Go Jindabyne Master Plan
The Go Jindabyne Master Plan was announced in November 2018, to revitalise Jindabyne into Australia’s premier alpine destination at the heart of the Snowy Mountains, and grow the town into a great place to live, work and visit year-round.

Upon commencement of the project, the NSW Department of Planning, Industry and Environment commissioned a range of technical studies to develop an evidence base that would subsequently inform drafting of the Go Jindabyne Master Plan. The technical studies commissioned for the Go Jindabyne Master Plan were conducted between March and July 2019 by specialist consultants with expertise in a variety of different fields:

1. Demographics and Housing Study (Consultant: City Plan)
2. Environment and Heritage Study (Consultant: NGH Environmental)
3. Economic Development and Tourism Study (Consultant: Hill PDA)
4. Mobility and Connectivity Study (Consultant: GTA Consultants)
5. Infrastructure and Services Study (Consultant: Aecom)

Analysis of the technical studies listed above, together with public consultation conducted in 2019, made it apparent that Jindabyne, as a town, is heavily dependent on the economic activity that occurs outside of the town itself – particularly within Kosciuszko National Park.

Snowy Mountains Special Activation Precinct
In response, the Snowy Mountains Special Activation Precinct was announced in November 2019, to expand the scope of the Go Jindabyne Master Plan to encompass the wider Snowy Mountains region. The Snowy Mountains Special Activation Precinct will continue to focus on Jindabyne’s transformation into Australia’s Alpine Capital, but will now also include the high-visitation areas within the southern region of Kosciuszko National Park as well as the key transport corridors between Jindabyne and the alpine resorts.

The objective of the Snowy Mountains Special Activation Precinct is to increase year-round tourism by making the region an unmissable place to visit during any season. Benefits offered by a Special Activation Precinct include streamlined planning, government-led development, and a business concierge service that will make it easier for new businesses to set up in the region and for existing organisations to thrive.
The Special Activation Precinct will build upon the work already undertaken as part of the Go Jindabyne Master Plan to identify opportunities to:

- promote the development of year-round adventure and eco-tourism attractions and improve tourism amenity within the region,
- improve access within and to the region, to support increased visitation numbers,
- remove capacity constraints to enable growth in winter tourism, and
- grow the region into Australia’s national training base for high performance alpine athletes and para-athletes.

Public Release of Go Jindabyne Technical Studies
The Department is now publicly releasing the technical studies from the Go Jindabyne Master Plan, as part of our ongoing commitment to community engagement and transparency.

Please note that these technical studies were conducted under the original scope of the Go Jindabyne Master Plan and thus may no longer be relevant and are not directly applicable to the Snowy Mountains Special Activation Precinct, given its expanded scope. Accordingly, the findings of these Go Jindabyne technical studies are subject to change through the Snowy Mountains Special Activation Precinct process. For this reason, we are not seeking public comments on these technical studies. Please also note that at this stage, the findings of these technical studies have not been endorsed by the NSW Government.

You will find that some information has been redacted from these technical studies to protect culturally and commercially sensitive information and ensure privacy of landholders. Specifically, the following information has been redacted:

- **Demographics and Housing Study**
  The following information has been redacted because it contains commercially sensitive information related to specific properties in Jindabyne:
  - Tables 36, 41, 43, 44, 46, 48, 68 and 69 (as well as their references in the table of contents).
  - Figures 58, 80 and 81 (as well as their references in the table of contents).
  - Text on pages 113, 151 and 156.

- **Environment and Heritage Study**
  The following information has been redacted to protect sensitive Aboriginal cultural heritage information, or because further analysis is required to confirm the accuracy of these findings:
  - Figures 4-2, 4-7, 4-8, 4-9, 5-4, 5-5, 5-7, 5-8, 5-9, 6-3, 6-4, 6-5, 7-1, and 7-2 (as well as their references in the table of contents).
These Go Jindabyne technical studies will be reviewed in detail through the Snowy Mountains Special Activation Precinct process, and their respective scopes will be expanded to reflect the larger investigation area that now includes areas of Kosciuszko National Park. The technical studies that will be prepared for the Snowy Mountains Special Activation Precinct will be publicly released in early 2021 when the draft Snowy Mountains Master Plan is released for public comment.

**Next Steps**
The NSW Department of Planning, Industry and Environment will continue to work closely with the community, stakeholders, Snowy Monaro Regional Council, and other NSW Government agencies on the Snowy Mountains Special Activation Precinct.

Community consultation on the Snowy Mountains Special Activation Precinct commenced in early 2020, and will continue throughout the project.

To keep informed on the Snowy Mountains Special Activation Precinct, please visit our project website at www.planning.nsw.gov.au/snowymountainssap and subscribe to our email list to receive future updates and opportunities to have your say.

Any questions regarding these technical studies or the Snowy Mountains Special Activation Precinct can be directed to Rukshan de Silva, Principal Planner, at rukshan.desilva@planning.nsw.gov.au.

We look forward to working with you to shape the future of the Snowy Mountains.

Yours sincerely,

Anthea Sargeant
Executive Director, Key Sites and Assessments
NSW Department of Planning, Industry and Environment
Environment and Heritage Study

GO JINDABYNE 2036 MASTERPLAN

JULY 2019
**Document Verification**

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ACKNOWLEDGMENTS

HERITAGE STUDY

We would like to acknowledge the Ngarigo people, traditional owners of the land in which our study is based. We recognise their continuing connection to land, waters and culture and pay our respects to their Elders past, present and emerging.

This project has been an exercise in becoming proficient in someone else’s history and we would like to thank those whose history it is for sharing it so extensively and freely with us.

To Deanna Davison and Iris White we would like to thank you for sharing your family histories and that of your ancestors. You filled in parts of the picture that were missing to us.

We would like to thank Tom Barry for sharing his family history and Leisa Caldwell for providing documents we couldn’t find and all of the workshop participants who so readily and enthusiastically discussed their history and families.

In particular we would like to thank Judy Winter and the Snowy River Historical society for opening their doors and library for us to pillage, we promise to return those books!

Special thanks need to be extended to Rosemary Stewart-Beardsley whose training as a social historian helped us to frame the project and to Greta Jones (nee McGufficke) for spending hours with us and hours without us ensuring the information she provided was accurate and well researched. Also, for allowing us into your past and present homes and for the best caramel slice we’ve ever had.

OFFICE OF ENVIRONMENT AND HERITAGE

Office of Environment and Heritage (OEH) staff from the Queanbeyan branch provided assistance in developing a biodiversity survey approach to meet the requirements of this project in the limited time available. They provided input into locations for full floristic surveys and vegetation mapping of specific lots that could be added to the mapping updates produced in this report. OEH also met the field ecologists during the surveys to discuss progress. Their comments on the draft report have been addressed to maximise the value of this study to guide future development and investigations in the Study Area.

UPDATES DURING THE DRAFTING OF THIS REPORT

The NSW Threatened Ecological Community listing of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions has recently changed under the NSW BC Act. As of the 28th of June 2019, this community has been relisted as the Critically Endangered ‘Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion’.

It essentially covers the same Plant Community Types in the Jindabyne Study Area. Any reference to Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions in this report should now be interpreted as: ‘Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion’.
1 INTRODUCTION

1.1 THIS REPORT

This Environmental and Heritage Study has been undertaken for the NSW Department of Planning and Environment to assist with the development of the Go Jindabyne Masterplan. The Study Area occupies 3,571 hectares around the town of Jindabyne (Figure 2-1).

The objective of this Environmental and Heritage Study is to gain a detailed understanding of the unique environmental and cultural heritage features of Jindabyne and surrounds, and their implications for growth and development (NSW Government 2017).

This report:
- Summarises the environmental, social and planning context of the Study Area
- Reviews existing environmental and heritage information
- Analyses key environmental and heritage values and risks
- Presents the findings of field surveys
- Provides a set of recommendations for further investigation and the management of environmental and heritage values in the Study Area.

The report consolidates and presents key information to help guide planning and development in the Jindabyne Study Area. The report will also support consultation with the local community and relevant agencies in developing the Go Jindabyne 2036 Masterplan.

1.2 BACKGROUND

1.2.1 Go Jindabyne 2036 Masterplan

The NSW Government is preparing the Go Jindabyne Masterplan to guide the development of Jindabyne until 2036. The Masterplan will encompass tourism, jobs, services, accommodation, housing, roads, local products and all factors that contribute to the distinct local character of the town (NSW Government 2019).

The Masterplan is being prepared to implement Direction 3 of the South East and Tablelands Regional Plan 2036 (DPE 2017), which aims to develop the Snowy Mountains into Australia’s premier year-round alpine destination. The Environmental and Heritage Study is also relevant to Goal 2 of the Regional Plan, which aims to achieve a diverse environment interconnected by biodiversity corridors and Direction 23 which specifically addresses the protection of the region’s heritage.

1.2.2 Planning context

Jindabyne is located in the Snowy Monaro Local Government Area (LGA), which occupies 15,158 square kilometres (SMRC, 2019) and has a population of 20,218 people (ABS, 2016). Snowy Monaro Regional Council was formed in 2016 by the amalgamation of the Snowy River, Cooma-Monaro and Bombala Councils. The Local Environmental Plans and other local instruments developed by the former Council are still current for the former Shire areas. Development and land use in the Jindabyne Study Area is regulated by the Snowy River Local Environmental Plan 2013 and Snowy River Development Control Plan 2013. Development is also subject to a range of regulations, State Environmental Planning Policies and specific...
legislation dealing with biodiversity, water resources, heritage, biosecurity and pollution which cover the whole of the LGA.

1.2.3 High Environmental Value (HEV) mapping

The South East and Tablelands Regional Plan 2036 (DPE 2017) provides for the mapping of potential High Environmental Value (HEV) land under its Goal 2 to inform local planning strategies and local environmental plans. The plan includes the Jindabyne Study Area. Relevant actions under the Regional Plan include:

- Protect the validated high environmental value lands in local environmental plans.
- Minimise potential impacts arising from development on areas of high environmental value, including groundwater-dependent ecosystems and aquatic habitats, and implement the ‘avoid, minimise and offset’ hierarchy.
- Improve the quality of and access to information relating to land with identified high environmental values.
- Support planning authorities to undertake strategic, landscape-scale assessments of biodiversity and areas of high environmental value.

Areas of High Environmental Value (HEV) generally already have some level of protection under existing legislation. The HEV mapping consolidates a range of protection criteria into a single map category. HEV land includes, in summary, existing conservation reserves, Threatened Ecological Communities (TECs) and key habitats, important wetlands, coastal lakes and estuaries as well as sites of geological significance.

HEV mapping should be given consideration in all strategic land use planning processes including growth strategies and regional and local plans. Planning authorities should strive to avoid and minimise impacts from zoning intensification and development on areas of HEV, and consider appropriate offset or other mitigation mechanisms for unavoidable impacts (OEH 2015).

2 THE STUDY AREA

The Study Area occupies 3,571 hectares around the town of Jindabyne, refer to Figure 2-1. The Study Area starts at the southern edge of Lake Jindabyne encompassing the town of Jindabyne, East Jindabyne, and the land to the south of Jindabyne urban area including the industrial area of Leesville, and land to the east and west of Barry Way ending at the crossing of the Mowamba River, just north of the locality of Moonbah.

Jindabyne is located in the Snowy Monaro Local Government Area (LGA), which occupies 15,158 square kilometres (SMRC, 2019) and has a population of over 20,000 people (ABS, 2016). Jindabyne is the fastest growing local centre within the Snowy Monaro Local Government Area. The population has increased by approximately 12% from 2001 levels in contrast to, for example, Cooma that has grown by approximately 4% in the same period. The main economic activity in the Snowy Monaro region is tourism, contributing $500 million to the regional economy each year. This represents 27% of the total economic contribution from tourism within the South East and Tablelands. In 2016, the Snowy Mountains welcomed more than 1.3 million overnight international, domestic and day-trip visitors. Both the visitors and permanent resident population are expected to continue to grow considerably, creating increased demand for community services, infrastructure, development capacity and urban amenity (NSW Government, 2019).

The 2018 State of the Environment Report (EPA, 2018) has documented the condition of the NSW environment, including alpine areas and surrounds (matters relevant to the snowy mountains and Jindabyne). It reports on emerging issues, has an objective of enabling effective action to be taken now,
Environmental and Heritage Study
Go Jindabyne 2036 Masterplan

for future generations and for the environment. The report covers 21 environmental topics across six broad themes, with the following of relevance to the Study Area:

- **Drivers**: population and economic activity and the environment
- **Human Settlement**: energy consumption, transport, urban water supply, waste and recycling, contaminated sites.
- **Climate and Air**: greenhouse gas emissions, air quality, climate change.
- **Land**: soil condition, native vegetation, protected areas and conservation.
- **Biodiversity**: threatened species, native species, invasive species.
- **Water and Marine**: water resources, river health, wetlands, and groundwater.

These themes are pertinent as they identify specific values and risk factors relevant to this environmental and heritage study and that have been built on within this study. The State of the Environment Report (EPA, 2018) shows population growth and human activity have influenced air and water quality, ecosystems and threatened species and lists the following key challenges relevant to the Study Area:

- **The growing population of NSW continues to exert pressure on the environment.** Innovative ways to use our natural resources more sustainably and to protect fragile ecosystems must continue to be found.
- **The effects of climate change are already evident, but these will become broader and intensify in the future.**
- **The number of species listed as threatened in NSW continues to rise.** These species are at the greatest risk from threats including vegetation clearing, the spread of invasive species and the mounting impacts of climate change.
- **NSW is still heavily dependent on non-renewable sources of energy such as coal for power generation.** Transport has become the largest (and fastest growing) sector for energy use.
- **The condition of most native vegetation is deteriorating.**

Environmental and heritage values that have been considered relevant to the Go Jindabyne Study Area (refer to Section 4.2 of this report) include biodiversity, Aboriginal heritage, non-Aboriginal (historic) heritage, water resources, soils and geology and the local climate. The risk factors or challenges for these values are considered to be climate change, land use and land management, clearing and soil degradation, contamination, increased bush fire risk, and invasive species (weeds and pest animals).
Figure 2-1 Study Area
3 LITERATURE REVIEW

3.1 APPROACH

The review of 102 documents undertaken (Appendix A) considered the following as being of high relevance to the Environmental and Heritage Analysis:

- South East and Tablelands Regional Plan 2036 (NSW DPE, 2017)
- Snowy River Council Local Environmental Plan (2013)
- DECCW Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)
- Lake Jindabyne Southern Foreshore Management Plan (Inspiring Place, 2005)
- Jindabyne Open Space and Recreational Land Use Strategy (Inspiring Place, 2007)
- Kosciuszko National Park Plan of Management (2006)
- South East and Tablelands Climate Snapshot (OEH 2014)
- Integrated Regional Vulnerability Assessment: South East New South Wales Pilot Study Volume 2: Priority Sector Workshops Summary Findings (OEH 2012)
- Enabling Adaptation in the South East (OEH 2017)
- Draft Urban Design Guide (GANSW 2018a)
- Greener Places: draft Green Infrastructure Policy for NSW (GANSW 2017b)
- Climate Ready revegetation guide (Hancock et al. 2018).

A literature review of the relevant documents was undertaken to identify the directions and implications of these documents, as they relate to the Go Jindabyne Masterplan.

3.2 LITERATURE REVIEW OF KEY DOCUMENTS

3.2.1 Strategic plans

South East and Tablelands Regional Plan 2036

The South East and Tablelands Regional Plan 2036 (NSW DPE, 2017) is a key strategic document that covers future planning in the context of the economy, biodiversity, community health and connectivity and environmentally sustainable housing. The Regional Plan includes a suite of visions and goals for the region, along with directions and activities to achieve these. Of particular relevance to the Environmental and Heritage Analysis is ‘Goal 2: A diverse environment interconnected by biodiversity corridors’.

Within the Regional Plan, there is a particular focus on High Environmental Value (HEV) lands, defined as follows:

- Existing conservation areas such as national parks and reserves, declared wilderness areas, marine estates, Crown reserves dedicated for environmental protection and conservation and flora reserves.
- Threatened ecological communities and key habitats and important vegetation areas.
- Important wetlands, coastal lakes and estuaries.
• Sites of geological significance.

