEGLIGIBLE

Sensitivity	MODERATE
Magnitude	LOW
LANDSCAPE CHARACTER IMPACT	LOW - MODERATE

Landscape character assessment LCZ4 CONSTRUCTION



- 313 Bullock Hill Trail
- 314 Nungar Creek Trail
- Recreation Attraction
- Operational Access Road
- ----- Unsealed Trail/Track
- Disturbance Zone

Figure 5.5 LCZ 4 Location Map

5.2.5 Landscape Character Impact of the Snowy **2.0** Main Works on LCZ5: Tantangara Woodland Operation:

Permanent elements found within this zone are upgrades to existing access roads. These are:

- Tantangara Road and;
- Quarry Trail Road

Both roads would be upgraded with unsealed, unbounded granular material. The design of the roads could include combinations of cut and fill batters and safety barriers where required with revegetated batters where possible. Subject to detailed design.

The magnitude of the permanent operational elements within LCZ5 have been given a **NEGLIGIBLE** magnitude. The upgrades to the access roads fit within the character of the zone and would provide some formality to vehicular movements throughout it. Combining with the **HIGH** sensitivity rating, the landscape character impact is **NEGLIGIBLE** during operation.

Construction:

Temporary supporting elements within LCZ5 include:

- Construction of Tantangara Road upgrade
- Construction of Quarry Trail Road upgrade

During construction the zone would experience impacts as a result of construction traffic and haulage along the Tantangara Road and Quarry Trail as well as the upgrades to Tantangara Road and Quarry Trail Road.

The magnitude of the temporary supporting elements within LCZ5 have been given a LOW magnitude. The upgrades to the access roads fit within the character of the zone and would provide some formality to vehicular movements throughout it. Combining with the HIGH sensitivity rating, the landscape character impact is MODERATE during construction .

Landscape character assessment LCZ5 OPERATION

LANDSCAPE CHARACTER IMPACT	NEGLIGIBLE
Magnitude	NEGLIGIBLE
Sensitivity	HIGH

Landscape character assessment LCZ5 CONSTRUCTION

Sensitivity	HIGH
Magnitude	LOW
LANDSCAPE CHARACTER IMPACT	MODERATE



Access Roads 316 Tantangara Road: Publicly Accessible



Recreation Attraction

Public Exclusion Zone (indicative)

Operational Access Road

- Unsealed Trail/Track
- Disturbance Zone

Figure 5.6 LCZ 5 Location Map

5.2.6 Landscape Character Impact of the Snowy 2.0 Main Works on LCZ6: Tantangara Reservoir and Foreshore

Operation:

Permanent elements found within this zone are:

- Tantangara Intake and control Building
- · Shoreline placement of excavated rock and
- Quarry Trail Road
- Barge launch and associated marine vessels

The form of Tantangara intake would be approximately 44 vertical metres from the approach channel at the invert level at the intake sill to the top of the platform. It would have engineered benches retained by cement stabilized rockfill batters. The intake would span almost 180m at its widest girth and the top bench would connect to an access road leading from Quarry Trail Road.

The control building would sit on the top platform situated approximately 18m above the FSL. The platform it sits atop would be a constructed embankment with engineered rock fill and rip rap layer of approximately 15m elevation. The control building would be surrounded by black perimeter fencing topped with barbed wire. The building would be about 4m high with a hammered concrete finish and pitched roof.

The excavated rock placement area is located north of the intake, approximately 500m from the mouth of the Murrumbidgee River. The area measures approximately 500,000m2 and would sit to approximately 1m above FSL. The final rock placement area will be rehabilitated and recreational areas will be established in accordance with the Rehabilitation Strategy and in consultation with NPWS. The proposed design intent is to keep the toe of the infill as high as possible to minimise the interface with water during placement. Minimum toe level would be 7m above MOL. A fall of 1 to 3 percent towards the reservoir is proposed, with a maximum batter slope of 4H:1V, with the possibility to be set shallower to improve visual amenity.

The magnitude of the permanent operational elements within LCZ 6 have been given a **HIGH** magnitude rating. This is a result of the large scale infrastructure that would be prominently displayed upon an otherwise undisturbed rural setting. This has led to a **HIGH** landscape character impact rating when combined with the **HIGH** sensitivity of the zone.

Construction:

Temporary supporting elements within LCZ6 include:

- Barge launch and associated marine vessels
- Haul Roads
- Tantangara Laydown Area
- Tantangara adit
- Tantangara Accommodation Camp

The barge launch and associated marine vehicles would facilitate construction of the intake structure. These would be in operation up to 24 hours a day. The barge ramp would be provided primarily to assist with the removal of the intake plug below water level. The barge ramp and the lower part of the access road would be submerged when water levels are between 1210 and 1228.69m AHD (FSL).

There are proposed temporary and permanent roads within LCZ6. During construction the permanent roads would be unsealed, unbounded granular material. The design of the roads would include combinations of cut and fill batters which would be re-vegetated. A temporary haul road is proposed to be constructed to connect the intake and construction yard associated with Tantangara adit with the spoil area.

Tantangara Laydown Area, adit and Accommodation Camp are temporary elements within the zone. The laydown area would be adjacent to the barge with a temporary linking unsealed road. The accommodation camp is to be located east of Quarry Trail, south of the intake, and would house and support up to 500 workers. This would require significant clearing of vegetation. Tantangara adit allows construction of the headrace tunnel and would be remediated post-construction of the Snowy 2.0 Main Works.

The magnitude of the temporary supporting elements within LCZ 6 have been given a HIGH magnitude rating. The size and use for each area would cause significant disturbance to the land and take substantial time to rehabilitate in a slow growing sub-alpine climate. This rating has led to a HIGH landscape character impact rating when combined with the HIGH sensitivity of the zone.

Landscape character assessment LCZ6 OPERATION

Sensitivity	HIGH
Magnitude	HIGH
LANDSCAPE CHARACTER IMPACT	HIGH

Landscape character assessment LCZ6 CONSTRUCTION

Sensitivity	HIGH
Magnitude	HIGH
LANDSCAPE CHARACTER IMPACT	HIGH



- 109 Tantangara Intake
- 110 Tantangara Control Building
- Tantangara Shoreline excavated rock placement 111

Temporary Supporting Element

- 212 Tantangara Stockpile
- 213 Tantangara Portal
- 214 Tantangara Stockpile and Barge
- 215 Accomodation Camp

Access Roads

- 307 Camp Road
- 317 Quarry Trail: Publicly Accessible
- Tantangara Spoil Access Road 315
- 318 Tantangara Camp Road: No Public Access

Recreation Attraction

- Public Exclusion Zone (indicative)
- **Operational Access Road**
- Unsealed Trail/Track

Disturbance Zone

Figure 5.7 LCZ 6 Location Map

SNOWY 2.0 LCVIA

5.2.7 Landscape Character Impact of the Snowy 2.0 Main Works on LCZ7: Rock Forest

Operation:

Permanent Operational Elements: N/A

Construction:

Temporary supporting elements:

212-Rock Forest Construction Yard.

Rock Forest would consist of an area of approximately 65,000sqm, 100m south of the Snowy Mountains Highway. The area would be cleared of vegetation and graded to a flat level. The site would be used as a logistics site and temporary construction yard for the duration of construction. Elements on site would include; truck lay down areas, vehicle weigh bridge, warehouse yard, material lay down area, demountable offices and car parking areas.

The layout and orientation of elements within the site have been arranged to avoid as much existing vegetation as possible so would be constructed predominantly on grassed areas.

The site would be returned to being stock pasture following the construction period.

The construction yard would have a LOW magnitude rating due to the minimal amount of clearing required to support the proposed elements. The temporary nature and plans to rehabilitate when possible, ensure the magnitude rating of the site is LOW. This rating combined with the LOW sensitivity rating yields a LOW - MODERATE Landscape character impact.