To achieve Goal 2, five directions with corresponding activities are specified within the Regional Plan:

• Direction 14: Protect important environmental assets.
• Direction 15: Enhance biodiversity connections.
• Direction 16: Protect the coast and increase resilience to natural hazards.
• Direction 17: Mitigate and adapt to climate change.
• Direction 18: Secure water sources.

The South East and Tablelands contains cultural heritage features that are important for Aboriginal communities. The South East and Tablelands Regional Plan 2036 (NSW DPE, 2017) notes that the effective and early consultation with the community on urban growth and development issues will enhance respect for cultural values and provide opportunities to pursue sustainable, social and economic outcomes for heritage assets.

Of particular relevance to the Heritage Analysis is Direction 23 which specifically addresses the protection of the region’s heritage and notes the following:

• Cultural and historic heritage provides tangible connections to the past and attracts tourists.
• The landscape of the South East and Tablelands also creates an important cultural identity for its Community.
• The process of protecting and preserving Aboriginal heritage gives Aboriginal people the opportunity to be involved in and consulted about the conservation of their heritage.
• Heritage is irreplaceable and should be appreciated, valued and protected for the benefit of current and future generations.
• Harm to Aboriginal objects and places, or areas of significance to Aboriginal people, should be avoided.
• Where impacts on Aboriginal and historic heritage cannot be avoided, appropriate heritage management mechanisms must be implemented.
• Early investment at the strategic planning stage can protect and preserve heritage and provide greater certainty for stakeholders during the development assessment process.
• Interpreting and adaptively re-using built heritage items gives smaller communities a new lease on life.
• Heritage conservation can renew main streets, using an area’s authenticity and history to attract new businesses, residents and tourists.

Direction 23 within the South East and Tablelands Regional Plan 2036 (NSW DPE, 2017) also notes a number of actions to address the protection of the regions heritage that include:

• Undertake and implement heritage studies, including regional Aboriginal cultural heritage studies, to inform local strategies.
• Consult with Aboriginal people and the broader community to identify heritage values at the strategic planning stage.
• Conserve heritage assets during local strategic planning and development.
• Provide resources for heritage advice to inform planning processes.
• Acknowledge cultural heritage assets where appropriate and consider how these assets can add value to a development.
Key implication:
The key implication of this document for the Master Plan is to align with the directions of the regional plan in making recommendations as part of the Environmental and Heritage Study.

Developing maps of high environmental value for strategic planning 2015

The Developing maps of high environmental value for strategic planning – mapping and governance guide (OEH, 2015) provides information relating to the development of HEV maps for strategic planning. HEV maps give an indication of relative biodiversity at the regional scale and are intended for use at regional planning value. Numerous datasets, representing the best available information, have been used to compile the HEV maps. It is noted that the reliability of the underlying data is variable and consequently presents limitations including scale and position accuracy. As such, at a local scale, more detailed vegetation mapping and ground-truthing is required in priority areas to ensure accurate representation of threatened entities and their habitat.

The HEV criteria were developed through liaison between Regional Operations Group and Policy Division in 2014. They were included in OEH input to DPE for the purpose of developing the State Planning Policy for Environment & Heritage (SPP). The criteria is composed of five categories which formed the basis for the criteria listed in the South East and Tablelands Regional Plan 2036:

1. Areas protected for conservation.
2. Native vegetation of a high conservation value.
3. Threatened species and populations.
4. Wetlands, rivers, estuaries and coastal features of high environmental value.
5. Areas of geological significance.

Diversity and habitat for flora and fauna, including significant Koala populations within the Snowy Monaro are provided for in the existing mapped HEV lands and network of biodiversity corridors shown in Figure 3-1.

The protection and enhancement of biodiversity corridors is critical to long-term ecological connections in the context of climate change and the potential increased occurrence of bushfires, storms and landslips (NSW DPE, 2017). The regional plan notes that some groundwater – dependant ecosystems and aquatic habitats associated with rivers, streams, estuaries and coastal waters may not have been included within the mapping, but have potential to be considered as HEV land. The HEV land mapping does include sensitive estuaries. The regional plan considers the effects of land use development on estuaries and their catchments as being adverse and as such, unsuitable for intense uses such as housing subdivision.

The Regional Plan includes priorities that build on the directions and actions specific to individual councils including the Snowy Monaro Regional Council. It is noted that the Snowy Monaro is known for its Aboriginal and European heritage and HEV lands. As such, priorities for the area include protecting the unique alpine environment including scenic landscape qualities.

Key implication:
The key implication of this document for the Master Plan is to ensure the validation of HEV land considers the above factors to maximise protection opportunities.
Figure 3-1 High Environmental Value (HEV) lands and biodiversity corridors within the South East and Tablelands region (source: OEH, 2015)
3.2.2 Management plans and assessment reports

Lake Jindabyne Southern Foreshore Management Plan 2005

The Lake Jindabyne Southern Foreshore Management Plan (Inspiring Place, 2005) outlines improvements to the southern foreshore and management practices with the aim of improving amenity. The plan provides clear guidelines for use and management of the southern foreshore and includes responsibility for the planning, development and management of the foreshore. Priorities for work and infrastructure are identified from 2005 until 2015.

The plan describes the physical characteristics of the Lake Jindabyne area including topography, soils, and biodiversity. The southern foreshore exhibits slopes generally within 10-20% and soils are primarily derived from granite, have low fertility and are subject to gully and sheet erosion. Remnant open savannah woodland vegetation is found in some locations around the lake but there has been considerable alteration due to past use and development. Introduced trees and weeds are found within the foreshore and some fish species have been introduced to the lake for recreational fishing (e.g. trout, Atlantic salmon, redfin).

Figure 3-2 shows land leased that was leased by Snowy Hydro Limited to Snowy Mountains Regional Council in 2004.

Key implication:

The key implication of this document for the Master Plan is to ensure conservation recommendations align with the desired character and protection of this important asset within the landscape.
Figure 3-2 Jindabyne Lake foreshore land leased to Snowy Monaro Regional Council (Inspiring Place, 2005).
Jindabyne Open Space and Recreation Land Use Strategy 2007

The *Jindabyne Open Space and Recreation Land Use Strategy* (Inspiring Place, 2007) summarises the natural and cultural values of Jindabyne and identifies the relevant opportunities and constraints for the future use and management of open space. Notable physical and biological characteristics of relevance to this Environmental and Heritage Study included:

- Geology and soils
- Topography
- Flora
- Fauna

Future development would need to consider the natural predisposition of the local soils to erosion and the potential for increased sedimentation rates due to sloping ground. The acidic nature of the soils would also need to be considered in relation to future revegetation and ornamental plantings. It is noted that the use of locally endemic species is recommended to maintain soil stability (Inspiring Place, 2007).

**Key implication:**

The key implication of this document for the Master Plan is the recommendation of Inspiring Place 2007 to consider natural corridors as a means of protecting and regenerating native vegetation communities and native fauna habitat. This recommendation is in line with the *South East Tablelands Regional Plan 2036* and the *Snowy River Local Environmental Plan* (2013).

Kosciuszko National Park Plan of Management 2006

The *Kosciuszko National Park Plan of Management* (2006) provides general background information relating to the Kosciusko National Park including size, location, values and history. The plan includes an overview of values, obligations and constraints that form the basis of management strategies for the park.

While the Kosciuszko National Park is outside the Study Area the plan notes the formation of the Southern Kosciuszko Aboriginal Working Group. The Southern Kosciuszko Aboriginal Working Group has been identified as a group within the Aboriginal community that should be consulted with for the current study. The plan also recognises that natural and cultural values are often intertwined within the larger landscape and should be managed in a holistic way. The plan notes that the cultural heritage of the park encompasses many places and themes and that the Kosciuszko National Park contains a great number of heritage sites, structures, artefacts and innumerable intangible values.

The Plan of Management is a relevant consideration on the potential impacts for the Study Area relating to Climate Change. The management plan considers the issues and opportunities of climate change on alpine and sub-alpine areas that may be applied to the Study Area.

The Kosciuszko National Park Plan of Management (OEH 2006) is a relevant consideration on the potential impacts for the Study Area relating to climate change. The management plan considers the issues and opportunities of climate change on alpine and sub-alpine areas and may be extrapolated to the Study Area. The Plan includes potential effects on the biota of the Kosciuszko National Park, especially that of the alpine and subalpine areas, specifically listed as the following:

- *The possible extinction of plant and animal species whose climatic ranges are already limited to the mountain-tops. This includes the possible extinction of between 15 and 40 of the 200 alpine plant species within 70 years, with a further 49 species likely to experience reductions in their distributions. As little as a 1°C rise in temperature accompanied by the predicted*
changes to precipitation, would eliminate the bioclimatic range of the mountain pygmy-possum (Burramys parvus);

- The uphill migration of biota from lower elevations;
- Likely expansion in the distribution of several plant communities, such as tall alpine herbfield and windswept feldmark, at the expense of more climatically-sensitive communities such as short alpine herbfield and snowpatch feldmark;
- Changes in the size and composition of sod tussock grassland, fen, raised bog and valley bog communities as changes in precipitation, runoff and evaporation alter the competitive advantages of plant species belonging to these communities;
- Changes in the composition of the fauna of the alpine area due to changes in snow cover which protects some animals from winter cold while limiting opportunities for others;
- A likely increase in the diversity, abundance and distribution of weed species;
- Uphill extensions in the ranges of feral animal species;
- An increase in the incidence of wildfires; and
- Alterations to catchment hydrology and geomorphological processes.

Further literature specifically related to climate change impacts and adaptation is outlined in section 0.

**Key implication:**

The key implication of this document for the Master Plan is to recognises that natural and cultural values are often intertwined within the larger landscape and should be managed in a holistic way.

### 3.2.3 Planning provisions and assessment guidelines

**Snowy River Local Environmental Plan 2013**

The *Snowy River Local Environmental Plan* (LEP; 2013) aims to make local environmental planning provisions for land in that part of Snowy Monaro Regional local government area to which the plan applies in accordance with the relevant standard environmental planning instrument. Particular aims of the plan of relevance to the Environment and Heritage Analysis are to:

- protect and enhance, for current and future generations, the ecological integrity, natural resources and environmental significance of the Snowy River.
- plan and provide for settlement where it provides a diverse range of living opportunities and housing choices without compromising the environmental values of the Snowy River including its natural resources such as water, biodiversity and agricultural land.
- protect, preserve and enhance areas of high scenic landscape value and the open rural landscape, including maintaining separation between towns and villages.
- value, protect and promote the natural, cultural and archaeological heritage of Snowy River by careful management.

Part 3 of the LEP includes a comprehensive list of land zoning that includes objectives, works permitted with and without consent and prohibited works for each land zone type. Exempt and complying development is covered in Part 4 of the LEP with reference to environmentally sensitive areas (including areas of high Aboriginal cultural significance and high biodiversity significance) and requirements to ensure the protection of heritage items. Part 5.10 specifically outlines heritage conservation for Aboriginal and non-Aboriginal sites. Part 7 covers additional local provisions including flood planning, terrestrial...
biodiversity, riparian land and watercourses, wetlands and development within Lake Eucumbene and Lake Jindabyne scenic protection areas.

Additionally, Heritage items and Heritage conservations areas are listed and described in Schedule 5 of the LEP and shown on the Heritage Map.

**Key implication:**

The key implication of this document for the Master Plan is to:

- Align with the aims of the LEP or
- Enable the variation of the LEP to better align with the values determined by the Master Plan.

Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW 2011 and Aboriginal cultural heritage consultation requirements for proponents 2010

The OEH Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH, 2011) provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW. The guideline identifies processes for assessing, measuring and minimising harm on Aboriginal cultural heritage and outlines OEH’s requirements for appropriate assessment for an Aboriginal Cultural Heritage Assessment Report (ACHAR).

The DECCW Aboriginal cultural heritage consultation requirements for proponents (DECCW, 2010) outlines the purpose, aim, scope and application of Aboriginal community consultation requirements. The document provides guiding principles and intended outcomes of consultation and outlines compliance framework for Aboriginal consultation as specified in clause 80c of the National Parks and Wildlife Regulation 2009. The guideline provides an overview of consultation and associated objectives and information required for decision making and details the steps for consultation including roles and responsibilities of participants.

**Key implication:**

The key implication of these documents for the Master Plan is to guide the appropriate level of Aboriginal heritage assessment and consultation for future activities in the Study Area.

South East and Tablelands Climate Snapshot (OEH 2014)

The NSW and ACT Regional Climate Modelling (NARClIIM) project has produced a series of climate change projections for the south-east Australia region, covering the range of likely future changes in climate. The resulting snapshot indicates that the region will continue to warm in the near future (2020–2039) and far future (2060–2079), with more hot days and fewer cold nights. Spring rainfall will decrease according to climate change modelling. The snapshot is accompanied by a set of maps showing annual and seasonal changes over the 2020-2039 and 2060-2079 timeframes, including changes in hot days, cold nights, minimum, maximum and mean temperatures, rainfall and Forest Fire Danger Index (FFDI).

A summary of expected changes to climate in the NSW South East and Tablelands region is provided in:
Integrated Regional Vulnerability Assessment: South East New South Wales Pilot Study Volume 2: Priority Sector Workshops Summary Findings 2012

The Integrated Regional Vulnerability Assessment (IRVA) (OEH 2012) process for South East New South Wales acknowledges that the region’s ecosystems’ functions and services are vital in supporting the environmental, social and economic viability of the region. The process identified a number of climate change impacts affecting landscapes and ecosystems that may contribute to regional vulnerability, including:

- Some exotic species in regional ecosystems may be favoured by changes in climate and emerge as serious weed threats. Fragmentation of the landscape also inhibits adaptive capacity, by reducing the options for species to migrate in response to changing climate conditions.
- Changes to hydrological functioning due to changes in rainfall intensity and seasonality affecting wetlands and rivers, decreasing aquatic and wetland biodiversity and ecosystem function.
- Increasing soil erosion due to greater rainfall intensity compromising the health of the region’s soils and waterways.
- Changes in the climate leading to changes to terrestrial species and their habitats/ranges.
- Changes to remnant native vegetation extent and condition, changes in bushfire regimes and longer-term impacts of weed invasion affecting biodiversity and ecosystem function.
- Increasing saltwater intrusion into…groundwater and associated salinity issues, decreasing terrestrial biodiversity and ecosystem function, with the potential for species extinction.
- Increasing frequency and intensity of bushfire putting natural resource managers under pressure.
- Increasing frequency and intensity of bushfire leading to land managers clearing vegetation buffer zones; this in turn affects the extent and condition of remnant vegetation.
• Diminishing availability of water in the landscape for allocation to the environment, leading to increased competition for water resources.
• Changes to pasture species and growth affecting agricultural productivity, leading to increased grazing intensity, loss of ground cover and decreasing terrestrial biodiversity and ecosystem function.

The report presents findings in relation to the adaptive capacity status for a range of sectors, including landscapes and ecosystems. Human, social, natural, physical and financial adaptive capacity indicators are addressed. Indicators of particular relevance to natural values in the Jindabyne Study Area include:

• Environmental education
• Community leadership
• Skills in the NRM workforce
• Communication between institutions
• Attitudes of elected councillors
• Public investment in nature conservation weeds
• Alteration to landscape composition
• Low fragmentation rural settlement
• Rural fencing for conservation and stock management
• Funding models and investment tools.

Enabling Adaptation in the South East 2017

Enabling Adaptation in the South East (EASE) (OEH 2017) builds on the findings of the IRVA process (OEH 2012) to identify regional vulnerabilities and develop ways to minimise the impacts of climate change on local communities. EASE is intended to help incorporate climate change considerations into long-term planning in state and local governments.