Landscape character assessment LCZ7 OPERATION

Sensitivity	MODERATE
Magnitude	N/A
LANDSCAPE CHARACTER IMPACT	N/A

Landscape character assessment LCZ7 CONSTRUCTION

Sensitivity	MODERATE
Magnitude	LOW
LANDSCAPE CHARACTER IMPACT	LOW - MODERATE

Temporary Supporting Element		
211	Rock Forest Construction Yard	
Recr	eation Attraction	

Public Exclusion Zone (indicative)
 Operational Access Road
 Unsealed Trail/Track
 Disturbance Zone

Figure 5.8 LCZ 7 Location Map

0 1500 3000 4500 m N



5.3 Landscape Character Impact Summary

The landscape character impact assessment of the Snowy 2.0 Main Works as described above, represents a qualitative assessment based on the seven LCZs. The results of these assessments conclude with a range of impact ratings and are tabulated below into operation and construction

5.3.1 Operation

	Landscape Character Zone	Sensitivity	Magnitude	Impact
LCZ 1	Talbingo Reservoir	HIGH	MODERATE	MODERATE - HIGH
LCZ 2	Talbingo Rugged Woodland	HIGH	LOW	MODERATE
LCZ 3	Lobs Hole	MODERATE	LOW	LOW - MODERATE
LCZ 4	Gooandra Plateau	MODERATE	NEGLIGIBLE	NEGLIGIBLE
LCZ 5	Tantangara Woodland	HIGH	NEGLIGIBLE	NEGLIGIBLE
LCZ 6	Tantangara Reservoir and Foreshore	HIGH	HIGH	HIGH
LCZ 7	Rock Forest	MODERATE	N/A	N/A

5.3.2 Construction

	Landscape Character Zone	Sensitivity	Magnitude	Impact
LCZ 1	Talbingo Reservoir	HIGH	MODERATE	MODERATE - HIGH
LCZ 2	Talbingo Rugged Woodland	HIGH	MODERATE	MODERATE - HIGH
LCZ 3	Lobs Hole	MODERATE	HIGH	MODERATE - HIGH
LCZ 4	Gooandra Plateau	MODERATE	LOW	LOW - MODERATE
LCZ 5	Tantangara Woodland	HIGH	LOW	MODERATE
LCZ 6	Tantangara Reservoir and Foreshore	HIGH	HIGH	HIGH
LCZ 7	Rock Forest	MODERATE	LOW	LOW - MODERATE



5.4 Dynamic Visual Impact and community views

Dynamic visual impacts relate to observing visual impacts while traveling through or over a landscape in both space and time and also when viewing information coverage on social media via the internet, social media platforms and conventional media such as TV and newspapers.

With increasing access and accuracy to digital media viewed on portable devices, images on map applications as well as on social media platforms such as Twitter, Facebook or Instagram, dynamic impacts are becoming increasingly relevant, particularly where reputation and image are paramount to businesses in industries such as tourism.

As can be seen in the images below, the top results on Instagram for both Talbingo and Tantangara hashtags show natural landscapes with people enjoying outdoor recreation within them. Images showing local wildlife, vegetation and geology are abundant beneath these two tags and #kosciuszko national park. There are thousands of uploaded photos with only a relatively small number that include any infrastructure, suggesting that the dynamic visual character of the study area is currently portraying a natural region, relatively devoid of imposing engineered structures.

The potential for the preconceived notions of the park to be influenced during the Snowy 2.0 Main Works construction via social media, is a reality. Aerial images showing the extent of cleared areas and new roads within the KNP would be easily accessible by the public and have the possibility of deterring visitors to the area for a period of time until the rehabilitation process is established and final rehabilitation outcomes achieved. Photos that are publicly uploaded showing the impacts of construction works, would influence the dynamic visual impact to observers of those images, resulting in impacted community views.



#talbingo







Figure 5.10 #tantangara results via Instagram

5.5 Other considerations

5.5.1 Potential water quality impacts

The visual impact of the appearance of water clarity and altered shoreline condition is difficult to predict, though worth discussing.

According to visitor surveys, major attractions are the area's scenic qualities, as well as its water quality which provides ideal conditions for swimming and fishing. Water clarity adds the scenic and experiential qualities of the area by reflecting the surrounding mountain landscape and allowing views of underwater life including fish (Elton, 2019).

Construction works including subaqueous placement of spoil into Talbingo Reservoir would have a potential visual effect on the condition of the water during construction, and potentially for extended periods following completion of placement.

Settlement tests and hydrodynamic modelling were conducted (by RHDHV) to help predict changes in turbidity of the water. The findings are presented in detail in the Reservoir assessment overview (RHDHV 2019) appended to the EIS. Modeling suggests that during construction the water quality will decrease, however in the first year post commission clarity will improve and be returned to a higher quality.

Along the embankments of the shoreline, existing conditions of exposed areas of mud will be retained when lower operating levels occur, especially when the minimum operation level is achieved, however, this is an unlikely and rare occurrence and can currently occur, pre Snowy 2.0 Main Works construction.

Tantangara Reservoir

The operation of Snowy 2.0 would increase variations in water levels at Tantangara, within the existing operating range. Long term average water levels would shift towards Full Supply Level (FSL). There would be an increase in short term variability of water levels. The maximum rate of change in water levels during operation would be 500mm (vertically) per hour near Minimum Operating Level (MOL), although these occurrences would be rare, and 70mm per hour (vertically) near FSL. In particular the faster rates of change near the MOL would lead to high flow velocities. This has the potential to suspend sediments, leading to increased turbidity and potentially scour.

It is possible that the operation of the project may also lead to a deterioration of the condition of the Tantangara Reservoir shoreline due to the overall operating water level range of approximately 22 vertical metres with associated horizontal fluctuations of the shoreline of up to 50 metres. The exact extent of change is difficult to predict due to the number and complexity of factors involved including seasonal changes, weather variability, climate change, and fluctuating demands for power and water. Proceeding completion of the Project, fluctuating water levels during operations may lead to marsh like conditions on the foreshore that would be unsuitable for recreational use by visitors and offering limited habitat or foraging opportunities for flora and fauna. Exposed muddy areas along the foreshore would also detract from the visual and scenic qualities of the reservoirs, leading to increased visual impacts. These conditions are consistent with other reservoirs in operation as part of the Snowy scheme, and are required to have fluctuating water levels to meet market conditions.

Talbingo Reservoir

The average water level in Talbingo Reservoir would experience reduced fluctuations in level than Tantangara Reservoir during the operation of the new power station. This is due to the large storage capacity and smaller operating range relative to Tantangara, which is about nine metres (vertically) between MOL and FSL. The reservoir would continue to be maintained closer to FSL to maximise generation opportunities for T3. Water level changes would be relatively slow at 70mm per hour or less.

5.5.2 Potential fauna migration

There is a potential risk that ongoing disturbance throughout the lengthy construction period may lead to dispersal of fauna in areas immediately adjacent to construction areas. These impacts will be transient and are unlikely to result in any significant loss of biodiversity value.

5.5.3 Potential construction impacts

Increased traffic during construction would add to both the landscape character and visual impacts experienced as a result of the project. Other likely construction impacts that would affect the visitor experience in the region would include noise, vibration, dust and light spill from night works, as they would alter the existing sense of quiet and remoteness within KNP.

Visual Impact Assessment

Section o6

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O Visual Impact Assessment

6.1 **Overview**

The assessment of visual impact requires the selection of a number of observer points of the project. A range of points was selected from various locations, distances and directions within the visual catchment of each of the proposed permanent operational elements of Snowy 2.0.



Figure 6.1 Talbingo Observer Locations 1 of 3



INSET

Permanent Operational Element \checkmark

- 105 ECVT Portal and Cableyard
- 106 MAT Portal
- 107 Marica Ventilation Shaft
- 108 Upstream Surge Shaft

Temporary Supporting Element

- 207 MAT Portal Construction Yards
- 208 Marica Camp
- 209 Marica Stockpile 1
- 210 Marica Stockpile 2

Access Roads

- Marica Road West: No Public Access 310 Surge Shaft Road: No Public Access
- 311
- Marica Trail: No Public Access

Figure 6.2 Gooandra Observer Locations 2 of 3

Viewpoints

- Recreation Attraction
- Public Exclusion Zone (indicative)
- **Operational Access Road** -
- Unsealed Trail/Track
- Disturbance Zone
 - MOL (Minimum Operating Level)
 - FSL (Full Supply Level)

500

1000 m





111 Tantangara Shoreline excavated rock placement

Temporary Supporting Element

- 212 Tantangara Stockpile
- 213 Tantangara Portal
- Tantangara Stockpile and Barge 214
- 215 Tantangara Accommodation Camp

Access Roads

- 315 Tantangara Spoil Access Road
- 316 Tantangara Road: Publicly Accessible
- 317 Quarry Trail: Publicly Accessible
- 318 Tantangara Camp Road: No Public Access

Figure 6.3 Tantangara Observer Locations 3 of 3

- Recreation Attraction
- Public Exclusion Zone (indicative)
- Operational Access Road
- Unsealed Trail/Track
 - Disturbance Zone

 - MOL (Minimum Operating Level) FSL (Full Supply Level)



6.2.4 Viewpoint 01 Location:

LCZ 1 from within Talbingo Reservoir looking north-west towards shoreline.



Plate 6-1 Viewpoint 1: LCZ 1

Existing conditions:

Dense trees on the shoreline, partially submerged trees in the reservoir, steep rugged terrain of dense forest leading to the waters edge. Crystal clear water revealing macrophytic vegetation below.

Receptor:

Water-based receptors: Fishers, boaters and swimmers within the reservoir. Public access during operation. No public access during construction.

View type:

Foreground view.

Permanent operational elements:

• 112 - Talbingo Shoreline Ravine Bay placement area

Sensitivity	Magnitude of Operation	Impact
HIGH	MODERATE	MODERATE to HIGH
The sensitivity of the view is high for users of the reservoir. The tranquil, picturesque nature of the area experienced from the water greatly influences the sensitivity. So too, the absence of infrastructure.	The permanent emplacement would be seen from this view, 1m above the FSL. Talbingo Reservoir would be kept closer to FSL the majority of times, according to SHL. The potential to vegetate the spoil would reduce the magnitude, during operation . The spoil will be rehabilitated in accordance with the Rehabilitation Strategy. The disturbed shoreline through fluctuating water levels during operation however, may have a further detrimental visual impact on the condition of it. This is further discussed in Section 08. During commissioning, the approach channel would be armoured if needed to assist in the avoidance of turbidity during operation. For these reasons, a moderate magnitude rating has been given for operation.	

Temporary supporting elements:

Barge Ramp

Sensitivity	Magnitude of Construction	Impact
нісн	нісн	HIGH
As above	The trucks and bulldozers would be transient and temporary while distributing spoil via the edge placement into the reservoir. The effect on water clarity may be longer lasting during construction. The clarity of the water has been recorded as a primary reason for visitation to the reservoir and therefore the increased turbidity during construction may have significant visual implications.	



6.2.5 Viewpoint 02 Location:

LCZ 1 from within Talbingo Reservoir looking north.



Plate 6-2 Viewpoint 2: LCZ 1

Existing conditions:

Mixed woodland ecosystem with broadly homogeneous vegetation communities lining the steep hills. The defining Eucalyptus blue haze provides a back drop and is perfectly reflected by the crystal clear water in the reservoir.

Receptor:

Water-based receptors only: Fishers, boaters and swimmers within the reservoir. Public access during operation. No public access during construction.

View type:

Foreground view.

Permanent supporting elements:

• Rehabilitated temporary access road

Sensitivity	Magnitude of Operation	Impact
нісн	LOW	MODERATE
The sensitivity of the view is high for users of the reservoir. The perfectly framed, rolling hills are reflected by the clear waters, where fish can be darting among the dense elodea.	Ravine Bay Road would be viewed as a temporary access road for the spoil placement. Once construction is complete, the area will be rehabilitated and the setting returned to a wooded landscape, however would take time given the extent of mature vegetation surrounding this area.	

Temporary supporting elements:

• Ravine Bay Road

Sensitivity	Magnitude of Construction	Impact
нісн	нідн	HIGH
As above	Ravine Bay Road would be viewed as a temporary access road for the spoil placement. The trucks and bulldozers would be transient and temporary while distributing spoil via the edge placement into the reservoir. This would be rehabilitated following construction, however would take time given the extent of mature vegetation surrounding this area.	
	The effect on water clarity may be longer lasting during construction with high turbidity toward the sediment curtain, which reduces as distance increases from the sediment curtain. The clarity of the water has been recorded as a primary reason for visitation to the reservoir and therefore the increased turbidity during construction may have significant visual implications.	



6.2.6 Viewpoint 03

Location:

LCZ1 from within Talbingo Reservoir looking south-east towards shoreline, on the edge of likely public exclusion zone.

Existing conditions:

Dense Eucalyptus trees leading to the water's edge. Steep, undulating hills frame the valley, with clear water submerging dead trees.

Receptor:

Water-based receptors only: Fishers, boaters and swimmers within the reservoir. Public access during operation (edge of indicative public exclusion zone). No public access during construction.

View type:

Mid-ground view.

Permanent operational elements:

- 101 Talbingo Intake
- 102 Talbingo Control Building
- 103 Middle Bay Barge Ramp established during Exploratory Works
- 301 Talbingo Intake Road
- 304 Wharf Road

Sensitivity	Magnitude of Operation	Impact
нідн	нісн	HIGH
The sensitivity of the view is high for users of the reservoir. A pristine natural setting embodying Australia's alpine environment, free of infrastructure.	The magnitude is high due to the contrast in nature and scale of the proposed elements compared to that of the wholly natural- appearing setting. Potential for magnitude rating to be downgraded after establishment of vegetation to rehabilitated construction areas. Turbidity of the water is a possibility post-commissioning of Talbingo Intake and may add to the magnitude of change at this location. See Section 08 for mitigation measures.	
Temporary supporti	ng elements:	
 201 – Talbingo Por 	tal	

- 202 Talbingo Stockpile and
- 302 Ravine Bay Road
- Barge distributing spoil
- Middle Bay Barge Ramp established during Exploratory Works

Sensitivity	Magnitude of Construction	Impact
нібн	нісн	HIGH
As above	There would be a substantial change from a largely undisturbed setting to a shoreline that reflects cleared vegetation and compacted soils for a duration of six years. Water quality would likely diminish during this period due to turbidity from the nearby placement of excavated rock in Talbingo Reservoir. Refer Plates 6-4, 6-5, 6-6 for visualisations from this viewpoint.	

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-3 Viewpoint 3: Existing view from water, edge of public exclusion zone (indicative)



Plate 6-4 Viewpoint 3: During construction - Typical operating level

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-5 Viewpoint 3: During first year post-commission (Operation) - Full Supply Level



Plate 6-6 Viewpoint 3: 15 year operation - Typical operating level

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-7 Viewpoint 3: 15 year operation - 20% Minimum Operation Level (Rare occurrence)



6.2.7 Viewpoint 04

Location:

LCZ2 from Lobs Hole Ravine Road looking west towards Talbingo Reservoir.

Existing conditions:

Dense woodland covering steep sloping hills down to meandering reservoir. Clearing seen in easement for overhead transmission lines. Herbaceous lower storey of shrubs and grasses.

Receptor:

Walkers, bike riders, horse riders, vehicles, campers using Lobs Hole Ravine Road. Public access during operation. No public access during construction.

View type:

Mid-ground view.

Permanent operational elements:

- 101 Talbingo Intake
- 102 Talbingo Control Building
- 103 Talbingo Barge Ramp
- 304 Wharf Road

Sensitivity	Magnitude of Operation	Impact
MODERATE	нісн	MODERATE to HIGH
The sensitivity of the view is moderate. A meandering river impacted by existing transmission lines, though not dominated by them, with re-established shrub layer beneath cleared easement. The slack of the transmission lines follows the topography of the landscape and assists in camouflaging the cables.	The scale and material of the proposed elements result in a high magnitude of change to the view. The extensive alteration of land form to support the proposed permanent elements would create an unnatural looking landscape. The amount of vegetation clearing and new hardscaping would affect the view for many years.	
Temporary supporti	ng elements:	
 201 – Talbingo Por 	tal	

- 202 Talbingo Stockpile
- 302 Ravine Bay Road
- 305 Middle Bay

Sensitivity	Magnitude of Construction	Impact
MODERATE	N/A	N/A
As above	No public visitation is permitted during construction. Therefore, there would be no visual impact to the public.	

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-8 Viewpoint 4: Existing view from Lobs Hole



Plate 6-9 Viewpoint 4: During construction - Typical operating level

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-10 Viewpoint 4: Commissioning - Full Supply Level



Plate 6-11 Viewpoint 4: 15 year operation - Typical operating level

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-12 Viewpoint 4: 15 year operation - 20% Minimum Operation Level (Rare occurrence)



6.2.8 Viewpoint 05 Location:

LCZ2 View towards the south, within Lobs Hole.



Plate 6-13 Viewpoint 5: LCZ 2

Existing conditions:

Steep, rugged ravine with woodland vegetation and exposed rock. Cleared, grassy foreground with wild flowers, shrubs and individual Eucalypts. Evidence of camping, four wheeled driving and previous uses.

Receptor:

Walkers, bike riders, horse riders, vehicles, campers using Lobs Hole. Public access during operation. No public access during construction.

View type:

Foreground view.

Permanent operational elements:

• 104 - Lobs Hole Substation

Sensitivity	Magnitude of Operation	Impact
нісн	MODERATE	MODERATE-HIGH
The sensitivity of the view is high for observers. The quaint, grassy area beside Yarrangobilly River is a popular tourist location for camping and one of the main reasons for visitation to the area.	The addition of a substation in this location would change the semi-rural to natural character, of this view. The materiality of the substation including 3m perimeter fencing with barbed wire would be a stark contrast to the surrounds.	

Temporary supporting elements:

• 206 - Lobs Hole Construction Compound

Sensitivity	Magnitude of Construction	Impact
нідн	N/A	N/A
As above	No public visitation is permitted during construction. Therefore, there would be no visual impact to the public.	


6.2.9 Viewpoint 06 Location:

LCZ2 Looking north from Lobs Hole Ravine Road along existing transmission line easement.



Plate 6-14 Viewpoint 6: LCZ 2

Existing conditions:

The undulating foreground yields to steep rugged mountains covered in dense woodland vegetation. Existing transmission lines are apparent in the foreground, so to is a winding, unsealed road.

Receptor:

Walkers, Bike riders, Horse Riders, Campers, Vehicles using Lobs Hole Ravine Road. Public access during operation. No public access during construction.