The report references the South East and Tablelands Climate Snapshot (OEH 2014) and notes that, towards 2036 the region is likely to change in the following ways:

• Virtually certain to be hotter, with a likely rainfall increase in summer and decrease in winter. Snowfall is likely to decrease; however, changes in weather patterns that cannot be resolved by the climate models mean that rainfall in coastal parts of the region is difficult to simulate. (Projections for less snow have the potential to impact Tourism and growth in the area).
• Cold nights are expected to decrease on average across the region. The Snowy Mountains and Cooma–Monaro, in particular, are likely to experience large declines in the incidence of cold nights with 10–20 fewer per year by 2030 and in excess of 40 fewer cold nights by 2070.
• The region as a whole is expected to experience an increase in average and severe fire weather in the near and far future. The greatest increase in fire weather is most likely in spring and summer, with a decrease in autumn.
• Runoff and stream flow are likely to decrease in spring and winter, particularly in the west, and increase during summer.
• The rate of erosion is likely to increase on some soils.
• Widespread changes to some natural ecosystems are very likely. Those most at risk are alpine ecosystems and those sensitive to fire.
EASE workshops involving representatives from the local government and NSW Government agencies identified transition pathways and adaptation actions for three regional landscapes: alpine, tablelands and coast. A total of 12 pathways models were developed, including for alpine tourism, public land management, off-reserve conservation and extensive grazing. Transition pathways are described and social, policy and economic enablers and constraints to transition are identified in the report.

Many of the issues, pathways and transition models in the report are directly relevant to the Go Jindabyne Study Area and the protection of biodiversity and heritage.

The priority adaptation pathway for alpine tourism was identified as involving broadened tourism opportunities, business opportunities and investigating synergies between national park management and regional prospects. The transformed alpine tourism sector is described as:

- An all season (snow-independent) destination
- Tourism by 2050 characterised by hazard-conscious visitation
- Tourism options administered, promoted and integrated at a regional scale
- The unique features of the region, such as the sensitive endemic species of the alpine zone, are duly conserved and protected from human-use impacts.

The priority pathways identified for adapting public land management focus on changed resourcing and management structures, enhanced ecosystem management arrangements, and community capacity building. Transition approaches may include:

- Integrated public–private land management
- Improved interagency, cross-jurisdictional, Aboriginal and public–private partnerships and collaborations
- Enhanced habitat where possible through suitably restored public lands
- Certified ecotourism promoting ecological awareness and supporting land management
- Integration of conservation strategies into regional planning and development
- Working together to maintain connectivity at a regional scale.

The priority transition pathways identified for off-reserve conservation focus on market mechanisms, landscape-scale management approaches, R&D extension, and community capacity building. At present, many hazard reduction burn regimes and intensive farming systems do not optimally align with regional biodiversity conservation objectives to enhance habitat connectivity. Transformed off-reserve conservation management approaches support:

- ‘Multifunctional landscape management’ where productive rural livelihoods and habitat connectivity are jointly supported through NRM partnerships
- Stewardship payments for off-reserve species conservation
- Novel financial support mechanisms that appropriately value natural resources and ecosystem services.

The priority transition pathways to adapt the extensive grazing sector focus on business diversification and strategic land management. Transformed extensive grazing systems could:

- Consolidate commercial-scale extensive grazing over the best-suited lands
- Tap into agitourism opportunities
- Integrate ‘niche agriculture’ to diversify farm income streams (diversified production outputs, localised food production, agitourism).
Draft Urban Design for Regional NSW 2018

The Draft Urban Design Guide (GANSW 2018a) builds upon the design principles in the Government Architect publication Better Placed: An integrated design policy for the built environment of NSW (GANSW 2017a). The guide is intended to support the goals and directions of the regional plans developed by the Department of Planning and Environment (DPE).

The guide is a non-statutory document and applies to nine NSW regions beyond Greater Sydney. It identifies urban design priorities and key trends for regional NSW. Climate change, increasing temperature extremes and natural hazard risks are identified as a key trend. Relevant issues include improving the environmental sensitivity of design, poorly located and oriented buildings, managing energy costs for heating and cooling, urban heat island effects and natural hazard risks (bushfire, flooding, drought, coastal erosion, snow and ice). Urban design and development planning can mitigate some of the effects of climate change. For example, well-orientated development with the right setbacks, materials, and exterior openings, providing the right level of sun exposure, saves energy and is good for the environment.

The guide provides a brief snapshot of challenges and opportunities for urban design in the South East and Tablelands region.

Greener Places: draft Green Infrastructure Policy for NSW 2017

The draft Green Infrastructure Policy (GANSW 2017b) aims to guide the design, planning and delivery of ‘Green Infrastructure’ in urban areas in NSW, to (summarised):

1. Protect, conserve and enhance green and open natural and cultural spaces
2. Secure a network of well-designed green space
3. Promote healthy living, encouraging physical activity, social cohesion, and enhancing wellbeing by providing liveable places
4. Create a more strategic approach to planning for Green Infrastructure
5. Deliver better tools for Green Infrastructure across NSW.

Green Infrastructure is the network of green spaces and natural systems including parks, rivers, bushland, streets and private gardens that support quality of life in the urban environment.

The document identifies climate resilience as a priority in NSW. Climate change is expected to adversely affect human health through heat related and extreme weather deaths, increases in water and food borne diseases, and the effects of increased air pollution. Green Infrastructure can help cities to adapt to climate change by reducing flood risk and overheating. Tree-planting and green roofs can improve air quality in urban areas, and reduce temperatures. Water sensitive urban design practices will reduce the risk of flooding. Biodiversity can also be supported through good Green Infrastructure design (GANSW 2017b).

Climate Ready Revegetation Guide 2018

*Climate-ready revegetation, a guide for natural resource managers* (Hancock et al. 2018) provides a pathway for assessing the suitability of species and provenances for revegetation projects based on climate projections and species responses. The guide assumes that survival will be enhanced for large, genetically diverse populations, and for species which are able to disperse with changing climatic envelopes.

The guide has been considered in relation to the Tableland Snow Gum Woodland community in section 4.2.7.

**Key implications:**
The projected impacts of climate change will need to be considered in land use planning, urban design, agricultural strategies and on- and off-reserve nature conservation.

### 3.2.4 Other documents

Only key source documents have been included in the literature review, detailed above, due to the extensive list of other documents sourced during the literature review and background studies containing relevant information. Most were relevant to general planning and not to this study, refer to Table 3-1. Biodiversity and Aboriginal heritage documents have been cited, where relevant, in Section 4.2, 5.1 and 6.1 of this report. Refer to Appendix A for the review of the provided documents.

Table 3-1 Summary of documents sourced

<table>
<thead>
<tr>
<th>Relevance to this report:</th>
<th>Biodiversity</th>
<th>Aboriginal heritage</th>
<th>Non-Aboriginal heritage</th>
<th>General environmental</th>
<th>General planning</th>
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</table>
4 ADDITIONAL BACKGROUND ANALYSIS

This section sets out the legislative context for development within the Study Area as well as the broad existing environmental and heritage values. It concludes with a risk analysis, to investigate the key environmental aspects at risk as a consequence of development pressure in combination with external forces, such as climate change, bushfire, invasive species and pathogens.

4.1 LEGISLATIVE CONTEXT

Environmental and Heritage values are protected within the Study Area through various legislation, specifically:

- Environment Protection Biodiversity Conservation Act 1999 (Commonwealth) (EPBC Act)
- Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act)
- Biodiversity Conservation Act 2016 (NSW) (BC Act)
- Heritage Act 1977 (NSW) (Heritage Act) and Burra Charter
- National Parks and Wildlife Act 1974 (NSW) (NPW Act)
- Fisheries Management Act 1994 (NSW) (FM Act)
- Snowy River Local Environmental Plan 2013 (LEP)

4.1.1 Environment Protection Biodiversity Conservation Act 1999

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (Cwth) (EPBC Act) enables the Australian Government to join with the states and territories in providing a truly national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act focuses Australian Government interests on the protection of matters of national environmental significance, with the states and territories having responsibility for matters of state and local significance.

The EPBC Act provides a legal framework for the protection and management of places of national environmental significance. The EPBC Act provides an assessment and approval process for actions likely to cause a significant impact on Matters of National Environmental Significance (MNES). The nine MNES are:

- World Heritage properties.
- National Heritage places.
- Wetlands of international importance (listed under the Ramsar Convention).
- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Nuclear actions (including uranium mines).
- Commonwealth marine areas.
- A water resource, in relation to coal seam gas development and large coal mining development.

Approval by the Commonwealth Environment Minister is required if an action is likely to have a significant impact on a MNES. Assessments of significance based on criteria listed in Significant Impact Guidelines 1.1 issued by the Commonwealth (Commonwealth of Australia, 2013) are used to determine whether the proposed action is likely to have a significant impact (i.e. is likely to be considered a ‘controlled action’).
The heritage lists addressed by the EPBC Act include the United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage List (WHL), National Heritage List (NHL) and the Commonwealth Heritage List (CHL).

All WHL properties in Australia are protected and managed under the EPBC Act. The NHL protects places that have outstanding value to the nation. The CHL protects items and places owned or managed by Commonwealth Government agencies. The Commonwealth Department of Environment is responsible for the implementation of national policy, programs and legislation to protect and conserve Australia’s environment and heritage and to promote Australian arts and culture. The Minister’s approval is required for controlled actions which would have a significant impact on items and places included on the WHL, NHL or CHL.

The Australian Heritage Database (AHD) includes the National Heritage List, which includes the natural, historic and indigenous places that are of outstanding national heritage value to the Australian nation. The AHD also contains the Commonwealth Heritage List that comprises those places on Commonwealth lands and waters, or under Australian Government control. Items on both of these lists are protected under the EPBC Act. The AHD also includes places listed as World Heritage by UNESCO.

References to the Register of the National Estate (RNE) were removed from the EPBC Act in 2012. The RNE is no longer a statutory list but remains an archive of information about more than 13,000 places throughout Australia.

### 4.1.2 Environmental Planning and Assessment Act 1979

The NSW Environmental Planning and Assessment Act 1979 (EP&A Act) is legislation for the management of development in NSW. It sets up a planning structure that requires developers (individuals or companies) to consider the environmental impacts of development. Under this Act, the land is a part of the environment.

The EP&A Act requires that all matters related to the land including impacts to biodiversity that development may have are formally considered in land-use planning and development approval processes. Under this Act, cultural heritage is considered to be a part of the environment.

The EP&A Act requires that Aboriginal cultural heritage and the possible impacts to Aboriginal heritage that development may have are formally considered in land-use planning and development approval processes.

The EP&A Act controls land use planning in NSW. The planning system established by the EP&A Act includes Local Environment Plans (LEPs) and other provisions relating to development control. Heritage items are added to a heritage schedule of a LEP often following identification and assessment from a local shire heritage study. The State Heritage Inventory also holds local heritage items listed by local councils in NSW. These items are then given protection by the heritage provisions within the relevant plan, which will then require consent of Council for certain actions or developments.

### 4.1.3 Biodiversity Conservation Act 2016

The NSW Biodiversity Conservation Act 2016 (BC Act) establishes the new regulatory framework for assessing and offsetting the biodiversity impacts of proposals. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

It defines biodiversity as:
• the variety of living animal and plant life from all sources and includes diversity within and between species and diversity of ecosystems.

It defines biodiversity values as:

• vegetation integrity—being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,
• habitat suitability—being the degree to which the habitat needs of threatened species are present at a particular site,
• biodiversity values, or biodiversity-related values, prescribed by the regulations.

The Act contains provisions relating to flora and fauna protection (repealing parts of the National Parks and Wildlife Act 1974), threatened species and ecological communities listing and assessment (repealing the Threatened Species Conservation Act 1995 and section 5A of the EP&A Act), a Biodiversity Offsets Scheme (BOS), a single Biodiversity Assessment Method (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and planning approvals. The Act is supported by the Biodiversity Conservation Regulation 2017.

Biodiversity certification is also included under the BC Act. It is a streamlined biodiversity assessment process for areas of land that are proposed for development and is particularly suitable where strategic land use planning is proposed. Where land is certified, development may proceed without the usual requirement for site-by-site assessment of impacts on biodiversity. Biodiversity certification provides a mechanism to address the potential impacts on biodiversity during the early planning of land use change and encourages planning authorities and landholders to design their development footprint in a way that avoids and minimises impacts on biodiversity values and protects those areas.

Two types of biodiversity certification are available:

1. Standard – available to both landholders and planning authorities.
2. Strategic – available only to planning authorities, to support significant regional development and planning processes.

4.1.4 National Parks and Wildlife Act 1974

Aboriginal heritage is primarily protected under the National Parks and Wildlife Act 1974 (NPW Act) and as subsequently amended in 2010 with the introduction of the National Parks and Wildlife Amendment (Aboriginal Objects and Places) Regulation 2010. The aim of the NPW Act includes:

*The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to: places, objects and features of significance to Aboriginal people.*

An Aboriginal object is defined as:

*Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with the occupation of that area by persons on non-Aboriginal extraction and includes Aboriginal remains.*
Part 6 of the NPW Act concerns Aboriginal objects and places and various sections describe the offences, defences and requirements to harm an Aboriginal object or place. The main offences under section 86 of the NPW Act are:

- A person must not harm or desecrate an object that the person knows is an Aboriginal object.
- A person must not harm an Aboriginal object.
- For the purposes of this section, "circumstances of aggravation" are:
  - that the offence was committed in the course of carrying out a commercial activity,
  - that the offence was the second or subsequent occasion on which the offender was convicted of an offence under this section.
- A person must not harm or desecrate an Aboriginal place.

Under section 87 of the NPW Act, there are specified defences to prosecution including authorisation through an Aboriginal Heritage Impact Permit (AHIP) or through exercising due diligence or compliance through the regulation.

Section 89A of the Act also requires that a person who is aware of an Aboriginal object, must notify the Director-General in a prescribed manner.

Section 90 of the NPW Act deal with the issuing of an AHIP, including that the permit may be subject to certain conditions.

### 4.1.5 Heritage Act 1977

**STATE HERITAGE REGISTER**

Natural, cultural and built heritage is protected in NSW under the *Heritage Act 1977*. The Act is administered by the Heritage Division, a State government agency within the Office of Environment and Heritage, Department of Planning and Environment.

The Act creates the State Heritage Register (SHR) which provides permanent protection for a heritage item or place. Items of State heritage significance are defined as a place, building, work, relic, moveable object or precinct which is of historical, scientific, cultural, social, archaeological or natural significance to the State (Section 4A(1) of the Act). The effect of SHR listing is that a person cannot damage, destroy, alter or move an item, building or land without approval from the Heritage Council.

The Heritage Council of NSW (Council), constituted under the *Heritage Act 1977*, is appointed by the Minister and responsible for heritage in NSW. The Council reflects a cross-section of community, government and conservation expertise with the Heritage Division being the operational arm of the Council.


When items are listed on the State Heritage Register (SHR) applications to carry out works on those items need to be made to the Heritage Council under Section 60 of the Act.

**STATE AGENCY HERITAGE REGISTERS**

State agencies and authorities in NSW are required to keep a register of heritage places under their management under Section 170 of the Act. The s.170 registers are also held in the NSW Heritage Division’s (OEH) State Heritage Inventory (SHI), an electronic database of statutory listed heritage items in NSW.
HISTORICAL ARCHAEOLOGY

The Heritage Act gives statutory protection to relics that form part of historical archaeological deposits. Amendments to the Heritage Act made in 2009 defined an archaeological ‘relic’ under the Act. A relic is:

An archaeological deposit, resource or feature that has heritage significance at a local or State level.

The definition is not based on age.

Sections 139-145 of the Heritage Act prevents the excavation or disturbance of land for the purpose of discovering, exposing or moving a relic, except in accordance with an excavation permit issued by the Heritage Council of NSW. The level of heritage significance of an item determines the excavation permit necessary for the works. The practical application of this is that is not necessary to apply for exemptions if an item has been assessed as having no heritage significance.

When a place is listed on the State Heritage Register or affected by an interim heritage order, the approval of the Heritage Council of NSW is required for any major work. The Heritage Council works to ensure that any changes, additions or new buildings on the site do not detract from the heritage significance of the place. A section 60 application, outlining the proposed works and supporting documents is required to be submitted to the Heritage Council for assessment prior to works on the site/building commencing. Standard Exemptions for works to State Heritage Listed items may apply and should be reviewed prior to submitting an application to the Council.