View type:

Midground view.

Permanent operational elements:

• 104 - Lobs Hole Substation

Sensitivity	Magnitude of Operation	Impact
MODERATE	LOW	LOW - MODERATE
The sensitivity of the view is high for observers from this direction, approaching Lobs Hole Camping area. As can be seen, the view contains forested rolling hills from an elevated viewpoint, with instances of infrastructure.	The magnitude of change on this view would be low. Only the very top of the substation gantries would be seen through the vegetation. As well as this, the widening of Lobs Hole Ravine Road and sealing of the road would be visible from this viewpoint. The view would also be transient due to the winding nature of Lobs Hole Ravine Road and would most likely be vehicles using the road.	

Temporary supporting elements:

• 206 - Lobs Hole Construction Compound

Sensitivity	Magnitude of Construction	Impact
MODERATE	N/A	N/A
As above	No public visitation is permitted during construction. Therefore, there would be no visual impact to the public.	



6.2.10 Viewpoint 07 Location:

LCZ3 Looking west from Wallaces Creek Fire Trail towards Talbingo Reservoir



Plate 6-15 Viewpoint 7: LCZ 3

Existing conditions:

Lookout showing the Great Dividing Range and the Yarrangobilly River valley. The dramatic summits of the Talbingo mountains and Bogong Peaks in the distance

Receptor:

Campers, walkers, bike riders, horse riders. Public access during construction and operation.

View type:

Long distance view

Permanent operational elements:

- 101 Talbingo Intake
- 103 Talbingo Barge Ramps
- 104 Lobs Hole Substation
- 108 Upstream Surge Shaft

Sensitivity	Magnitude of Operation	Impact
нідн	LOW	MODERATE
The sensitivity of the view is high from this observer location. The view presents a layered arrangement of The Snowy Mountains with Talbingo Reservoir situated in the distant valley.	The visibility of the permanent elements from this location would be Low. The RLOS analysis shows this location as having some visibility of the surge shaft. However the majority is likely to be screened by the existing vegetation in this viewpoint.	
Temporary supporti	ng elements:	
• 201 – Talbingo Por	tal	
 202 - Talbingo Sto 	ockpile	
 206 - Lobs Hole C 	onstruction Compound	

- 208 Marica Camp
- 209 Marica Stockpile 1

Sensitivity	Magnitude of Construction	Impact
нідн	LOW	MODERATE
As above	The visibility of temporary elements would be difficult from this range. Dust and light pollution during construction is a possibility from this distance.	



6.2.11 Viewpoint 08 Location:

LCZ2 View north from Wallaces Creek Lookout



Plate 6-16 Viewpoint 8: LCZ 2

Existing conditions:

Lookout showing the Great Dividing Range and the Yarrangobilly River valley. The dramatic summits of the Talbingo mountains and Bogong Peaks in the distance

Receptor:

Wheel chair accessible lookout. Walkers, campers at Lobs Hole, visitors to the Lookout. Public access during operation. No public access during construction.

View type:

Long distance, view.

Permanent operational elements:

• N/A

Sensitivity	Magnitude for Operation and Construction	Impact
нісн	NEGLIGIBLE	NEGLIGIBLE
The sensitivity of the view is high for this location. The view offers spectacular alpine scenery with no instances of infrastructure. The observation point frequented by visitors for its grandeur.	The lookout is some 10km from any Snowy 2.0 elements. Although the ZTV reaches this point, it is unlikely that any elements would be seen. However, there is potential light and dust pollution that may be seen in the distance during construction works.	
Temporary supporti	ng elements:	
• N/A		

Access Roads:

• Lobs Hole Ravine Road

Sensitivity	Magnitude for Operation and Construction	Impact
нісн	N/A	N/A
As above	No public visitation is permitted during construction. Therefore, there would be no visual impact to the public.	



6.2.12 Viewpoint 09 Location:

LCZ5 Looking south from within Tantangara Reservoir



Plate 6-17 Viewpoint 9: LCZ 5

Existing conditions:

View of grassed shoreline with dappled vegetation on crest. Densely vegetated, rolling hills in the background.

Receptor:

Water-based receptors: Fishers, boaters and swimmers within the reservoir. Public access during construction and operation.

View type:

Mid-Long distance view.

Permanent operational elements:

- 109 Tantangara Intake
- 110 Tantangara Control Building
- 111 Tantangara Shoreline excavated rock placement

Sensitivity	Magnitude of Operation	Impact
HIGH	MODERATE	MODERATE - HIGH
The sensitivity of the view is high for those using the reservoir by boat. Although man made, the reservoir is enjoyed for its natural appearance and mountainous surrounds.	The magnitude is moderate as multiple permanent elements would be seen from this view. The rear of the Intake and top of control building would only just be sighted, though the excavated rock placement would be obvious. The spoil will be rehabilitated in accordance with the Rehabilitation Strategy which would assist in the mitigation of the view. A changed shoreline condition, depending on the frequency that the intake is used, may also change the visual appearance in an unfavourable way.	
Temporary supportir	ng elements:	

- 212 Tantangara Stockpile
- 213 Tantangara Portal
- 214 Tantangara Stockpile and Barge

Sensitivity	Magnitude of Construction	Impact
HIGH	HIGH	HIGH
As above	Extensive disturbance would happen to the shoreline during the six year construction period. Public access would remain open at this location during the works which would be evident and visually obtrusive to an otherwise natural area.	



6.2.13 Viewpoint 10 Location:

LCZ5 From within Tantangara Reservoir looking southwest



Plate 6-18 Viewpoint 10: LCZ 5

Existing conditions:

Layered blue mountains in the background, shallow, sloping grassed hills forming a sedge-like shoreline, evidenced through a muddy region between green grass and water's edge.

Receptor:

Water-based receptors: Fishers, boaters and swimmers within the reservoir. Public access during construction and operation.

View type:

Mid-ground View.

Permanent operational elements:

• 111 - Tantangara Shoreline excavated rock placement

Sensitivity	Magnitude of Operation	Impact
MODERATE	нісн	MODERATE - HIGH
The sensitivity of the view is moderate for those using the reservoir by boat. Although man made, the reservoir is enjoyed for its natural appearance and mountainous surrounds, though in this particular location the muddy shoreline detracts from the otherwise picturesque view.	The magnitude is high as the amount of change to the existing landscape and view is substantial in this location. The spoil would be a contrasting greyish colour to the existing green grass. Early and effective re-vegetation of the spoil would remedy the magnitude. The turbidity caused by subaqueous excavated rock placement in the reservoir would also have impact on the aesthetic value. A changed shoreline condition, depending on the frequency that the intake is used, may also change the visual appearance in an unfavourable way.	

Temporary supporting elements:

• N/A

Sensitivity	Magnitude of Construction	Impact
MODERATE	нісн	MODERATE - HIGH
As Above	The magnitude is high as the amount of change to the existing landscape and view is substantial in this location. Rehabilitation of spoil placement above FSL will integrate with the landscape once established and will provide improved recreational use to be determined with NPWS. A changed shoreline condition, depending on the frequency that the intake is used, may also change the visual appearance in an unfavourable way.	



6.2.14 Viewpoint 11 Location:

LCZ5 Looking south toward Tantangara Road from within the reservoir



Plate 6-19 Viewpoint 11: LCZ 5

Existing conditions:

Low rolling, densely vegetated hills surrounding a shallow valley. Grassed shoreline, clear water.

Receptor:

Water-based receptors only: Fishers, boaters and swimmers within the reservoir. Public access during construction and operation.

View type:

Mid-long distance view.

Permanent operational elements:

- 109 Tantangara Intake
- 110 Tantangara Control Building
- 111 Tantangara Shoreline excavated rock placement
- 317 Quarry Trail Road

Sensitivity	Magnitude of Operation	Impact
нідн	LOW	MODERATE
The sensitivity of the view is high for observers at this location. From this view the landscape is presented as an Arcadian, naturalistic environment to those using the reservoir for fishing and recreating.	The magnitude of change in this location is moderate as the observer would see multiple permanent elements that are atypical to the existing environment. A changed shoreline condition, depending on the frequency that the intake is used, may also change the visual appearance in an unfavourable way.	
Temporary supporti	ng elements:	

- 212 Tantangara Stockpile
- 213 Tantangara Portal
- 214 Tantangara Stockpile and Barge
- 315 Tantangara Spoil Access Road

Sensitivity	Magnitude of Construction	Impact
нідн	LOW	MODERATE
As above	The magnitude of change due to construction elements is high due to the abundance of construction activity that would be seen. This location is outside the public exclusion zone (indicative), and immediately adjacent the excavated rock placement site.	



6.2.15 Viewpoint 12

Location:

LCZ5 looking south-west towards proposed Intake location from within Tantangara Reservoir, on edge of public exclusion zone (indicative).

Existing conditions:

Densely vegetated mountains leading to the reservoir. Rolling hills with evidence of vehicular dirt tracks. Grassed shoreline on the right of image, rocky slope leading to the water on left with boat launch area.

Receptor:

Water-based receptors only: Fishers, boaters and swimmers within the reservoir. Public access during operation. Public access during construction may be restricted due to safety requirements.

View type:

Mid-long distance view.

Permanent operational elements:

- 109 Tantangara Intake
- 110 Tantangara Control Building
- 317 Quarry Trail Road
- 316 Tantangara Road
- 318 Tantangara Intake Road

Sensitivity	Magnitude of Operation Impact	
нісн	MODERATE	MODERATE-HIGH
The sensitivity of the view is high from this observer location. The natural setting provides an ideal backdrop to the reservoir.	The magnitude of change in this location is moderate. The grassy shoreline on the right would be replaced by a large concrete intake with control building atop it. The intake would be slightly oriented away from the observer point so would only partially be seen.	
Visitors use this location for shoreline camping, fishing and swimming.	The shoreline would experience an increased frequency of water level change that would effect the visual appearance of the grassed edge.	

Temporary supporting elements:

- 212 Tantangara Stockpile
- 213 Tantangara Portal
- 214 Tantangara Stockpile and Barge

Sensitivity	Magnitude of Construction	Impact
нісн	нісн	HIGH
As above	The magnitude of the construction activity is high due to the proximity of the observer to the various, obtrusive elements. Refer Plates 6-19, 6-20, 6-21 for visualisations from this viewpoint.	



Plate 6-20 Viewpoint 12: Existing view from water on edge of public exclusion zone (indicative)



Plate 6-21 Viewpoint 12: During construction - Typical operating level



Plate 6-22 Viewpoint 12: Commissioning - Full Supply Level



Plate 6-23 Viewpoint 12: 15 year operation - Typical operating level



Plate 6-24 Viewpoint 12: 15 year operation - 20% Minimum Operation Level (Rare occurrence)

6.2.16 Viewpoint 13

Location:

LCZ5 looking north-west from Tantangara boat ramp into the reservoir

Existing conditions:

Elevated view of reservoir, showing meandering shoreline of low grasses. Rocky boat ramp leading to water's edge with adjacent transmission lines.

Receptor:

Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors. Public access during operation. Public access during construction may be restricted due to safety requirements.

View type:

Mid-long distance view

Permanent operational elements:

- 109 Tantangara Intake
- 110 Tantangara Control Building
- 111 Tantangara Shoreline excavated rock placement
- 317 Quarry Trail Road

Sensitivity	Magnitude of Operation	Impact
нісн	нісн	нісн
The sensitivity of the view is high from this location. The picturesque view from the boat ramp frames the reservoir and grassy shoreline of LCZ 5 and invites visitors down to the water. The ramp is used for boat launching and camping locations are to the east, off the ramp.	The view from this location would be substantially altered by the construction of proposed permanent elements. The intake would be located on the peninsula in the centre of the image above and contrast the natural setting. This area would be fenced and have substantial rehabilitation concluding construction of operational elements. The water in the foreground would not be publicly accessible during operation of the scheme and it is unlikely that the boat ramp would be open and may have opportunity for rehabilitation.	

Temporary supporting elements:

- 213 Tantangara Portal
- 214 Tantangara Stockpile and Barge
- 215 Tantangara accommodation camp

Sensitivity	Magnitude of Construction Impact	
нісн	нісн	HIGH
As above	Construction magnitude from this view would be high. The supporting elements would juxtapose the natural setting. Machinery, vehicles and workers would be visible across the shoreline and greatly lower the attraction for visitors and bushwalkers. Refer Plates 6-23, 6-24, 6-25 for visualisations from this viewpoint.	

Please note, photomontages are based on a conceptual design that may be optimised during detailed design



Plate 6-25 Viewpoint 13: Existing view from road to boat ramp



Plate 6-26 Viewpoint 13: During construction - Typical operating level



Plate 6-27 Viewpoint 13: Commissioning - Full Supply Level



Plate 6-28 Viewpoint 13: 15 year operation - Typical operating level



Plate 6-29 Viewpoint 13: 15 year operation - 20% Minimum Operation Level (Rare occurrence)



6.2.17 Viewpoint 14 Location:

LCZ5 looking west from shoreline towards the spoil location.



Plate 6-30 Viewpoint 14: LCZ 5

Existing conditions:

Background of tree covered mountains, typical of the area. Grassed, undulating shoreline with single trees and shrubs. Some earth and rock exposed.

Receptor:

Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors. Public access during construction and operation.

View type:

Mid-long distance view.

Permanent operational elements:

• 112 - Tantangara Shoreline excavated rock placement

Sensitivity	Magnitude of Operation	Impact
MODERATE	нісн	MODERATE-HIGH
The sensitivity of the view is high in this location. The area is predominantly used by campers and for shoreline fishing. The serene spot provides a naturalistic area to recreate within the KNP.	The spoil location would have a high magnitude of change to the view. This is highly dependent on the ability to camouflage the spoil by naturalising the form and vegetating the surface and the future recreational use to be determined in consultation with NPWS.	

Temporary supporting elements:

• 315 - Tantangara Spoil Access Road

Sensitivity	Magnitude of Construction	Impact
MODERATE	нісн	MODERATE-HIGH
As above	The six years of construction in this location would cause substantial disturbance and change to the view. Bulldozers, vehicles and barges would occupy the area, moving spoil, creating dust.	

122



6.2.18 Viewpoint 15

Location:

LCZ4 looking west from Pocket Saddle Road into Tantangara Reservoir.

Existing conditions:

View through dead snow gums with low sapling under storey to rolling, tree covered hills. Blue water complemented by green grassed shoreline. Dirt tracks evident of camping and 4WD use.

Receptor:

Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors. Public access during construction and operation.

View type:

Mid-long distance view

Permanent operational elements:

- 109 Tantangara Substation
- 110 Tantangara Intake
- 111 Tantangara Control Building
- 317 Quarry Trail Road
- 318 Tantangara Intake Access Road

Sensitivity	Magnitude of Operation	Impact
MODERATE	нісн	MODERATE-HIGH
From this location, the sensitivity is moderate. Visitors using Pocket Saddle Road would have dappled views into the reservoir, between the existing Eucalyptus trees. There are also small clearings for campers along the eastern side of Pocket Saddle Road and the sun sets over the hill in the image above during the Summer months. A picturesque view of Tantangara.	The magnitude of change in this location would be high. The peninsula seen in the image above has heavily used access tracks leading onto it. The grassed shoreline is utilized by campers and fishers and is soon to be closed to the public, with multiple permanent operational elements atop it. The condition of the shoreline may change when the intake is in use.	

Temporary supporting elements:

- 214 Tantangara Portal
- 215 Tantangara Stockpile and Barge
- 315 Tantangara Spoil Access Road

Sensitivity	Magnitude of Construction	Impact
MODERATE	нісн	MODERATE-HIGH
As above	A high magnitude of change would result from the seven years of construction activities in this view. Machinery, workers, dust and light pollution would effect the quality of environment currently experienced. Refer Plates 6-28, 6-29, 6-30 for visualisations from this viewpoint.	



Plate 6-31 Viewpoint 15: Existing view from Pockets Saddle Road



Plate 6-32 Viewpoint 15: During construction - Typical operating level



Plate 6-33 Viewpoint 15: Commissioning - Full Supply Level



Plate 6-34 Viewpoint 15: 15 year operation - Typical operating level



Plate 6-35 Viewpoint 15: 15 year operation - 20% Minimum Operation Level (Rare occurrence)



6.2.19 Viewpoint 16

Location:

LCZ4 looking north-west into Tantangara Reservoir from the existing dam wall.

Existing Condition:

Foreground view of concrete dam wall, fencing and guard rail. Mid ground view of rip-rap and exposed shoreline to left. Long distance view of natural, rolling hills with grassed, flattish shoreline.

Receptor:

Campers in Tantangara, Walkers, Horse and Bike Riders, 4WD's, Visitors. Public access during operation. Public access during construction may be restricted due to safety requirements.

View type:

Long distance view.

Permanent operational elements:

- 110 Tantangara Intake
- 111 Tantangara Control Building
- 112 Tantangara Shoreline excavated rock placement
- 317 Quarry Trail Road

Sensitivity	tivity Magnitude of Operation Im	
MODERATE	MODERATE	MODERATE
Visitors using Tantangara Road are aware of the Snowy Scheme and in this location would be standing atop the existing dam wall, viewing other supporting infrastructure. The naturalistic appearing area in the centre of the image, however is sensitive to change.	Although the dam wall is located within the view, the new permanent operational elements would cause substantial change to the existing landscape seen in the long distance view of the image. The peninsula would exhibit cleared vegetation, new formalised roads and Tantangara Intake, Control Building and Excavated rock placement, in the distance. Note that during lower operating levels the observer would see more of the intake, and little during FSL. This may impact the magnitude.	