If any works require excavation to be undertaken on an item of local heritage significance, a Section 140 excavation permit under the Heritage Act 1977, or a Section 139 Exception will be required from the Heritage Council. Any works that require a Section 140 excavation permit will require an Archaeological Assessment, Research Design and Methodology that details the proposed archaeological work and an archaeologist present during any excavation works.

Section 139 prohibits the excavating or disturbing of land leading to a relic being discovered, exposed, moved, damaged or destroyed. To excavate and disturb land in the context of the NSW Heritage Act is associated with the activity of digging or unearthing. The new definition also indicates that the ‘relic’ being exposed or disturbed is considered significant (or has the potential to be significant) at the time of its excavation, removal or destruction.

A S139 (1B) exception is for excavation or disturbance of land that will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them. Under this scenario therefore, there are opportunities to assess the presence of relics to ascertain if more detailed excavation is warranted.

4.1.6 The Burra Charter

The Australia ICOMOS (International Council on Monuments and Sites) Charter for the conservation of places of cultural significance (the Burra Charter) (current edition 2013) sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance including owners, managers and custodians. The Charter is not a statutory document but does provide specific guidance for physical and procedural actions that should occur in relation to significant places.

An appreciation of landscape is highlighted in the 1999 revision of the Burra Charter of Australia ICOMOS, placing greater emphasis on ‘setting’. Article 8 of the Burra Charter now reads:
“Conservation requires the retention of an appropriate visual setting and other relationships that contribute to the cultural significance of the place. New construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate”.

4.1.7 Fisheries Management Act 1994

The purpose of the Fisheries Management Act 1994 (FM Act) is to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

4.1.8 Snowy River Local Environmental Plan 2013

The Snowy River Local Environmental Plan 2013 (LEP) aims to make local environmental planning provisions for land in that part of Snowy Monaro Regional local government area to which the Plan applies and specifically relevant to environmental values, including to:

- Protect and enhance, for current and future generations, the ecological integrity, natural resources and environmental significance of snowy river
- Plan and provide for settlement where it provides a diverse range of living opportunities and housing choices without compromising the environmental values of Snowy River, including its natural resources such as water, biodiversity and agricultural land
- Protect, preserve and enhance areas of high scenic landscape value and the open rural landscape, including maintaining separation between towns and villages
- Value, protect and promote the natural, cultural and archaeological heritage of snowy river by careful management
- Retain, and where possible, extend public access to foreshore areas and link existing open space areas for environmental benefits, health benefits and public enjoyment

The LEP identifies and protects heritage conservation areas and listed buildings/items, identifies environmentally sensitive land, and proscribes land use practices. Heritage items (if any) are listed and described in Schedule 5. Heritage conservation areas are shown on the Heritage Map as well as being described in Schedule 5.

HERITAGE CONSERVATION - LEP CLAUSE 5.10

Clause 5.10 of the LEP provides stipulations how heritage is to be conserved. The objectives of Clause 1 are particularly pertinent to this report and are as follows:

a) to conserve the environmental heritage of Snowy River,
b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,
c) to conserve archaeological sites,
d) to conserve Aboriginal objects and Aboriginal places of heritage significance.

Heritage assessment

The consent authority may, before granting consent to any development:

a) on land on which a heritage item is located, or
b) on land that is within a heritage conservation area, or
c) on land that is within the vicinity of land referred to in paragraph (a) or (b),
require a heritage management document to be prepared that assesses the extent to which the carrying out of the proposed development would affect the heritage significance of the heritage item or heritage conservation area concerned.
The LEP is supported by the Snowy River Development Control Plan (DCP), which provides more detailed standards and controls for specific types of development.

4.2 **EXISTING ENVIRONMENTAL AND HERITAGE VALUES AND RISKS**

In addition to the Literature Review summarised in Section 3, a review of background information was undertaken to gain an understanding of the environmental and heritage values and risk factors or threats relevant to the Study Area. Key environmental aspects investigated below include:

- Soils and geology
- Water resources
- Biodiversity
- Bushfire
- Aboriginal heritage
- Non-Aboriginal heritage
- Climate change and weather
- Land use.

4.2.1 **Soils and geology**

**Topography**

The Study Area is located at an elevation above sea level (ASL) of approximately 860m (below the dam) to 1260m (west of Leesville). The landscape within the Study Area consists of undulating low hills and gently to moderately inclined slopes on granites (NGH, 2017). The soils are considered to be susceptible to sheet and gully erosion and have poor drainage.

**Geology**

The Bega-Mallacoota 1:250,000 geological map (Lewis and Glen, 1995) indicates the Study Area is composed of early – late Silurian sequences within the Kosciusko Batholith Igneous Suites including the:

- Bullenbalong Suite (Sgb) consisting of Leesville granodiorite, biotite granodiorite (Sgbv).
- Jindabyne Suite (Sgj) consisting of Jindabyne tonalast (Sgjj).

An unassigned and unnamed pluton (Sg) is also present within the Study Area. The Grosses Plain thrust fault traverses the southern portion of the Study Area in a north-east south-west direction. No areas of geological significance are mapped or were observed within the study area (Cartoscope Pty Ltd, 2019).

**Soils**

Soil landscape and land resource mapping provide a detailed assessment of the landscapes and potential physical constraints of the proposal site based on information at a scale of 1:50,000. Four soil landscapes are described that occur within the proposal site and are described in Table 4-1, which sets out the limitations of each soil landscape, in terms of development or other impacts. Soil capability limitations may influence onsite sewage treatment systems and individual assessments would need to consider limitations connected with the soil landscapes of the Study Area.
### Table 4-1 Soil landscapes within Study Area and their limitations.

<table>
<thead>
<tr>
<th>Soil Landscape</th>
<th>Soil Landscapes</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jindabyne (ji)</td>
<td>Slopes: Shallow to moderately deep (50 – 150 cm), well drained.</td>
<td>• Erodibility.</td>
</tr>
<tr>
<td></td>
<td>• Earthy Sands (Basic Paralithic Orthic Tenosols).</td>
<td>• Low fertility.</td>
</tr>
<tr>
<td></td>
<td>• Yellow Earths (Bleached Eutrophic Brown Kandosols).</td>
<td>• Hard setting surface.</td>
</tr>
<tr>
<td></td>
<td>• Red Earths (Sodic Eutrophic Red Dermosols).</td>
<td>• High permeability.</td>
</tr>
<tr>
<td></td>
<td>• Yellow Podzolic Soils (Sodic Eutrophic Grey Dermosols).</td>
<td>• Sodicity.</td>
</tr>
<tr>
<td></td>
<td>• Red Podzolic Soils (Eutrophic Brown Chromosols).</td>
<td>• Gully sheet and wind erosion risk.</td>
</tr>
<tr>
<td></td>
<td>Drainage lines and depressions: Moderately deep to deep (&gt; 50 cm), imperfectly</td>
<td>• Seasonal waterlogging.</td>
</tr>
<tr>
<td></td>
<td>drained.</td>
<td>• Seasonally high water tables.</td>
</tr>
<tr>
<td></td>
<td>• Solodic soils (Melonic Eutrophic Brown Kandosols).</td>
<td>• Shallow soils localised.</td>
</tr>
<tr>
<td></td>
<td>• Very poorly draining Peats (Basic Fibre Organosols).</td>
<td></td>
</tr>
<tr>
<td>Kalkite (ka)</td>
<td>Footslopes: Moderately deep to deep (&gt; 150 cm), moderately well drained:</td>
<td>• Low permeability.</td>
</tr>
<tr>
<td></td>
<td>• Yellow Solodic Soils (Eutrophic Subnatric Brown Sodosols).</td>
<td>• Shrink swell potential.</td>
</tr>
<tr>
<td></td>
<td>Plains: Imperfectly drained to poorly drained:</td>
<td>• Sodicity.</td>
</tr>
<tr>
<td></td>
<td>• Black Earths and Alluvial Soils (Episodic crusty Black Vertosols and Melanic</td>
<td>• Dispensations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low wet bearing strength.</td>
</tr>
<tr>
<td></td>
<td>Drainage lines: Moderately deep to deep (&gt; 50 cm) poorly drained:</td>
<td>• Poor drainage.</td>
</tr>
<tr>
<td></td>
<td>• Alluvial soils</td>
<td>• Seasonal waterlogging.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Foundation hazard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Run-on.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Permanently high water table localised.</td>
</tr>
<tr>
<td>Bullenbalong (bu)</td>
<td>Crests and slopes: Shallow (&lt; 50 cm) to moderately deep (50 – 150 cm), well –</td>
<td>• Erodibility</td>
</tr>
<tr>
<td></td>
<td>drained to moderately well-drained:</td>
<td>• Low fertility.</td>
</tr>
<tr>
<td></td>
<td>• Erodibility.</td>
<td>• Hard-setting surfaces.</td>
</tr>
<tr>
<td></td>
<td>• Low permeability.</td>
<td>• High permeability.</td>
</tr>
<tr>
<td></td>
<td>• Sodicity.</td>
<td>• Sodicity.</td>
</tr>
</tbody>
</table>
Soil Landscape | Soil | Limitations
---|---|---
**Earthly Sands and Yellow Earths (Basic Paralithic Orthic Tenosols).**
**Red Earth (Eutrophic Red Dermosols).**
**Yellow Podzolic Soils (Eutrophic Brown Chromosols and Grey Dermosols).**
**Red Podzolic Soils (Eutrophic Brown Chromosols).**

**Dispersion.**
**Sheet erosion risk.**
**Shallow soils.**
**Outcrop localised.**

**Open depressions**
Moderately deep (50 – 100 cm) to deep (> 150 cm), poorly drained:
**Yellow Solodic Soils (Melanic Eutrophic Brown Dermosols).**

**Disturbed terrain (xx)**
Terrain has been disturbed by human activity to the depth of at least 100 cm. The original soil has been removed, greatly disturbed or buried. Landfill material includes soil or rock.

**Water erosion hazard.**
**Shallow soils.**
**Rock outcrop.**
**Stoniness.**
**Low fertility.**

Statewide land and soil mapping identifies the Australian Soil Classification of the Study Area as being predominantly Dermosols accompanied by a small area mapped as Rudosols and Tenosols. However, limited soil and landscape data is available at a catchment scale (1:100,000 and 1:250,000) which limits the quality of the assessment of LSC and other soil thematic maps. As such, soil survey profiles are considered to provide a more accurate representation of the soils and soil limitations present within the Study Area. A review of the technical reports associated with each of the 44 soil profiles within the Study Area (OEH eSPADE, 2019) identified the following:

- Soil types (ASC) within the Study Area include Kandosol, chromosol, Rudosol, Anthroposol, Dermosol and Tenosol soils.
- High to very high erosion hazard, particularly within the northern portion of the Study Area. This hazard was associated with Kandosol, Chromosol and Rudosol soils.
- Minor sheet erosion was identified across the Study Area and associated with Dermosol, Kandosol, Tenosol and Anthroposol soils.

**Contaminated land**

A search of the EPA contaminated lands record did not return any sites within the Jindabyne suburb (NSW EPA, 2019a). A search of the List of NSW contaminated sites notified to the EPA (NSW EPA 2019b) identified two Petrol Stations within the Study Area however, these sites have negligible relevance to the environmental and heritage study. Previous land uses would need to be considered when rezoning and developing land.

**ACID SULFATE SOIL**

The site is situated a considerable distance from the coastline (c. 130 kilometres) and as such the potential for acid sulphate soils to occur is negligible. The Australian Resource Information System (ASRIS) database
(CSIRO, 2019) indicates there is an extremely low probability of acid sulfate soils occurring within the Study Area.

### 4.2.2 Water resources

Lake Jindabyne is located immediately to the north and east of the Study Area and receives flow from three primary tributaries, the Snowy River, the Thredbo River and Eucumbene River. The lake is manmade and is an important component of the Snowy Scheme as well as providing opportunities for water sports, general tourism and leisure activities. The lake is mapped as Key Fish Habitat (KFH) (Figure 4-1), primarily for its importance to the recreational fishing industry. There are no important wetlands mapped within the Study Area and the nearest Ramsar wetland is Blue Lake in Kosciusko National Park, approximately 23 km to the west. There are pressures on lake Jindabyne from increase urbanisation, lower and warmer water levels. Similarly, other water ways are also subject to these pressures. Buffers from water resources would be an important protection measure.

The Study Area also supports terrestrial and aquatic groundwater dependent ecosystems (GDEs) (Figure 4-2).
Figure 4-1 Key Fish Habitat Mapping (NSW DPI)
4.2.3 Biodiversity

Flora and fauna of conservation significance

The following database searches were carried out to obtain mapping data and lists of threatened and migratory flora and fauna species and Threatened Ecological Communities (TECs) that have the potential to occur within the Study Area:

- The OEH threatened species database (Bionet) was searched in relation to the Study Area. This search identified species listed as threatened under the *Biodiversity Conservation Act 2016* within 100 km of the Study Area.


- The Department of the Environment Protected Matters search tool was used to search an area 100 kilometres in radius from the centre of the proposal site. This search identified species listed as threatened or migratory under the *Environment Protection Biodiversity Conservation Act 1997*.

The findings of these studies are presented in the following maps and tables.

The BioNet and Fisheries threatened species search results are mapped in Figure 4-3 - Figure 4-5 and included:

- 64 flora species
- 12 amphibian species
- 7 reptile species
- 46 bird species
- 25 mammal species
- 3 fish species.

Considering the smaller Study Area boundary, there are 3 threatened flora\(^1\) records, 9 threatened fauna records and 1 threatened fish that have so far been identified within the Study Area (Table 4-2).

### Table 4-2 Threatened flora and fauna within the Study Area

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>BC Status</th>
<th>EPBC Status</th>
<th>FM Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Litoria aurea</em></td>
<td>Green and Golden Bell Frog</td>
<td>E1,P</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><em>Artamus cyanopterus cyanopterus</em></td>
<td>Dusky Woodswallow</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Calyptrorhynchus lathamii</em></td>
<td>Glossy Black-Cockatoo</td>
<td>V,P,2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Epthianura albifrons</em></td>
<td>White-fronted Chat</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Hieraaetus morphnoides</em></td>
<td>Little Eagle</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Neophema pulchella</em></td>
<td>Turquoise Parrot</td>
<td>V,P,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Pachycephala olivacea</em></td>
<td>Olive Whistler</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Petroica boodang</em></td>
<td>Scarlet Robin</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Stagonopleura guttata</em></td>
<td>Diamond Firetail</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Hoary sun ray is identified in the broader area but so far has not been recorded in the Study Area.
The BioNet threatened species search results for Threatened Ecological Communities (TECs) that have the potential to occur in the South East Corner – Monaro IBRA Subregion identified 5 TECs, listed below. Section 5.4 comments on the actual distribution of these, based on the field validation undertaken as part of this study.

Table 4-3 Threatened ecological communities with potential to occur within the Study Area

<table>
<thead>
<tr>
<th>Community</th>
<th>BC Status</th>
<th>EPBC Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions</td>
<td>E3</td>
<td>E</td>
</tr>
<tr>
<td>Natural Temperate Grassland of the South Eastern Highlands</td>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions</td>
<td>E3</td>
<td></td>
</tr>
<tr>
<td>Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions (refer note below).</td>
<td>E3</td>
<td></td>
</tr>
<tr>
<td>White Box Yellow Box Blakelys Red Gum Woodland</td>
<td>E3</td>
<td>CE</td>
</tr>
</tbody>
</table>

**BC Act:** E3 = Threatened Ecological Community  
**EPBC Act:** CE = Critically Endangered, E = Endangered

**Note:**

The listing of *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* has recently changed under the NSW BC Act. As of the 28th of June 2019, this community has been renamed to Critically Endangered ‘Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion’. It essentially covers the same Plant Community Types (PCTs: 679, 1191, 1110 & 1196) over the Jindabyne Study Area. Any reference to *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* in this report should now be interpreted as ‘Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion’.