Temporary supporting elements:

- 214 Tantangara Portal
- 215 Tantangara Stockpile and Barge
- 216 Tantangara Accommodation camp

Sensitivity	Magnitude of Construction	Impact
MODERATE	нісн	MODERATE-HIGH
As above	Construction activities would be obtrusive from this angle. Large amounts of clearing, machinery, dust would be noted. Rehabilitation to these areas would greatly assist in lowering this impact. Refer Plates 6-32, 6-33, 6-34 for visualisations from this viewpoint.	



Plate 6-36 Viewpoint 16: Existing view



Plate 6-37 Viewpoint 16: During construction - Typical operating level



Plate 6-38 Viewpoint 16: Commissioning - Full Supply Level



Plate 6-39 Viewpoint 16: 15 year operation - Typical operating level



Plate 6-40 Viewpoint 16: 15 year operation - 20% Minimum Operation Level (Rare occurrence)



6.2.20 Viewpoint 17 Location: Russell Lot, looking south from Snowy Mountains Highway

Plate 6-41 Viewpoint 17: LCZ 5

Receptor:

Commuters, workers, tourists predominantly from vehicle, using Snow Mountains Highway, residents from neighbouring properties.

View type:

Mid ground view

Permanent operational elements:

• N/A

Temporary supporting elements:

• 211 - Russell Lot Construction Yard

Sensitivity	Magnitude of Construction	Impact
MODERATE	MODERATE	MODERATE
The sensitivity of the view is moderate. Many people use the Snowy Mountains Highway as a tourist drive. In this area there is little to no development adjacent the road, allowing for a scenic trip.	The magnitude of change to this observer location is high. However, there exists potential in this location to retain vegetation for screening purposes.	
	The construction yard would contain Truck lay down, material lay down area and portable facilities. Heights may exceed height of existing vegetation. Neighbouring property at 6560 Snowy Mountains Highway, would have high magnitude of change, however motorists may only experience moderate magnitude.	
	This area returned to previous use in line with the rehabilitation strategy, and as agreed with the landowner.	



6.3 Visual Impact Summary

The visual impact assessment of Snowy 2.0 Main Works, represents a qualitative assessment based on the sensitivity of setting for each observer location and the magnitude of change considering each permanent operational element. The results of the assessment for each observer location during operation are summarised in the table below.

6.3.1 Permanent operational elements

It can be noted that the sensitivity to change for each viewpoint location is predominantly either moderate or high. This is due to the historical, cultural and environmental significance of the region, imbued in the Australian psyche. The KNP, as before mentioned is the only true alpine environment on the continent, presenting a fragile and visually aesthetic landscape that attracts people to it, year round. The potential loss of the aesthetic and perceptual aspects that are key to the character of the nationally valued landscape have equated to the higher sensitivity ratings. The magnitude of change on the 17 viewpoints has resulted in a mixed spread of ratings due to the varying scale of elements across the large site area. As can be seen, in the locations immediately adjacent each reservoir, where the majority of permanent surface elements would be located, has yielded a moderate to high rating for 14 of the 17 viewpoints. The remaining viewpoint's magnitude ratings are either negligible or low due to distance to the project or screening by adjacent vegetation, range of elevation of site or scale of proposed elements.

Viewpoint number	Sensitivity	Magnitude	Impact
1	HIGH	MODERATE	MODERATE - HIGH
2	HIGH	LOW	MODERATE
3	HIGH	HIGH	HIGH
4	MODERATE	HIGH	MODERATE - HIGH
5	HIGH	MODERATE	MODERATE - HIGH
6	MODERATE	LOW	LOW - MODERATE
7	HIGH	LOW	MODERATE
8	HIGH	NEGLIGIBLE	NEGLIGIBLE
9	нісн	MODERATE	MODERATE - HIGH
10	MODERATE	HIGH	MODERATE - HIGH
11	HIGH	LOW	MODERATE
12	HIGH	MODERATE	MODERATE - HIGH
13	HIGH	HIGH	HIGH
14	MODERATE	HIGH	MODERATE - HIGH
15	MODERATE	HIGH	MODERATE - HIGH
16	MODERATE	MODERATE	MODERATE
17	MODERATE	N/A	N/A

Table 6.1 Visual Impact of Snowy 2.0 Operation.

12 September 2019

6.3.2 Visual Impact Assessment Summary on Temporary supporting elements

The visual impact assessment of SNOWY 2.0 Main Works, represents a qualitative assessment based on the sensitivity of setting for each observer location and the magnitude of change considering temporary supporting elements required during construction. The results of the assessment for each observer location for construction are summarised in the table below.

It can be noted that the sensitivity to change for each viewpoint location is the same for both operation and construction, and is generally of a high rating as mentioned above.

The magnitude of change due to temporary construction elements has resulted in a number (6 of 17) of high ratings. These are due to construction work and biproducts of the project build. The magnitude of change on the 17 viewpoints has resulted in a mixed spread of ratings due to the varying scale of elements across the large site area. As can be seen, in the locations immediately adjacent each reservoir, where the majority of temporary surface elements would be located, has yielded a moderate to high rating for 13 of the 17 viewpoints. The remaining viewpoint's magnitude ratings are either N/A due to no public access.

Six of the 17 impact ratings are HIGH. This number is reduced to two during operation, at the removal of temporary supporting elements.

Viewpoint number	Sensitivity	Magnitude	Impact	
1	HIGH	нідн	нідн	
2	HIGH	HIGH	HIGH	
3	HIGH	HIGH	HIGH	
4	MODERATE	N/A	N/A	
5	HIGH	N/A	N/A	
6	MODERATE	N/A	N/A	
7	HIGH	LOW	MODERATE	
8	HIGH	N/A	N/A	
9	HIGH	HIGH	HIGH	
10	MODERATE	HIGH	MODERATE - HIGH	
11	HIGH	LOW	MODERATE	
12	HIGH	HIGH	HIGH	
13	HIGH	HIGH	HIGH	
14	MODERATE	HIGH	MODERATE - HIGH	
15	MODERATE	HIGH	MODERATE - HIGH	
16	MODERATE	HIGH	MODERATE - HIGH	
17	MODERATE	MODERATE	MODERATE	

Table 6.2Visual Impact of Snowy 2.0 Construction.

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Cumulative Impact Assessment

Section 07



Figure 7.1 Cumulative Impact Context Overview



Cumulative Impact Assessment

A separate development proposal within the study area is the Snowy 2.0 Transmission Connection Project (TCP). Approval for the TCP is being sought by TransGrid under a separate application (SSI-9717).

This section discusses the potential cumulative landscape character and visual impacts that could be expected in the study area, as a result of operating both the Snowy 2.0 Main Works project and the TCP.

In addition, this section also considers potential cumulative effects that might be derived as a result of the project and potential climate change effects.

7.1 Transmission Connection Project

7.1.1 Overview of the TCP

The TCP involves:

- A new 330/500 kV substation at Maragle, west of Lobs Hole and the Tumut River arm of Talbingo Reservoir
- Two new 330 kV double-circuit transmission lines with new easements, from the cable yard at the ECTV Portal (part of the proposed Snowy 2.0 Main Works) to the Maragle substation
- Transmission line connection consisting of about three towers between the Maragle substation and Line 64
- Establishment and upgrade of access tracks and roads to the substation and transmission line structures
- Ancillary facilities such as brake and winch sites, crane pads, helicopter landing pad, site compounds and equipment laydown areas.
- The transmission lines would extend about nine kilometres in an east-west direction, linking the cable yard at Lobs Hole (proposed by Snowy 2.0 Main Works) with the new substation at Maragle.
- The project is considered integral to the success of Snowy 2.0 as it would provide a direct connection to the transmission network and the National Electricity Market (NEM).
- The NEM is a wholesale market through which generators and retailers trade electricity in Australia. It covers around 40,000 km of transmission lines and cables, supplying around 9 million customers. The TCP connection is key to feed the energy that would be generated by Snowy 2.0 into the NEM.

The transmission connection would also allow the Snowy 2.0 storage 'battery' to be charged during periods of low demand.

The detailed composition of the elements required for the TCP are currently being developed. TransGrid's indicative concept design has been used as the basis for this cumulative assessment. The following additional assumptions were made:

- Transmission towers that support the conductors would be steel lattice towers approximately 50m high, and spaced at roughly 300m intervals.
 However, towers could be up to 90m high to increase the interval between towers and enable long spans
- The connection would require an easement of cleared vegetation up to 120m in width
- The substation would be located on the western side of Talbingo and not be visible from the landscape character zones discussed in section 04.

7.1.2 Potential visual effects

Potential magnitude of visual effect as a result of the TCP is derived from:

- Direct visual effects derived from the built infrastructure itself
- Indirect visual effects derived from the potential for an increase in bushfire risk as a result of operation.

Magnitude derived from built infrastructure

The primary magnitude of visual effect would be derived from the three new transmission towers. They would be prominent large new structures in the landscape, exacerbated by the clearing required for the easement. The easement would be minimised by increased tower height, however would result in a taller structure. Both the easement and structure have the potential to be readily visible from a range of vantage points in the area. Magnitude of visual effect would also be derived from the transmission cables, especially in areas where they would be experienced silhouetted against the sky such as at ridgeline crossings or when passing under the cables.

The magnitude of visual effect would therefore be highly variable, ranging from high in the immediate vicinity of the TCP, to low when seeing the TCP from a distance and against a bushland backdrop. Viewpoints of Snowy 2.0 Main Works that would be affected by potential cumulative visual impacts are summarised in Table 7.2.

Magnitude derived from operation

The study area is at risk from bushfires. Bushfire risk has been addressed within the Bushfire Risk assessment within the EIS.

Potential landscape character effects

Both TCP built infrastructure and increased bushfire activity would affect the landscape character, due to their potential direct and indirect impacts on the scenic and landscape quality as discussed above.

It is noted that high voltage transmission lines are already present in the study area and are an integral part of operating any power scheme. While the TCP would introduce new infrastructure to the area, it would not introduce a new type of infrastructure that might be considered 'foreign'. Although the history and underlying function of much of the landscape is well known, and there is likely a higher level of acceptance of supporting infrastructure, the cumulative impacts of operating both the Snowy 2.0 Main Works project and the TCP would result in greater impacts to the LCZ's and viewpoints. The cumulative landscape character impacts of the TCP within the context of the Snowy 2.0 Main works have been assessed are summarised in Table 7.1.

7.2 Light Pollution

Light pollution is an indirect visual impact of Snowy 2.0 that would add to the cumulative visual impact of the project. There would be a permanent increase in light pollution around permanent operational elements though this pollution can be mitigated using minimization of light spill principles through design and is discussed in mitigation strategies in the next chapter.

Light pollution during construction would be substantially higher to that of current conditions. Construction works would be in operation up to 24 hours a day and would subsequently require significant lighting. Increases in traffic and accommodation camps would further contribute to the light pollution. The light pollution would have a cumulative impact on visitor experience within KNP. The sky within the park prior to the commencement of exploratory works in 2018 can be seen in the map below as exhibiting a 'dark sky' with radiance of less than .04W/cm as shown on the radiance gradient in Figure 7.2 and 7.3. The darkness of the sky greatly influences visibility to stars which is a desirable camping aesthetic.

Nocturnal animals that hunt during night would also be affected by the increase in light pollution to the area. It is likely that there will be temporary dispersal to other nearby suitable habitats during construction, as outlined within the biodiversity report, due to increased light pollution and noise. Depending on the species, fauna should return once construction is completed. Changes to migratory patterns of these animals due to increased night time light and noise can in turn, have knockon effects on visitor experience.

The following images show light pollution in 2017 and 2018 across KNP study area.

It is evident that in areas within the Marica area that light pollution levels are comparable in 2018 to that of a suburban sky and in 2017, a dark/rural sky. This increase in light pollution is likely the result of geotechnical drilling in this area which were 24 hour works that commenced in 2018 for Snowy 2.0.



Figure 7.3 Light pollution map of the KNP taken in 2018

FINAL

7.3 Climate change

Overview

The following overview highlights the potential predictions of the impact that climate change may have by 2060. As part of this overview, potential effects of higher temperatures and reduced precipitation will be outlined and the impacts of Snowy 2.0 as an element within this changing landscape will be provided. Further to this, the proposal's impact on climate change, through vegetation clearing is discussed within the Air quality impact assessment (EMM) appended to the EIS. It is noted that Snowy 2.0 is proposed as an important project to supplement the NEM with renewable energy as a means to minimise fossil fuel reliance and mitigate the potential impacts of climate change.

Snowy 2.0 Main Works Scoping Report (2018) identified key climate change projections for the region over the next 40 year period:

- Mean, maximum and minimum air temperatures are projected to rise by an average of 2°C (by 2060-2079) with an increased frequency of extreme hot days
- Dam inflow is projected to decrease on average, driven predominantly by reduced cool season precipitation including snow fall
- Rainfall is projected to decrease by 13% on average (by 2060) with an increased frequency of drought events
- Precipitation is projected to become more intense
- Severe weather is projected to become more frequent, including an increase in severe bushfire conditions as a result of a lengthening of the fire season.

The above projections may affect the study area as follows:

- Higher temperatures, increased evaporation and decreases in precipitation could lead to reduced inflows to the reservoirs. Vegetation may as a result may be impacted, depending on the resilience and adaptability of vegetation, however could lead to greater exposure of large project elements such as the intakes and excavated rock placement areas along the foreshores
- The study area is currently at risk from bushfires. The increase of severe weather events and storm activity has the potential to increase the frequency and intensity of electrical storms that may lead to an increase in bushfires.

7.4 Cumulative Impact Assessment Summary

The findings of the cumulative landscape character impact assessment and cumulative visual impact assessment are presented in Table 7.1 and Table 7.2 respectively.

LCZ	Cumulative Impact Source	Landscape Character Impact	Cumulative Magnitude of Visual Effect	Cumulative Impact Rating
1	-	MODERATE - HIGH	MODERATE (Unchanged)	MODERATE
2	 Transgrid's Transmission Connection Project 	MODERATE	нідн	MODERATE - HIGH
3	-	LOW - MODERATE	LOW (Unchanged)	LOW
4	-	NEGLIGIBLE	NEGLIGIBLE (Unchanged)	NEGLIGIBLE
5	-	NEGLIGIBLE	NEGLIGIBLE (Unchanged)	NEGLIGIBLE
6	-	нідн	HIGH (Unchanged)	HIGH
7	-	MODERATE	N/A	N/A

Table 7.1 Cumulative visual impact summary by LCZ

Viewpoint Number	Existing Elements	Proposed Elements	Impact Type*	Visual Impact Rating	Cumulative Magnitude of Visual Effect	Cumulative Impact Rating
1	 Existing Power Lines Talbingo 	-	Combined - in combination	MODERATE - HIGH	MODERATE - HIGH	MODERATE - HIGH
2	 Existing Power Lines Talbingo 	-	Combined - in combination	MODERATE	MODERATE	MODERATE
3	 Existing Power Lines Talbingo 	-	Combined - in combination	HIGH	HIGH	HIGH
4	 Existing Power Lines Talbingo 	-	Combined - in combination	MODERATE - HIGH	MODERATE - HIGH	MODERATE - HIGH
5	• Existing Power Lines Talbingo	 Transgrid's Transmission Connection Project - Proposed Transmission Lines 	Combined - in combination and succession	MODERATE - HIGH	нібн	HIGH
6	 Existing Power Lines Talbingo 	 Transgrid's Transmission Connection Project - Proposed Transmission Lines 	Combined - in combination and succession Sequential - occasionally	LOW- MODERATE	нідн	MODERATE - HIGH
7	-	-	N/A	MODERATE	N/A (no permanent elements)	N/A
8	-	-	N/A	NEGLIGIBLE	N/A (no permanent elements)	N/A
9	-	-	N/A	MODERATE - HIGH	N/A (no permanent elements)	N/A
10	-	-	N/A	MODERATE - HIGH	N/A (no permanent elements)	N/A
11	Tantangara dam wallTantangara power lines	-	Combined - in combination	MODERATE	MODERATE	MODERATE
12	Tantangara dam wallTantangara power lines	-	Combined - in combination Sequential - Frequently	MODERATE - HIGH	MODERATE - HIGH	MODERATE - HIGH
13	• Tantangara power lines	-	Combined - in combination Sequential - Frequently	HIGH	нісн	HIGH
14	-	-	Combined - in combination	MODERATE - HIGH	N/A (no permanent elements)	N/A
15	Tantangara power linesTantangara dam wall	-	Combined - in combination	MODERATE - HIGH	MODERATE - HIGH	MODERATE - HIGH

 Table 7.2
 Cumulative landscape character impact summary by Viewpoint

Viewpoint Number	Existing Elements	Proposed Elements	Impact Type*	Visual Impact Rating	Cumulative Magnitude of Visual Effect	Cumulative Impact Rating
14	 Tantangara power lines 		Combined - in combination	MODERATE	MODERATE	MODERATE
1 0 • Ta da	 Tantangara dam wall 	-	Sequential - Frequently			
17	-	-	N/A	N/A	N/A (no permanent elements)	N/A

* Impact type: There are several types of cumulative visual impacts, outlined as follows:

Combined - in combination	Where elements from more than one project would be within the observer's arc of vision at the same time without moving their head
Combined - in succession	Where the observer has to turn their head to see elements from more than one project
Sequential - frequently	Occurs when the observer has to move to another viewpoint to see the same or different elements: elements appear regularly and with short time lapses between instances depending on speed of travel and distance between viewpoints
Sequential - occasionally	Occurs when the observer has to move to another viewpoint to see the same or different elements: there would be longer time lapses between sighting elements because the observer is moving slowly and/or there are large distances between viewpoints.