The EPBC Protected Matters Search identified 7 TECs, 88 threatened species and 13 migratory species that have potential to occur at the site.

A search of the Department of Primary Industries WeedWise identified 121 priority weeds for the Snowy Monaro Regional LGA.
Figure 4-3 Threatened Fauna Records within 10 km of the Study Area (DEH 2019)
Figure 4-4 Threatened Flora Records within 10 km of the Study Area (OEH 2019)
Figure 4-5 Threatened Freshwater Species (NSW DPI Fisheries)
Invasive species

Controlling the spread of weeds and feral animals are important environmental management issues for the Study Area, as well as controlling biosecurity impacts within high environmental value land and areas adjoining high environmental value land.

The management of weeds within the Study Area is governed by the NSW Biosecurity Act 2015. Local Government and Council are responsible for enforcing weed control within Snowy Monaro Regional Council LGA. Local councils also have obligations under the Local Land Services Act 2013 and Companion Animals Act 1998 to manage both pest and domestic animals on land they own, occupy or manage. Local councils play an important role in coordinated pest control programs for weeds and pest animals (NSW DPI, 2018). Snowy Monaro Regional Council specifically has an aerial weed spraying program targeting serrated tussock (*Nassella trichotoma*) which is a weed of National Significance. Other weeds that occur within the Snowy Monaro Regional Council LGA and either occur, or could be present within the Study Area are African Lovegrass (*Eragrostis curvula*), St Johns Wort (*Hypericum perforatum*), Gorse (*Ulex Europaeus*), Chilean needle grass (*Nassella neesiana*), Fireweed (*Senecio Madagascariensis*), Cape Broom (*Genista monspessulana*), Scotch broom (*Cytisus scoparius*), Sweet Briar (*Rosa rubiginosa*), Nodding Thistle (*Carduus nutans*), Coolatai Grass (*Hyparrhenia hirta*), and Blackberry (*Rubus fruticosus agg*).

4.2.4  Bushfire

Currently minimal bush fire prone areas are mapped for the Study Area (Figure 4-6). However, large areas of continuous canopy vegetation does occur and may require management where adjacent to areas of development. Clearing for asset protection and other fire mitigation may impact adversely on high environmental and heritage value land. NGH Environmental suggest that the Council’s Bush Fire Management Plans and mapping of Bush Fire Prone Land require review.
Figure 4-6 Bushfire prone land mapping
4.2.5 Aboriginal heritage

A review of the local, state and national heritage registers including the Snowy River LEP was undertaken to identify any existing heritage items of Aboriginal significance located within the Study Area. A search of the Aboriginal Heritage Information Management System (AHIMS) database was also conducted to gain information about any Aboriginal sites previously identified within the Study Area.

The Aboriginal Heritage Information Management System (AHIMS) is maintained by OEH and provides a database of previously recorded Aboriginal heritage sites. A search provides basic information about any sites previously identified within a search area. However, a register search is not conclusive evidence of the presence or absence of Aboriginal heritage sites, as it requires that an area has been inspected and details of any sites located have been provided to OEH to add to the register. As a starting point, the search will indicate whether any sites are known within the investigation area.

A search of the AHIMS database was conducted over the Study Area on the 9th of April 2019. The AHIMS client service ID was 414250. There are 128 Aboriginal sites and a declared Aboriginal Place recorded in the Study Area Table 4-4, below, shows the site types previously recorded in the Study Area. Figure 4-7 shows the location of AHIMS sites in relation to the Study Area. It is clear from these search results that artefacts are the dominate site type located within the Study Area.

Table 4-4 Breakdown of previously recorded Aboriginal open sites in the region

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artefact</td>
<td>119</td>
</tr>
<tr>
<td>Artefact, Potential Archaeological Deposit (PAD)</td>
<td>2</td>
</tr>
<tr>
<td>Stone Arrangement, Burial</td>
<td>2</td>
</tr>
<tr>
<td>Potential Archaeological Deposit (PAD)</td>
<td>1</td>
</tr>
<tr>
<td>Modified Tree (Carved or Scarred), Burial</td>
<td>1</td>
</tr>
<tr>
<td>Burial</td>
<td>1</td>
</tr>
<tr>
<td>Modified Tree (Carved or Scarred)</td>
<td>1</td>
</tr>
<tr>
<td>Ceremonial Ring (Stone or Earth), Grinding Groove</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>

The declared Aboriginal Place Curiosity Rocks is recorded within the Study Area. Aboriginal places protect areas of land that have recognised values of significance to Aboriginal people. A place can have spiritual, natural resource usage, historical, social, educational or other type of significance.
Curiosity Rocks is listed as an Aboriginal Ceremonial complex site encompassing approximately 40 hectares of Lot 161 DP 756686. The site was registered as an Aboriginal Place on the 7th of April 2016. The values for which Curiosity Rocks has been assessed as significant to Aboriginal culture includes but is not limited to it being in sight of Kalkite Mountain and adjacent to a camping area and ceremonial grounds situated along the traditional travel pathways up the Snowy River to the Mt Twynam area. The site is noted to have archaeological evidence of occupation and use by Ngarigo people. The area holds a deep spiritual connection for the Ngarigo people who continue to acknowledge the cultural integrity of this place and the importance of protecting its cultural values for future generations.

The declaration of Curiosity Rocks as an Aboriginal Place legally protects the land which has been deemed to have special significance for Aboriginal people. The declaration of an Aboriginal Place aims to conserve the ‘special significance with respect to Aboriginal culture’ of that place. Under s86 of the NPW Act there are penalties for harming or desecrating a declared Aboriginal Place. The gazetting of Curiosity Rocks as an Aboriginal Places notes that “the use of Curiosity Rocks Aboriginal Place for water storage by Snowy Hydro Limited and any lawful activities associated with such use, including activities which cause the rise and fall of water within the Aboriginal Place, do not constitute harm or desecration of the Aboriginal Place.” (NSW Government Gazette No 44 of 3 June 2016: 1206). The landowner/land manager or occupier, OEH and the Aboriginal community are responsible for developing an agreed management plan for the Aboriginal Place. Given that the Minister declares Aboriginal Places the site is administered through OEH, and all management plans require endorsement by OEH.

No other Aboriginal cultural heritage sites beyond those outlined above are listed on local, state and national heritage registers or within the Snowy River LEP (2013).

4.2.6 Non-Aboriginal heritage

NGH Environmental undertook a search of statutory and non-statutory heritage registers to identify any recorded heritage sites within the Study Area. Heritage databases were searched in April 2019. The searches as part of this assessment were as follows.

- The Australian Heritage Database (Department of the Environment and Energy (Cwth), 2019), this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the Study Area.
- The NSW State Heritage Inventory (SHI) (Office of Environment and Heritage (NSW), 2019), this includes items on the State Heritage Register and items listed by state agencies and local Government, to identify any items currently listed within or adjacent to the Study Area.
- Heritage schedule of Snowy River LEP 2013 for locally listed heritage items that are within or adjacent to the Study Area.

Three registrations on the Australian Heritage Database are located within the Study Area as detailed in Table 4-5. These listings include one registration on the Register of the National Estate, one place rejected for emergency listing on the National Heritage List and one removal from the Register of the National Estate.
Table 4-5. Results from search undertaken of the Australian Heritage Database.

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Location</th>
<th>Status and Listing ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Jindabyne</td>
<td>Jindabyne, NSW, Australia</td>
<td>(Registered) Register of the National Estate (Non-statutory archive) Place ID: 1054</td>
<td>Extensively used for tourism and recreation: fishing, water sports, caravanning and camping in established areas.</td>
</tr>
<tr>
<td>Snowy River</td>
<td>Jindabyne, NSW, Australia</td>
<td>(Place rejected for Emergency Listing) National Heritage List Place ID: 106122</td>
<td>The whole of the river.</td>
</tr>
<tr>
<td>Snowy River (New South Wales)</td>
<td>Jindabyne, NSW, Australia</td>
<td>(Removed from Register or IL) Register of the National Estate (Non-statutory archive) Place ID: 1053</td>
<td>Through forested areas in Kosciusko National Park, Lake Jindabyne, the Snowy River National Park (Victoria) to the coast.</td>
</tr>
</tbody>
</table>

STATE HERITAGE REGISTER

A search of the Study Area and surrounds indicated that there are no items of State Heritage Significance listed within the Study Area.

STATE AGENCY HERITAGE REGISTERS

There are no listings within the Study Area on the s.170 register.

SNOWY RIVER LOCAL ENVIRONMENTAL PLAN 2013

While there are a number of local heritage items listed on the Snowy River LEP, 11 items are within the Study Area as detailed in Table 4-6 below and shown in Figure 4-8.

Table 4-6. Snowy River LEP listed heritage items within the project area.

<table>
<thead>
<tr>
<th>Item name</th>
<th>Location</th>
<th>Listing ID</th>
<th>Statement of Significance from OEH SHI Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Jindabyne Conservation Area</td>
<td>Jindabyne, NSW 2627</td>
<td>C4</td>
<td>Lake Jindabyne, including the dam wall, is an important component of the historic Snowy Scheme. It contributes significant landscape value to the town of Jindabyne as well as providing opportunities for water sports, general tourism while the lake foreshores are popular for community celebrations and leisure activities. The lake is representative of the man-made Snowy water bodies. Date significance updated: 26 Jan 12</td>
</tr>
<tr>
<td>Item name</td>
<td>Location</td>
<td>Listing ID</td>
<td>Statement of Significance from OEH SHI Database</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------------------------</td>
<td>------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Jindabyne Cemetery</td>
<td>Barry Way, Jindabyne, NSW 2627</td>
<td>I145</td>
<td>This is a representative example of a relocated cemetery associated with the development of the Snowy Mountains Scheme. It is evidence of the establishment of the new town of Jindabyne. It is a significant site for the local community whose friends and families have graves which were relocated to the site or have been buried there more recently. Further the memorial gates have significant social and historic heritage value. Date significance updated: 16 Feb 12</td>
</tr>
<tr>
<td>Jindabyne Winter Sports Academy</td>
<td>207 Barry Way, Jindabyne, NSW 2627</td>
<td>I146</td>
<td>The lodges are significant because of their association with the snowy Scheme. They are tangible evidence of post World War II temporary workers' single accommodation. The Love Shack is particularly significant as it was used by Sir William Hudson when visiting the Scheme. Date significance updated: 07 Jul 11</td>
</tr>
<tr>
<td>Leesville Hotel</td>
<td>218 Barry Way, Jindabyne, NSW 2627</td>
<td>I147</td>
<td>Leesville is a group of vernacular rural buildings. The shepherd's hut section of the hotel dates from the mid-19th century, while the later building is probably 1860s. The hotel was built in response to the need for accommodation for travelers to the Thredbo Valley gold diggings in the 1860s. The place was owned and operated by the Sturgeon family. It is a landmark on the Barry Way with its distinctive front verandah. The cottage, shearing shed, and old plantings contribute to the place's heritage significance. Date significance updated: 16 Feb 12</td>
</tr>
<tr>
<td>St Andrews Uniting Church</td>
<td>19 Gippsland Street, Jindabyne, NSW 2627</td>
<td>I150</td>
<td>This is a representative example of 20th century period ecclesiastical style church construction. It is a landmark in the local district. The hall is an example of the re-use of building built and used for the Snowy Mountains Scheme. Date significance updated: 25 May 09</td>
</tr>
<tr>
<td>Jindabyne Foreshore Park</td>
<td>Banjo Paterson Park, Kosciuszko Road, Jindabyne, NSW 2627</td>
<td>I151</td>
<td>This is a representative example of a cultural landscape developed in the 1960s which is significant to the local community as a recreational area. Date significance updated: 16 Feb 12</td>
</tr>
<tr>
<td>Strzelecki Monument</td>
<td>Banjo Paterson Park, Kosciuszko Road, Jindabyne, NSW 2627</td>
<td>I152</td>
<td>The statue was donated by the Polish government to Australia's bicentenary and is evidence of the long-standing links between the two countries. It is a representative example of a landmark monument dedicated to Paul Strzelecki, a significant explorer, scientist, geologist, surveyor and philanthropist. It has aesthetic significance as a fine bronze sculpture by renowned Polish</td>
</tr>
<tr>
<td>Item name</td>
<td>Location</td>
<td>Listing ID</td>
<td>Statement of Significance from OEH SHI Database</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>St Columbkille’s Church and Hall</td>
<td>24 Kosciuszko Road, Jindabyne, NSW 2627</td>
<td>I153</td>
<td>sculptor Jerzy Sobocinski and it is rare to have such well-crafted monument in a rural setting. Date significance updated: 26 Jan 12</td>
</tr>
<tr>
<td>Memorial Hall</td>
<td>45 Kosciuszko Road, Jindabyne, NSW 2627</td>
<td>I154</td>
<td>A representative example of 20th century ecclesiastical style church construction and is evidence of the era of establishment of the town. The building is sited in a prominent position and makes a significant contribution to the townscape. It is an important site for the Roman Catholics of the district. The hall, an ex-Snowy building, contributes to the heritage significance of the site. Date significance updated: 26 Oct 11</td>
</tr>
<tr>
<td>St Andrews Anglican Church</td>
<td>3 Park Road, Jindabyne, NSW 2627</td>
<td>I155</td>
<td>The church is a significant site for the Anglican community of the district and a representative example of 20th century ecclesiastical architecture. Date significance updated: 27 Jan 11</td>
</tr>
<tr>
<td>Cobbin</td>
<td>504 Barry Way, Moonbah NSW 2627</td>
<td>I166</td>
<td>The Cobbin property was recorded to be settled by John Lambie in 1840. The homestead, built around 1856, is a representative example of a mid-Victorian period Georgian style Monaro stone farm house with a quite a good degree of integrity and intactness. Date significance updated: 26 Oct 11</td>
</tr>
</tbody>
</table>

The results of the heritage searches listed above indicate that there are eleven non-Aboriginal local heritage items located within the Study Area, one registration on the Register of the National Estate, one place rejected for emergency listing on the National Heritage List, and one removal from the Register of the National Estate. These listings will require consideration in the Go Jindabyne Environment and Heritage Study.
4.2.7 Climate and weather

Temperature

The Jindabyne area is in a temperate climate zone and experiences mild to warm summers and cold winters. The Thredbo AWS and Cooma Airport AWS are the nearest weather stations to Jindabyne. Cooma Airport AWS is considered to have the closest match in weather to Jindabyne. The long term average maximum temperature is recorded as 18.2 degrees and minimum temperature as 4.1 degrees. The average rainfall is 535.3mm (BOM, 2019).

The Snowy Monaro Regional Council (SMWC, 2019) describes the weather of sub-alpine areas as generally fine and sunny weather with warm to hot days and cool to warm days and cold nights in winter. As the area varies from tablelands to the highest mountains in Australia, naturally the weather conditions vary according to altitude. In the lower districts temperatures range from around 9 to 28 degrees celsius in summer and between -5 and 16 degrees celsius during winter. Rainfall also varies considerably between the alpine and sub-alpine areas. Generally, the sub-alpine annual average is between 400 and 500mm with only an occasional snowfall.

Air Quality

There is no routine air quality monitoring in the area, however, air quality in the Jindabyne Area has been reported to be generally acceptable, with reported impacts from solid fuel burning and fuel reduction burns particularly in winter the colder weather can result in temperature inversions that trap air pollution close to the ground (ACT Commissioner for Sustainability and the Environment, 2010). According to the Regional State of the Environment Report, 2004-2009, the Snowy River Shire unlikely to be exposed to noticeable reductions in air quality due to vehicle emissions, which are more apparent in larger population centres, although large numbers of seasonal visitors or an increase in traffic through flow, may cause some reduction in outdoor air quality. In general, the absence of large scale industries that emit atmospheric pollutants and the low population density within the area ensures that the air is of a relatively high quality.

Climate change

Anthropogenic Climate Change is listed as a Key Threatening Process under the NSW Biodiversity Conservation Act 2016. Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases has also been nominated for listing as a Key Threatening Process under the Commonwealth EPBC Act, to replace the earlier listing Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases.

A number of tools exist or are under development to assist with adaptation and conservation of native species and communities at the local and regional levels:

- The Biodiversity Node (OEH 2019b) is led by Macquarie University in collaboration with partner institutions has a series of relevant projects dealing with weeds, translocation, drought-mortality risk for tree species, the vulnerability of endangered species and ecosystems to climate change, ecological range metrics for the NSW flora, identifying floristic refugia and corridors and impacts on freshwater biodiversity
- The Weed Futures website (Duursma et al. 2013) is a decision-support tool for determining current and future weed threats by providing individual profiles for over 700 non-native naturalised and invasive plant species
Climate Ready revegetation guide (Hancock et al. 2018) provides a pathway for assessing the suitability of species and provenances for revegetation projects based on climate projections and species responses.

A number of regional projections and analyses of challenges and opportunities related to climate change have been undertaken for the Southern Tablelands region, summarised in section 0.

Key changes relevant for environmental values in the Jindabyne Study Area include:

- Reduced rainfall during the spring growing season and increased incidence of drought
- Warmer temperatures, including higher winter minima.

Species at risk include those with long generations, poor mobility, narrow ranges, specific host relationships, isolated and specialised species and those with large home ranges (Hughes and Westoby 1994 in Scientific Committee 2000). Climate change can also affect natural communities indirectly through interactions with other threatening processes such as fire, weeds and herbivory.

The dominant natural ecological community in the Study Area is PCT 1191 Snow Gum - Candle Bark woodland ‘Snow Gum Woodland’), which forms part of the NSW Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland Threatened Ecological Community (TEC). In its natural state, this community commonly exists in a mosaic with natural grassland, which occurs where minimum temperatures, impeded drainage or soil conditions preclude the growth of tree seedlings. Where there remains sufficient soil moisture for tree growth, warmer winter temperatures are likely to reduce the ‘frost hollow’ effect and may lead to:

- The expansion of eucalypts into natural grassland areas, where there are viable tree populations within dispersal distance
- The replacement of cold-tolerant tree species (Snow Gum, Black Sally and Candlebark) with other eucalypt species (Yellow Box, Blakely’s Red Gum, Ribbon Gum, Apple Box), where these species are present within dispersal range.

The invasion of trees into frost hollow grasslands may be exacerbated by the ‘fertiliser’ effect of increased CO₂ on tree growth.

At the lower end of the present rainfall range of Snow Gum woodland, reduced annual rainfall is likely to lead to a contraction of woodland in favour of natural grassland (Scientific Committee 2019). Reduced rainfall and warming temperatures may selectively affect wet area species and communities, such as the River Tussock grassland component of the Commonwealth Natural Temperate Grassland TEC (PCT 1110), and the Black Sally woodland community (PCT 679).

Climate change may also be impacting other functionally important woodland species which are at the edge of their climatic range, such as Ribbon Gum, a wetter area species which has experienced widespread dieback on the Monaro in recent years (associated with outbreaks of the eucalyptus weevil, Gonipterus sp.).

Increased temperatures and reduced rainfall are likely to increase the frequency and intensity of wildfires, extending the fire season throughout the year. High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition is also listed as a Key Threatening Process under the BC Act.

The implications for planning and conservation in the Study Area include:

- The size and connectivity of existing woodland patches will need to be enhanced to improve resilience
Patches which include ecotones and a number of vegetation communities should be protected to allow species movement / dispersal (noting the very short dispersal distance of heavy-seeded eucalypts).

The potential loss of eucalypt tree cover due to changes in rainfall and fire regimes, or interaction with insect pests, would reduce available habitat and exacerbate movement barriers for mobile woodland fauna such as birds and microbats.

The likely increased incidence of drought and wildfire places greater importance on the protection and enhancement of existing corridors and refugia.

Increased drought frequency is likely to increase the impact of native and introduced herbivores on groundlayer vegetation.

A significant proportion of high conservation value vegetation and habitat and connectivity restoration opportunities are located on private land in the Study Area, requiring a suite of public-private interactions to achieve adaptation goals.

A more detailed analysis of climate change mitigation and adaptation in the Study Area (and LGA) is required, coupled with a review of HEV mapping and development of a comprehensive planning and restoration strategy for threatened species and ecological communities. HEV mapping should be configured to specifically protect areas important for biodiversity adaptation to climate change, including movement corridors, climate refugia, ecotones, species migration zones and restoration opportunities. The priority pathways identified in the EASE process (OEH 2017) would be a valuable input to the development of such a strategy (refer section 0).

Movement barriers and connectivity requirements will vary between species; conservation approaches will need to address the needs of species at most risk from the effects of climate change. The Climate Ready Revegetation Guide (Hancock et al. 2018) offers a revegetation planning methodology based on the responses of individual species. It is noted that restoration in some areas may require the introduction of different species or provenances to those which existed prior to climatic changes.

An evaluation of urban design opportunities in Jindabyne would also be worthwhile, in line with the climate change adaptation measures outlined in the Draft Urban Design Guide (GANSW 2018a) and Greener Places: draft Green Infrastructure Policy for NSW (GANSW 2017b).

The impacts of climate change on flora and fauna in the Study Area have been considered in the assessment and validation of environmental values and development of the risk assessment matrix (refer Section 4.3.2).

4.2.8 Land use

The growth of Jindabyne will result in changes to land zoning and expansion of land uses into areas of previously undeveloped land. This will include commercial, industrial and residential development. Refer to Figure 4-10 for the current LEP land zoning map.

RU1 Primary production (rural land) is a significant land use zone (in area) within the Study Area. Continuing farming practices have the potential to impact land mapped as high environmental or heritage value specifically through removal of native vegetation and ground disturbance for agricultural purposes and as part of routine agricultural management actions. Poor management of rural land and surrounding council land could result in adverse impacts, such as the introduction or spread of pests and weeds and/or loss of high environmental and heritage value land.

Existing urban developments, specifically residential (R5 Residential Large Lot) expansion, would have resulted in vegetation removal, fragmentation of potential HEV land and biodiversity corridors, potential
impacts to heritage values, disturbance of land for roads, buildings, services, bushfire protection zones, landscape and hydrological changes, and the introduction of pests and weeds within the Study Area. Management plans for individual subdivisions may control some of these impacts.

Increased development beyond the existing urban areas would result in a greater potential impacts and encroachment into or towards high environmental and heritage value land within the Study Area. The potential impacts would need to be considered before any rezoning or new development occurs, in accordance with relevant legislation.

Expansion of land uses within the existing footprint of Jindabyne town area may present a lesser impact to environmental values, by consolidating development in existing areas of disturbance and retaining those areas that are more intact.
Figure 4-10 Land Zoning
4.3 ENVIRONMENTAL RISK ANALYSIS

The risk analysis has been prepared to investigate the key environmental aspects at risk as a consequence of development pressure in combination with external forces, such as climate change, bushfire, invasive species and pathogens, in the Study Area.

Key environmental aspects have been broken down as follows:

- **Biodiversity** (threatened species, native vegetation, connectivity or linkages, protected land and reserves)
- **Heritage** (Aboriginal and non-Aboriginal; known and unknown items or places), social values for the Aboriginal community and the wider public, and educational values
- **Water resources** (Lake Jindabyne and streams)
- **Local Climate** (Air Quality)

Environmental risks associated with the area have been considered in general terms and with the expectation that development will expand within the Study Area. Risks, acting on the values above, have been categorised as follows:

- **Climate change** (the risk of more intense weather systems and increasing temperature)
- **Bushfire** (the risk of more frequent and intense bushfires)
- **Land development** (the risks associated with clearing vegetation, soil disturbance and building demolition/refurbishment, noise and indirect ongoing impacts)
- **Invasive species** (the risk of increasing plant and animal pests)
- **Contamination** (the risk of spreading or generating soil, water or air pollution)

4.3.1 Risk assessment methodology

The risk assessment methodology used is consistent with relevant international standards for Environmental Management Systems and Risk management, AS/NZ ISO 14004:2004 (Environmental Management Systems) and AS/NZ ISO 13000:2009 (Risk management). The development of a risk matrix is a systematic and transparent means to arrive at a risk rating using ‘consequence’ of impacts in combination with ‘likelihood’ of impacts. This is considered an important tool for communication with the public to explain the risks associated with the growth of Jindabyne and systematically rank them.

High consequence in combination with high likelihood results in the highest risk rating. Consequence is defined as the impact on the physical, ecological, social and heritage values of the Study Area or place and extent of the impact. Likelihood is the chance that the impact would occur. All risk ratings shown are ‘unmitigated’; that is they assume that no management actions are taken to contain the risks.
### Table 4-7 Risk assessment methodology

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Negligible</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Catastrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community interest</td>
<td>Negligible impact, as defined by relevant guidelines.</td>
<td>Minor impact as defined by relevant guidelines, or temporary impact that is readily reversed.</td>
<td>Moderate impact, as defined by relevant guidelines, or temporary impact that could be reversed with a moderate level of effort or financial outlay. Resulting in legal action.</td>
<td>Major impact, as defined by relevant guidelines, or temporary impact that could be reversed only with significant effort or financial outlay. Potential for significant fines or legal action.</td>
<td>Significant impact (as defined by relevant guidelines) resulting in the destruction of, or long term impact on those values. Prohibitive cost to reverse impact. Significant legal action.</td>
</tr>
<tr>
<td>Community interest</td>
<td>– a few people interested.</td>
<td>– some people affected/concerned/interested.</td>
<td>– many people affected/concerned/interested.</td>
<td>– most people affected/concerned/interested.</td>
<td>– virtually everybody affected/concerned/interested.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Remote</th>
<th>Unlikely</th>
<th>Possible</th>
<th>Likely</th>
<th>Almost certain or inevitable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likelihood</td>
<td>Remote</td>
<td>Unlikely</td>
<td>Possible</td>
<td>Likely</td>
<td>Almost certain or inevitable</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
<td>Extreme</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
</tbody>
</table>

### Table 4-8 Resulting risk matrix

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Consequence</th>
<th>Negligible</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Catastrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Unlikely</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Possible</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td>Likely</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
<td>Extreme</td>
<td>Extreme</td>
</tr>
<tr>
<td>Almost certain or inevitable</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Extreme</td>
<td>Extreme</td>
<td></td>
</tr>
</tbody>
</table>
4.3.2 Risk assessment results

This assessment considers the environmental and heritage values and risks present in the Study Area. The risk matrix (Tables 4-9 – 4-11 below) identifies environmental and heritage values with a high to very high risk rating (unmitigated). To address the unmitigated risk, this report has developed measures for incorporation into the master plan that would avoid, minimise or mitigate the impacts with the aim to reduce the risk rating.

<table>
<thead>
<tr>
<th>Table 4-9 Resulting risk matrix: Climate change impacts</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>VALUES</th>
<th>Aspect of value/risk</th>
<th>Temperature rise</th>
<th>Climate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assessment</td>
<td>Consequence</td>
<td>Likelihood</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Threatened Species</td>
<td>major</td>
<td>almost certain</td>
</tr>
<tr>
<td></td>
<td>EEC</td>
<td>major</td>
<td>almost certain</td>
</tr>
<tr>
<td></td>
<td>Native vegetation</td>
<td>moderate</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Linkages/connectivity</td>
<td>moderate</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Reserves</td>
<td>moderate</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Aboriginal Heritage</td>
<td>Known items</td>
<td>minor</td>
</tr>
<tr>
<td></td>
<td>Unknown items</td>
<td>minor</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Cultural value</td>
<td>cannot assess</td>
<td>cannot assess</td>
</tr>
<tr>
<td></td>
<td>Scientific value</td>
<td>minor</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Unknown items</td>
<td>negligible</td>
<td>remote</td>
</tr>
<tr>
<td></td>
<td>Cultural value</td>
<td>negligible</td>
<td>remote</td>
</tr>
<tr>
<td></td>
<td>Scientific value</td>
<td>negligible</td>
<td>remote</td>
</tr>
<tr>
<td></td>
<td>Non Aboriginal Heritage</td>
<td>Lake Jindabyne</td>
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</tr>
<tr>
<td></td>
<td>Water Quality</td>
<td>moderate</td>
<td>unlikely</td>
</tr>
<tr>
<td></td>
<td>Local climate</td>
<td>Air Quality</td>
<td>remote</td>
</tr>
</tbody>
</table>

Table 4-10 Resulting risk matrix: Land use impacts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assessment</td>
<td>Consequence</td>
<td>Likelihood</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Threatened Species</td>
<td>major</td>
<td>likely</td>
</tr>
<tr>
<td></td>
<td>EEC</td>
<td>major</td>
<td>likely</td>
</tr>
<tr>
<td></td>
<td>Native vegetation</td>
<td>moderate</td>
<td>likely</td>
</tr>
<tr>
<td></td>
<td>Linkages/connectivity</td>
<td>moderate</td>
<td>likely</td>
</tr>
<tr>
<td></td>
<td>Reserves</td>
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<td>unlikely</td>
</tr>
<tr>
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<td>Aboriginal Heritage</td>
<td>Known items/places</td>
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</tr>
<tr>
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<td>Unknown items/places</td>
<td>major</td>
<td>likely</td>
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<td></td>
<td>Cultural value</td>
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<td>cannot assess</td>
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<td>Scientific value</td>
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<td>Unknown items/places</td>
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</tr>
<tr>
<td></td>
<td>Cultural value</td>
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<td>possible</td>
</tr>
<tr>
<td></td>
<td>Scientific value</td>
<td>moderate</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Water resources</td>
<td>Lake Jindabyne</td>
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</tr>
<tr>
<td></td>
<td>Water Quality</td>
<td>minor</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Local climate</td>
<td>Air Quality</td>
<td>minor</td>
</tr>
</tbody>
</table>

Table 4-11 Resulting risk matrix: Invasive species, bushfire and contamination impacts

<table>
<thead>
<tr>
<th>ENVIRONMENTAL VALUES</th>
<th>Aspect of value/risk</th>
<th>Increasing plant and animal pests</th>
<th>More frequent and intense bushfires</th>
<th>Spreading or generating soil, water or air pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assessment</td>
<td>Consequence</td>
<td>Likelihood</td>
<td>Risk Rating</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Threatened Species</td>
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<td>possible</td>
<td>Very High</td>
</tr>
<tr>
<td></td>
<td>EEC</td>
<td>major</td>
<td>possible</td>
<td>Very High</td>
</tr>
<tr>
<td></td>
<td>Native vegetation</td>
<td>moderate</td>
<td>possible</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Linkages/connectivity</td>
<td>moderate</td>
<td>possible</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Reserves</td>
<td>moderate</td>
<td>possible</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Aboriginal Heritage</td>
<td>Known items</td>
<td>moderate</td>
<td>possible</td>
</tr>
<tr>
<td></td>
<td>Unknown items</td>
<td>moderate</td>
<td>possible</td>
<td>High</td>
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<td>cannot assess</td>
<td>n/a</td>
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<tr>
<td></td>
<td>Scientific value</td>
<td>moderate</td>
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<td>High</td>
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<tr>
<td></td>
<td>Non-Aboriginal Heritage</td>
<td>Known items</td>
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<td>Low</td>
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<td></td>
<td>Local climate</td>
<td>Air Quality</td>
<td>negligible</td>
<td>remote</td>
</tr>
</tbody>
</table>
### 4.3.3 Risk assessment discussion

#### Risk significance and outcome

The risk ratings derived in Section 4.3.2 above are considered to be the unmitigated (without management actions) ‘risk rankings’ for the Go Jindabyne Study area. This is considered an important tool for communication with the public to explain the areas of highest risk associated with the growth of Jindabyne. It was also used by this study to identify key areas for further investigation.

The aspects of Biodiversity and Aboriginal heritage were identified as having high to very high risk of impact, against the majority of risk factors. As such, this has been the focus of further assessment in this environmental and heritage study. Other values where a medium to high risk rating has been identified, for certain risk factors, are non-Aboriginal heritage, and water resources. The protection of these values are likely to be tied closely to the identification and protection of high value areas.