 Table 7.2
 Cumulative landscape character impact summary by Viewpoint (Continued)
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Mitigation Strategy

Section o8

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Mitigation Strategy

8.1 Introduction

This section presents a series of potential measures to prevent, avoid, reduce and where possible, offset or remedy the potential landscape character and visual impacts of the project, in order to maintain the amenity, recreation value and conservation value of KNP as the site of Australia's only true alpine environment.

Best practice impact mitigation follows a hierarchy that should be applied at each stage of a project and includes

- · Prevention/avoidance
- Reduction
- Offset
- Remedy

Prevention or avoidance is generally a more effective and therefore better option to reducing the potential impacts of a project than remediation following construction, or compensation, either locally or elsewhere. Prevention or avoidance is most effectively achieved during the design phases of the project, though construction processes can also influence the extent, duration and magnitude of impacts experienced during the construction phase.

For both the design and construction phases, measures and processes need to ensure both their effectiveness in mitigating adverse effects and their appropriateness in terms of fit with the existing landscape and visual character.

Mitigation measures for Snowy 2.0 can fall into three categories:

- · Primary measures
- Secondary measures
- · Standard management.

Primary measures are preventative measures and are best developed through an iterative design process that embeds the need for visual and landscape character impact mitigation into the project design process.

Secondary measures address residual adverse impacts that remain after primary measures have been incorporated into the design. They include measures to offset, remedy or compensate the identified impacts.

Standard management relates to construction and operation practices for avoiding and reducing visual impacts.

It must be noted that final mitigation measures will be developed and optimised throughout the detailed design phase of the project, and in consultation with NPWS and other key stakeholders to the project.

8.2 Primary Mitigation Measures

A number of primary mitigation measures have been incorporated into the initial project design. They include decisions made concerning site selection, access, layout and the locations and design of infrastructure elements. It also includes commitments to landscaping and rehabilitation both progressively during construction as well as final rehabilitation at completion of construction. Potential landscape character and visual impacts are one of a wide series of constraints considered during this process.

Further measures to reduce potential landscape character and visual impacts are discussed in Section 8.3.

8.3 Secondary Mitigation Measures

The following outlines a series of measures recommended for consideration and integration during further design development of the project, in order to minimise the impacts identified in section 04 and section 05.

Materials and finishes

As the proposal introduces additional built elements and hard surfaces into KNP, it is important that they are designed to complement, and where possible, recede into the surrounding landscape, in order to maintain the amenity and visual values of the area.

Some examples of secondary mitigation measures include:

- The use of non-reflective paint should to avoid glare and surface reflectivity as they increase the visual prominence of structures
- The use of dark colours is preferred as they are usually better absorbed within natural areas. Greens should be avoided. Greys and charcoal colours generally provide less visual contrast to the colours of the Australian landscape and complement the hues of the alpine environment of native woodlands
- The use of oxide and dark aggregates for exposed concrete surfaces in order to prevent glare and reduce the contrast between the existing environment and new project elements

- The use of textures in particular of large surfaces reduces the contrast between built elements and the surrounding (textured) natural environment and reduces the potential for glare. Examples include shot-blasting or ribbing of concrete to create shadows and patterns and can result in reducing the perceived scale of new elements
- Use a combination of form, where possible,, colour and texture to reduce the perceived scale of new structures, especially those visible from popular recreation areas and destinations such as the reservoirs
- Investigate opportunities to emulate natural rock textures and geological features in the placement of subaqueous rock. A texture surface would reduce the potential visual impact on the shoreline environment and has the potential to provide habitat. It also offers greater potential for natural sedimentation to occur that, over time might form a soil layer that matches adjoining shore areas to remove the visual contrast between the existing shore and excavated rock placement areas. Finally, establishment of a soil layer might enable the establishment of vegetation suited to the changing wet/ dry conditions, or of vegetation that might cover the shoreline during potential extended periods of low water levels, such as may result from droughts or climate change
- Where possible, maximise locally sourced materials for a better fit with the textures and colours of the landscape and its underlying geology. A local example of this approach is the Tumut 2 Power Station adit entrance, where locally sourced rock has been used to clad the facility
- Integrate materials and finishes already present in the area including elements of vernacular architecture where appropriate for example tin roofs or other materials used locally/ traditionally. Use of these materials should be inventive to realise a 21st century aesthetic where appropriate, including in a high visibility areas. Consideration would still need to be given to the reduction of glare and of apparent bulk of form.

Vegetation and re-vegetation

- Maximise the use of vegetation to screen proposed project elements either at the source (where feasible) or at strategic locations to provide a visual buffer between project elements and popular views, tourism destinations or vantage points such as lookouts, picnic areas, camping areas or visitor centres
- Screening vegetation should be incorporated between FSL and facilities where practical. The opportunity to screen facilities at Tantangara should be explored with the incorporation of suitable height buffer planting on the eastern, northern and southern sides of the buildings to reduce visibility as these are the primary areas that will be exposed.

- Where possible, design the project and construction methodologies to minimise the extent of tree and vegetation clearing. Investigate the potential for the protection of individual and clusters of trees through thoughtful layout design of each site for its potential to reduce both construction and operational impacts through increased visual screening and protection of new tubestock and seed mixes during rehabilitation, as well as the incorporation of support planting..
- Program the works to incorporate a strategic and staged re-vegetation plan to reduce impacts during construction and ongoing impacts during operation while vegetation matures. A rehabilitation strategy for the project has been prepared and should be referred to for further details.

Lighting

• Design lighting (including flood lighting) during both construction and operation to avoid spill that might affect sensitive areas or receivers.

8.4 Standard Management Measures

Temporary accommodation

• Develop a landscape responsive layout for temporary worker accommodation. Where possible, the design and layout should seek to integrate the buildings into the landscape to minimise visual impacts

Construction management

Managing the interface between construction activities and tourism would be a key issue for the project, given the area's significant tourism values and extended construction period.

As part of the construction management plan for the project, the following measures should be considered to minimise visual impacts during construction:

- Prompt incident responses including removal of debris or spills outside of construction zones to prevent adverse visual impacts and adverse impacts on traffic flow/ accessibility and connectivity through the region
- Stabilise stockpiles to prevent erosion by wind and water and avoid the development of dust plumes adversely impacting air and visual quality. Refer to the Social impact assessment (Elton Consulting 2019) and Recreational user impact assessment (TRC Tourism 2019) – both are appended to the EIS for more information.
- Provide project induction to all staff employed in the construction of the scheme to ensure positive interactions between construction staff and park users, and make staff aware of the visual values and sensitivity of the area
- Keep the public informed of the progress of the project through a range of media channels, including updates on significant milestones, upcoming work, and potential temporary changes to access, traffic or park use.

Annexures

Section 09

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Annexures

9.1 Zone of Theoretical Visibility and Observer Locations

The following images depict the Zone of Theoretical Visibility (ZTV) for each permanent operational element. Each ZTV has been constructed via Radial Line of Sight (RLOS) analysis on the Digital Surface Model (DSM) and Digital Terrain Model (DTM) for the entire site boundary. Visibility of each element is seen in green and it is important to note that although the RLOS analysis shows visibility up to 10km away, visibility from this distance would be extremely limited and is discussed further in Section 06.

Temporary supporting elements of the project are located predominantly adjacent permanent operational elements. It is for this reason, combined with the temporary nature of these elements that they have been excluded from the RLOS analysis. However, all elements both permanent and temporary, have been included in the ZTV and are discussed in the visual impact assessment in Section 06. The concentric circles show 2, 5 and 10km radii from each permanent operational element.



Plate 9-1 101 - Talbingo Intake: ZTV





Plate 9-2 102 - Talbingo Control Building: ZTV



Plate 9-3 103 - Talbingo Barge Ramps: ZTV 12 September 2019

FINAL



Plate 9-4 104 - Lobs Hole Substation: ZTV



Plate 9-5 105 - ECVT Portal and Cable Yard: ZTV





Plate 9-6 106 - MAT Portal: ZTV



Plate 9-7 107 - Marica Ventillation Shaft: ZTV 12 September 2019

FINAL



Plate 9-8 108 - Upstream Surge Shaft: ZTV



12 September 2019

Plate 9-9 109 - Tantangara Intake: ZTV FINAL





Plate 9-10 110 - Tantangara Control Building: ZTV



Plate 9-11 111 - Tantangara Shoreline Excavated rock placement: ZTV 12 September 2019 FINAL



Plate 9-12 112 - Talbingo Shoreline Ravine Bay placement area: ZTV



Plate 9-13 ZTV Existing Transmission Line 01 FINAL



Plate 9-15 ZTV Existing Transmission Line 02



Plate 9-14 ZTV Existing Transmission Line 03 12 September 2019

FINAL



Plate 9-16 ZTV Proposed Transgrid Transmission Line