The highest risk ranking determined for the Study Area associated with Climate change relates to Threatened species and Threatened Ecological Communities and Water resources this is linked to their existing vulnerability or susceptibility to harm and local and social value.

There is also risk from increasing invasive species or plant and animal pests, more frequent and intense bushfires and contamination associated with existing land uses and the future development of the land however specifically for Threatened Species and Threatened Ecological Communities and this is again linked to their existing vulnerability or susceptibility to harm. There is also a risk through the demolition or modification to some existing structures and buildings in relation to the non-Aboriginal heritage values.

Consistent with the findings of the risk matrix, the focus of further assessment within this Environmental and Heritage Study has been Biodiversity and Aboriginal and historic heritage, with an aim to provide recommendations relating to high value and sensitive areas and constraints and opportunities specifically addressing areas for protection and conservation management. The detailed studies undertaken are outlined in Section 5, 6 and 7 of this report.
5 BIODIVERSITY

5.1 BIODIVERSITY CONTEXT OF THE STUDY AREA

The South East and Tablelands region is diverse and includes alpine, tablelands and coastal landscapes. It is home to more than 100 threatened plant species, 112 threatened animal species and 13 Threatened Ecological Communities (OEH 2017). The biodiversity corridors in the region are part of a national wildlife corridor extending from Victoria to Far North Queensland (DPE 2017).

5.1.1 Site-based environmental assessments

NGH Environmental (2005a) provides a summary of the natural values of the woodlands, grasslands and riparian areas in the Study Area, drawing on a desktop review of previous site-based assessments, supplemented with a vehicle-based survey to verify the current condition of habitats for threatened flora and flora. The report noted the conservation value of grassy woodlands dominated by Snow Gum or Candlebark, in the Jindabyne Study Area (equivalent to the NSW Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland), which offers habitat to several threatened plant and animal species. The report further noted the conservation significance of woodland connectivity, hollow-bearing trees, and areas with diverse understorey and ground refugia (rocks and fallen timber). Appropriate grazing management and the control of pest plants and animals were highlighted as important environmental management issues for Jindabyne.

Below is a brief summary of the findings of NGH Environmental (2005a) in relation to the Study Area’s flora, fauna and habitats.

Note:

Much of the environmental information referenced below remains relevant as site examples within the Study Area. However, the assessments commonly focus on proposed development sites and there are likely to have been localised changes to environmental values since the studies were undertaken. Information from more recent survey and impact assessment work is also included and referenced separately.

Forests and woodlands

Woodlands on steep rocky slopes around Jindabyne, such as east of the dam wall, are unlikely to have ever been cleared for grazing and have a predominantly shrubby understorey. Montane forest or woodland dominated by Ribbon Gum (*E. viminalis*) occurs in a few areas. It was recorded as extensive on steep slopes east of Kalkite village and present towards the southern end of Avonside Road, on Chongs Road in the valley of Daley Creek, in the gully south of the road to Tigers Hill (south of Gaden Road) and on the east-facing steep slopes of the range south of Tigers Hill. Gentler slopes are more likely to have been grazed and to have a grassy understorey. Woodland dominated by Snow Gum (*E. pauciflora*) with a mixed shrubby and grassy understorey occurs near East Jindabyne.

FLORA

A good example of a grassy snow gum woodland on a less exposed site occurs south-west of Jindabyne, adjacent to the Leesville industrial estate. Snow Gum and Candlebark grassy woodland offers potential habitat to several threatened plant species. Of these only the Silky Swainson-pea (*Swainsona sericea*) and Mauve Burr-daisy (*Calotis glandulosa*) have contemporary records within 20km of Jindabyne, both in Snow...
Gum woodland. There is an old record of *Euphrasia scabra* near Jindabyne; this species is now likely to be locally extinct due to degradation of its swampy habitat. The ROTAP species Anchor Plant (*Discaria pubescens*), a leafless, thorny, grazing-sensitive shrub, can occur among rocks in woodland and has been recorded close to Jindabyne (R. Rehwinkel, pers. comm.; NGH Environmental 2003c; NGH Environmental 2004; NGH Environmental 2005a). It is noted that disturbed sites can still retain their potential for significant vegetation to occur.

A survey on land to the immediate west of the Leesville Industrial Estate recorded woodland dominated by Snow Gum and Candlebark (*E. rubida*), with a small area carrying Black Sallee (*E. stellulata*) (NGH Environmental 2004). The ROTAP plant species Anchor Plant (*Discaria pubescens*) was recorded as a single population of about 14 plants at the site (GDA 643304 5966430). Areas of higher diversity groundcover were recorded, including less common or declining species such as *Leptorhynchos squamatus*, *Cullen microcephalum*, *Swainsona monticola*, *Lotus australis*, *Calotis scabiosifolia*, *Bulbine glauca* and *Ophioglossum lusitanicum*.

A study of land to the north and east of the Leesville Industrial Estate mapped the majority of the land to the north of the estate as excellent condition Snow Gum – Candlebark Woodland (ELA 2017 – map extract provided by OEH). Smaller areas of moderate condition woodland were mapped in this area, with a larger patch east of Barry Way. A degraded wetland area was also mapped east of Barry Way. There is a strip of exotic and exotic-native grassland either side of Barry Way. The report also maps several hollow-bearing trees north of the estate and two occurrences of the threatened forb *Swainsona sericea*.

A biodiversity assessment of land at 417 Barry Way (Lots 50, 95 and 111 DP 7 56686) (ELA report - map extracts provided by OEH), located to the north of The Station resort shows the site to be dominated by exotic pasture, with a small area of Tablelands Snow Gum Grassy Woodland in moderate-good condition as secondary grassland and structural woodland largely on the western side of the site along Barry Way. The moderate-good condition woodland and parts of the moderate-good grassland are mapped as high constraint for development. An area of low condition woodland is mapped on the western side of the site, considered to be medium constraint. Hollow-bearing trees and areas of small-medium embedded rock habitat are also mapped at the site.

An assessment of vegetation to the west of Jindabyne along Kosciuszko Road (MR286) between Barry Way and Alpine Way recorded only one natural ecological community; PCT 1191 Snow Gum - Candle Bark woodland, which belongs to the NSW Tablelands Snow Gum Grassy Woodland EEC. Thirteen patches of the EEC with tree cover were mapped in the report. No threatened flora were recorded in the woodland areas during targeted searches (Envirokey 2017).

**FAUNA**

Key features of quality forests and woodlands within the Jindabyne target area include connectivity to larger wooded or forested areas, the presence of hollow-bearing trees, and at least periodic release from grazing pressure. Understorey density, fallen timber and rocky outcrops provide additional resources, required by some species.

Patches of woodland with hollow-bearing trees were observed along Barry Way. At Scandal Hill Road (off Barry Way) older hollow-bearing trees and abundant fallen timber occur. As well this area appears to be contiguous with the forested range west of the Mowamba River. Similarly, woodland along Chongs Road and Sugarloaf Road is contiguous with Ngadang Nature Reserve and also contains ribbon gum, a primary koala feed tree.
Quality woodland also occurs on Kaludan Park Road (from 2.1 to 2.3km from the Cobbin-Beloka Road and approximately 7km from Jindabyne), Kosciuszko Road, Avonside Road, Kalkite Road (from hillcrest at 2.9km from Eucumbene Road. Scattered woodland is also present along Geikle Creek Road and Tigers Hill Road, south from Gaden Road, becoming more dense near Tigers Hill. Montane forest or woodland dominated by Ribbon Gum east of Kalkite village, the southern end of Avonside Road, on Chongs Road in the valley of Daley Creek, in the gully south of the road to Tigers Hill (south of Gaden Road) and on the east-facing steep slopes of the range south of Tigers Hill may provide potential Koala habitat.

Snow Gum and Candlebark woodland offers potential habitat to several threatened fauna species including a suite of woodland birds, several of which have been recorded near Jindabyne (Brown Treecreeper, Diamond Firetail, Hooded Robin, Turquoise Parrot), the Squirrel Glider and Koala (also recorded nearby). This woodland may also support most of the listed threatened reptiles which occur on the Southern Tablelands, particularly those which utilise rocks for shelter such as the Little Whip Snake (Suta flagellum), Striped Legless Lizard (Delma impar) and Rosenberg’s Monitor (Varanus rosenbergii), though none of these have been recorded close to Jindabyne. Even sites with some degree of disturbance and sites that are within close proximity of developments have been found to have high fauna habitat values.

In the Tyrolean Village area, in 2003, potential habitat was observed for the Spotted-tailed Quoll, Koala, Eastern Pygmy Possum, Common Bentwing Bat, Hooded Robin, Diamond Firetail, Little Whip Snake, Eastern Earless Dragon, Rosenberg’s Monitor, Speckled Warbler and Masked Owl (NGH Environmental 2003d). The presence of rocky granite tors and proximity to grassland were noted as contributing to the value of this habitat. A fauna survey conducted in December 2000 (Woods & White 2000) 5km south of Jindabyne recorded potential habitat for the Koala, Spotted-tailed Quoll, Eastern Pygmy Possum, Olive Whistler and Eastern False Pipistrelle in modified snow gum woodland. A fauna survey conducted for the Alpine Sands and Kunama Ridge Estate in 2004 recorded potential habitat for threatened fauna species including the Spotted-tailed Quoll, Koala, Eastern pymy-possum, Common Bentwing Bat, Hooded Robin, Diamond Firetail, Little Whip Snake, Eastern Earless Dragon, Speckled Warbler and Masked Owl (NGH Environmental 2005b).

Leesville industrial estate was found to have abundant fallen logs would support small mammal species such as Antechinus spp. and bush rat. Due to the abundance of hollow bearing trees, the forest is likely to provide habitat for hollow-dependent species. Two threatened species were recorded at the site; the Hooded Robin and Squirrel Glider.

Mill Ridge, approximately two kilometres east of Jindabyne, is a more disturbed site which still retains potential for threatened species, including the Hooded Robin, Eastern Pygmy-possum, Diamond Firetail, Speckled Warbler, Masked Owl and Barking Owl. Rocky outcrops provide suitable habitat to the threatened species Rosenberg’s Monitor, Spotted-Tailed Quoll and Little Whip Snake (NGH Environmental 2003b).

The threatened Dusky Woodswallow and Diamond Firetail were recorded to the west of Jindabyne along Kosciuszko Road (MR286) between Barry Way and Alpine Way in a survey conducted in 2017. Five other threatened bird species were assessed as having moderate potential to be present; Gang-gang Cockatoo, Varied Sittella, Little Eagle, Scarlet Robin and Flame Robin (Envirokey 2017).

**Grasslands**

Dry native grasslands around Jindabyne are most likely to be secondary grassland created by clearing of the trees, rather than natural grasslands\(^2\). Areas of natural wet tussock grassland dominated by River or

\(^2\) As verified by recent on ground surveys.
Silver Tussock (Poa labillardieri) occur in small drainage lines (for example along Avonside Road 3.3km south of the Kosciuszko Road); this vegetation may belong to the Commonwealth Natural Temperate Grassland TEC. Dry secondary grasslands around Jindabyne is largely native pasture dominated by Spear Grasses (Austrostipa species), or more rarely by Kangaroo Grass (Themeda triandra).

Most of the grassland along Kosciuszko Road and in adjacent paddocks to the west of Jindabyne between Barry Way and Alpine Way is mapped as Introduced Grassland in Envirokey (2017). Two patches of grassland derived from PCT 1191 Snow Gum - Candle Bark woodland which belong to the NSW Tablelands Snow Gum Grassy Woodland EEC were mapped in this area. No threatened flora were recorded in the grassland.

**FLORA**

Spear Grass pasture is unlikely to provide habitat for threatened flora species, but areas where Kangaroo Grass is still dominant may do so. Such areas close to the Jindabyne dam wall and between Lees Creek and Jindabyne have been searched and no threatened flora species were recorded (NGH Environmental 2003c; NGH Environmental 2004b).

A survey at a grassland site located off Gippsland Street, approximately one kilometre from the centre of Jindabyne did not record any threatened species but did detect four species considered to be of regional conservation significance; the tall, silver foliaged daisy Ammobium alatum, the ROTAP Anchor Plant and the leguminous forbs, Lespedeza juncea var. sericea and Lotus australis (NGH Environmental 2005b). Lespedeza juncea var. sericea and Ammobium alatum have also been recorded in disturbed secondary grassland near Jindabyne Dam wall (Biosis Research 2003; NGH Environmental 2003c).

Exotic grassland and degraded native grassland derived from Box-Gum Woodland and Snow Gum Woodland is present in the vicinity of the Jindabyne Sport and Recreation Centre (NGH Environmental 2014). Exotic trees have been planted along roadways including species of pine (Pinus sp.), Lombardy Poplar (Populus nigra ‘Italica’) and Wattle trees (Acacia sp.). No threatened flora species or Threatened Ecological Communities were recorded in this area. Degraded grassland is also recent near the Lake at the Jindabyne pump station site, largely exotic but with patches of low diversity native grassland dominated by Kangaroo Grass (Themeda triandra), Niggerheads (Enneapogon nigricans), Snow Grass (Poa sieberiana) and Weeping Grass (Microlaena stipoides) (NGH Environmental 2010). An area of grassland between the Leesville Industrial Estate and Barry Way is largely covered by a dense mat of the exotic Kentucky Bluegrass (*Poa pratensis*), with a few areas also having a large proportion of the cover provided by the native Poa Tussock (Poa labillardieri) and Curly Sedge (Carex bichenoviana).

**FAUNA**

Fauna habitat value in native grasslands is influenced by degree of disturbance, the presence of rocky outcrops (as refuge for reptile species) and proximity to woodland (providing foraging and refuge resources for birds and mammals). Pastures tend to be more weedy with distance from Jindabyne and would therefore by expected to provide less potential for native fauna. Rock outcrops in grasslands along Gullies Road (off Barry Way) are grazed but not weedy and may therefore provide habitat for reptiles. Similarly, on the Cobbin-Beloka Road and Hilltop Road scattered rocky outcrops and relict trees provide fauna habitat in moderate condition. A survey between East Jindabyne and Kalkite, in less disturbed grassland adjacent to woodland observed potential habitat for several threatened reptiles; the Little Whip Snake, Eastern Earless Dragon and Striped Legless Lizard (NGH Environmental 1999).

Fauna habitat in the vicinity of the Jindabyne Sport and Recreation Centre is limited and is restricted to degraded grassland and aquatic habitats (NGH Environmental 2014). within the Study Area. The
groundcover vegetation is mostly exotic and regularly mown reducing foraging and sheltering opportunities for fauna species. The exotic trees may provide foraging habitat for some bird species and Kangaroos. No mature native trees were recorded within the Study Area and no hollows were observed. Based on aerial images and previous investigations, higher quality grassland habitat is present to the east and south of the Centre site. Patches of remnant woodland vegetation, providing higher quality habitat to woodland dependent species, occurs on the hills sloping to the western banks of Lees Creek and to the north and west of the Centre.

**Riparian areas**

Riparian vegetation is inaccessible in many locations within the Study Area. However, a narrow strip of riparian scrub resembling a natural condition occurs along much of the Mowamba River (observed at the southern end of Mowamba Road), particularly downstream from the Barry Way bridge and again downstream from the Cobbin-Beloka Road and to its confluence with the Snowy River.

**FLORA**

Descriptions of riparian vegetation in past surveys along the Snowy River include pools fringed by *Phragmites*, stream edges with narrow strips of *Leptospermum lanigerum* and *Carex gaudichaudiana* along the water’s edge, shrublands with *Daviesia mimosoides*, *Kunzea ericoides*, *Bursaria lasiophylla* and *Lomatia myricoides* on river sandbars, occasional Ribbon Gums, steep banks dominated by Burgan (*Kunzea ericoides*) and the exotics Willows (*Salix* spp), Lombardy Poplar (*Populus nigra var. italicca*) and Box Elder (*Acer negundo*) (Nicholas Graham Higgs Pty Ltd 1999).

The threatened shrub *Discaria nitida*, which grows almost exclusively in riparian vegetation, has been recorded on the Mowamba River near the Barry Way (Wright & Briggs 2000) and could occur more extensively along the river since only 300m of river frontage was surveyed by these authors. The rare shrub *Discaria pubescens* has also been recorded, between the Cobbin-Beloka Road and the Snowy River confluence (Nicholas Graham Higgs Pty Ltd 1999). Flora and fauna species typical of grassy woodlands could occur in such riparian strips, which usually include some grassy woodland on the slopes adjacent to the more specifically riparian vegetation on the river banks.

**FAUNA**

Several riparian zones and wetlands of varying quality as faunal habitat were able to be observed during the field assessment for Jindabyne. The Mowamba River riparian corridor visible from Barry Way, approximately 6km south of Jindabyne, is highly modified by grazing and provides limited faunal habitat. The morass, another kilometre west, is dry and weedy although some wetland poa tussocks occur near the 10km target area limit, which may provide habitat close to water for species such as the Striped Legless Lizard.

Better fauna habitat occurs on the Mowamba River observed from Scandal Hill Road (off Barry Way) which could provide threatened fauna habitat for reptiles such as the Rosenberg’s Monitor, microchiropteran bats, woodland birds and arboreal mammals. Platypus are also known from the Mowamba River 7km south of Jindabyne). Similarly, from Mowamba Way (off Barry Way), good quality riparian scrub and a narrow strip of snow gum woodland occurs on the northern bank of the Mowamba River.

Riparian zones viewed from the Cobbin-Beloka Road contain *Poa* tussocks that offer refuge to native amphibians and reptiles. Approximately 3km along Avonside Road, in the north west of the target area, a broad wet grassy flat is present with a rocky outcrop east of the road just beyond it. The cleared wetland near Lorien may provide waterbird habitat ephemerally however, the immediate surrounds are largely
cleared. Devils Hole Creek retains native tussocks and rocks that may provide reptile and amphibian habitat. From Kalkite Road, flats close to Jindabyne Lake shore were observed to be either totally cleared (south of Kalkite) or grazed and weedy (north of Kalkite), providing limited faunal habitat.

A number of aquatic dependent fauna are known to utilise Lake Jindabyne (David Woods NPWS, pers. comm.). These include the Australasian Grebe, Australian Wood Duck, Australian Pelican, Pacific Heron, Australian Darter, Royal Spoonbill, Little Pied Cormorant, Sacred Ibis, Pied Cormorant, Black Swan, Little Black Cormorant, Australian Shoveler, Great Cormorant, Australian Grey Teal, Great Egret, Pacific Black Duck, White-faced Heron, Silver Gull, Masked Plover, White-Breasted Sea Eagle, Black-fronted Dotterel, Double-banded Plover and Red-capped Plover. Mammals known to utilise Lake Jindabyne include the regionally significant Platypus (*Ornithorhynchus anatinus*), and Water Rat (*Hydromys chrysogaster*).

Riparian zone surveys on the Snowy River found potential habitat for the threatened Spotted-tailed Quoll, Large Bentwing Bat, Greater Broad-nosed Bat, Great Pipistrelle, Yellow-bellied Sheathtail-bat, Large-footed Myotis, Barking Owl, Pink Robin, Giant Burrowing Frog, Booroolong Frog and Little Whip Snake (Nicholas Graham Higgs Pty Ltd 1999).

Aquatic habitat is present within Lees Creek in the vicinity of the Jindabyne Sport and Recreation Centre (NGH Environmental 2014). The area would provide habitat for frogs; the Common Eastern Froglet (*Crinia signifera*) and the Spotted Marsh Frog (*Limnodynastes tasmaniensis*) were heard calling during the site inspection. No fish were observed. Lees Creek provides a wildlife corridor for a variety of fauna species. Several threatened bird species could use the riparian habitat along Lees Creek, including the Spotted Harrier (*Circus assimili*), Diamond Firetail (*Stagonopleura guttata*), Barking Owl (*Ninox connivens*) and the migratory bird species Great Egret (*Ardea alba*), Cattle Egret (*Ardea ibis*) and Latham’s Snipe (*Gallinago hardwickii*). Lees Creek also belongs to the aquatic ecological community of the Snowy River Catchment in NSW.

### 5.1.2 OEH vegetation inspections

OEH inspected vegetation at Crown Land sites to the south of Jindabyne in May 2012. The locations of the sites are shown in Figure 5-1. The findings of the inspections are summarised in Table 5-1 below.

<table>
<thead>
<tr>
<th>Site</th>
<th>Vegetation</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. East of Barry Way</td>
<td>Mixed condition Snow Gum Woodland and exotic grasses</td>
<td>Detailed survey required before rezoning.</td>
</tr>
<tr>
<td>7. West of Moonbah TSR</td>
<td>Natural Temperate Grassland with few weeds.</td>
<td>Zone E2 Environmental Conservation</td>
</tr>
</tbody>
</table>
Figure 5-1 OEH inspected sites 2012
5.1.3 Compilation of LLS region vegetation mapping

Eco Logical Australia (2015) reviewed and compiled available vegetation mapping for the South East Local Land Services region to produce standardised Biometric Vegetation Type (BVT) and potential Threatened Ecological Community maps for the region.

The report noted information gaps, particularly in the west of the region and on the Monaro. Relevant recommendations in the report included:

- Update BVT mapping to PCTs
- Improve information to assist BVT/PCT and TEC identification through the use of data in environmental impact assessments, updated Monaro grasslands mapping and targeted on-ground validation.

5.1.4 Lake Jindabyne reports

The Lake Jindabyne Southern Foreshore Management Plan (Inspiring Place 2005) provides guidance for the planning, development and management of the Lake foreshore and identifies work priorities for a 10 year horizon. The plan covers the area leased by Snowy River Shire Council from Snowy Hydro, and extends approximately 10 kilometres from the ‘Haven’ around to ‘Curiosity Rocks’ on the western side of the town. The Plan provides a review of a number of previous plans prepared for the foreshore over the last 20 years.

In relation to biodiversity values, the plan notes that:

- Remnant open savannah woodland is found in places around the lake but there has been considerable disturbance
- Introduced trees and weeds are found within the foreshore and exotic fish species are introduced to the lake for recreational fishing
- The lake has relatively low value as waterfowl habitat compared to other natural lakes and wetlands.

Environmental impacts in the foreshore area are due to:

- Variation in lake water levels
- Site impacts from high levels of use
- Foreshore erosion.

The following environmental issues are relevant to the plan area:

- Loss of native vegetation
- Spread of weeds
- Increased management and maintenance costs
- Potential increased fire risks
- Potential for increased erosion Loss of general amenity.

The plan provides protection for the natural environment by:

- Limiting and controlling vehicle access to the foreshore to designated locations away from sites with significant natural and/or cultural values
- Limiting bike access to suitable tracks and areas at Curiosity Rocks area but allowing for continued walking access
• Supporting continued community efforts to reduce weeds and restore natural vegetation in areas such as Curiosity Rocks, Widows Inlet – Claypits, Townsend Point and The Haven through appropriate management
• Changing the maintenance regime to reduce mowing in the more ‘natural’ areas off the shared pathway
• Proposing the planting of endemic vegetation in favour of introduced species.

The plan provides for the following actions to address environmental impacts:

• Reducing the site impacts caused by uncontrolled vehicle access to the foreshore and use of the designated vehicle parking areas;
• Proposing zoning of water based recreational activities;
• Fixing erosion problems evident at some foreshore locations;
• Rehabilitation of the old tip site that is exposed at low lake levels;
• Supporting community and Council initiatives for reducing introduced weeds, re-establishing native vegetation plantings and reducing damage to these sites (primarily by control of vehicle access); and
• Proposing all licences and permits seek to reduce impacts relating to approved activities and use of the foreshore and lake.

Royal Haskoning DVH (2016) assessed options for the improvement of facilities associated with boat ramps at Lake Jindabyne and Lake Eucumbene. In relation to biodiversity values, the report notes that the fluctuating water level of the lakes is not conducive to the permanent growth of nearshore vegetation. The nearshore lake bed is generally unvegetated and eroded. Fast growing and resilient species such as grasses and rushes are able to establish during low lake levels.

The Snowy River Local Environmental Plan (2013) indicates TECs near the sites, including Snow Gum Grassy Woodland near all locations and Natural Temperate Grassland near Widows Inlet and Claypits Foreshore on Lake Jindabyne. The aquatic ecological community of the Snowy River catchment in NSW TEC includes the river bed channel inundated by the dams, but excludes the communities that have developed in the waters of the impounded artificial lakes behind the dams.

The Snowy Lakes Trout Strategy 2012-2017 notes annual stocking of Lake Jindabyne with the exotic species Rainbow Trout, Brook Trout and Atlantic Salmon.

5.1.5 Weeds

The Snowy Monaro Region Local Weed Management Plan (SMRC 2018) outlines Council’s obligations in terms of weed control under the Biosecurity Act 2015. The Plan identifies Prohibited Matters, weeds for which mandatory measures apply and the General Biosecurity Duty of land managers. The Local Weed Management Plan is consistent with the principles and priorities in the South East Regional Strategic Weed Management Plan 2017-2022, developed by the South East Regional Weed Committee in 2017.

The Local Weed Management Plan contains sub-plans for Serrated Tussock (Nassella trichotoma), African Lovegrass (Eragrostis curvula), St Johns Wort (Hypericum perforatum), Gorse (Ulex europaeus), Chilean needle grass (Nassella neesiana), Fireweed (Senecio madagascariensis), Cape Broom (Genista monspessulana), Scotch Broom (Cytisus scoparius), Sweet Briar (Rosa rubiginosa), Nodding Thistle (Carduus nutans), Coolatai Grass (Hyparrhenia hirta) and Blackberry (Rubus fruticosus agg).
5.2 OBJECTIVE

Field investigations have been undertaken to validate High Environmental Value (HEV) lands in the Study Area. As part of this process, Biometric Vegetation Types (BVT) were also updated to Plant Community Types (PCTs), consistent with the new *Biodiversity Conservation Act 2016*.

In summary, the detailed biodiversity investigations involved the following stages:

- **Desktop analysis:**
  - Confirmation of HEV data layers
  - Conversion of existing BVT to PCTs
- **Field surveys:**
  - Rapid field surveys
  - Full floristic plots (limited)
- **Update of existing mapping** (PCT, Threatened Ecological Communities (TEC) and HEV).

A discussion and recommendations are provided to assist the understanding of the unique biodiversity features of Jindabyne and surrounds, and their implications for growth and development. Recommendations have been developed for:

- Refining the accuracy of the results presented in this report, which has been necessarily ‘broad brush’
- Managing development within the Study Area, based on the distribution of HEV.

5.3 METHODS

5.3.1 Desktop evaluation of the HEV mapping

The HEV areas already mapped for the Study Area were not subject to field validation; the aim of the investigation is to add to the existing HEV areas, not validate or reclassify existing HEV areas. A desktop exercise was undertaken to ensure all relevant HEV criteria were included in the existing HEV mapping in the Study Area. HEV criteria, as set out in *Developing Maps of High Environmental Value for Strategic Planning - Mapping and Governance Guide* (OEH 2015), include:

- Reserves
- Wilderness areas
- Over-cleared Mitchell Landscapes
- Private land with conservation commitments
- Old growth forest
- Rainforest
- Critical habitat; which would be included in the OEH Biodiversity Values (BV) mapping
- Any currently mapped key habitats
- Known endangered populations
- Important wetlands
- Riparian vegetation of rivers.

The following datasets were considered as part of this investigation:

- South East Tablelands HEV mapping
- OEH Biodiversity Values (BV) mapping
- South East and Tablelands Region Plan Corridors
Conversion of Biometric Vegetation Types (BVT) to Plant Community Types (PCTs)

Existing BVT mapping (Ecological 2015; as described in Section 5.1.3) shows nine vegetation types in the Study Area (Figure 5-2). These were assigned to ten possible PCTs using the PCT conversion spreadsheet provided by OEH. The converted PCT mapping is shown in Figure 5-3. PCTs were derived from the BioNet Vegetation Classification database which is intended to provide a single integrated classification for NSW.

Table 5-2 Biometric Vegetation Type to Plant Community Type conversion table

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<th>Biometric ID</th>
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<th>PCT name</th>
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<td>MR501</td>
<td>637</td>
<td>Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion</td>
</tr>
<tr>
<td>MR569</td>
<td>896</td>
<td>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</td>
</tr>
<tr>
<td>MR614</td>
<td>1110</td>
<td>River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion ('River Tussock - Tall Sedge - Kangaroo Grass moist grasslands')</td>
</tr>
<tr>
<td>MR631</td>
<td>1202</td>
<td>Speargrass grassland of the South Eastern Highlands Bioregion</td>
</tr>
<tr>
<td>MR638</td>
<td>1289</td>
<td>Wallaby Grass - Red-grass - Tall Speargrass - Kangaroo Grass dry tussock grassland of the North-western and Eastern Southern Tablelands in the South Eastern Highlands Bioregion</td>
</tr>
<tr>
<td>SR603</td>
<td>1101</td>
<td>Ribbon Gum - Snow Gum grassy open forest on flats and undulating hills of the eastern tableland, South Eastern Highlands Bioregion</td>
</tr>
<tr>
<td>SR637</td>
<td>1191</td>
<td>Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion ('Snow Gum - Candle Bark woodland')</td>
</tr>
<tr>
<td>SR638</td>
<td>1196</td>
<td>Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion ('Snow Gum - Mountain Gum shrubby open forest of montane areas')</td>
</tr>
<tr>
<td>SR515</td>
<td>679</td>
<td>Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion ('Black Sallee - Snow Gum low woodland')</td>
</tr>
</tbody>
</table>

---

BVT_to_PCT_CSVExport_Biometric_Export_20170110.xls”, author Rob Armstrong, last modified by Bentley Joss, 2011.
Figure 5-2 Existing Biometric Vegetation Types (BVT) mapping for the Study Area, sourced from Ecological 2015.
Figure 5-3 Converted (interpolated) Plant Community Types (PCT) mapping for the Study Area, using the PCT conversion spreadsheet provided by OEH.
Relationship of PCTs to TECs

Both PCT 1191 Snow Gum - Candle Bark woodland and 679 Black Sallee - Snow Gum low woodland can qualify as the NSW Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner TEC.

This TEC typically forms an open-forest, woodland or open woodland that transitions into grassland at low tree cover. The canopy is dominated by Snow Gum (*Eucalyptus pauciflora*), Candlebark (*E. rubida*), Black Sallee (*E. stellulata*) and Ribbon Gum (*E. viminalis*), either singly or combination. The listing includes secondary grassland derived from the community. It mainly occurs on valley floors, margins of frost hollows, footslopes and undulating hills, on a variety of substrates (Scientific Committee 2011). The listing references communities described as Frost Hollow Grassy Woodlands (Tozer *et al.* 2010) and VG 153 Tablelands and Slopes Herb/Grassland/Woodland in Gellie (2005). Both Gellie’s VG 153 and Tozer *et al.*’s community p22 Frost Hollow Grassy Woodland are dominated by Snow Gum and Candlebark.

PCT 1191 is based on Gellie’s community VG 153 and clearly corresponds to the Snow Gum Woodland TEC. PCT 679 is based on the Gellie’s VG 124 and VG 146. The OEH PCT database indicates that PCT 679 belongs to the NSW Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner TEC. However, in a recent assessment of the TEC on public land, the NSW EPA concluded that VG 124 and Armstrong *et al.*’s (2013) community u118: Black Sallee grass-herb woodland, which incorporates Gellie’s Vegetation Group 146 (Scientific Committee 2018), did not form part of the TEC (EPA 2016). These communities, and stands which are dominated by Black Sallee but do not include Snow Gums as at least a co-dominant, are also likely to be excluded under the Preliminary Determination for the Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion Critically Endangered Ecological Community (Scientific Committee 2018), released for public comment last year. This listing is intended to replace the existing Snow Gum Woodland EEC listing. PCT 679 is conservatively included in the TEC for the purposes of the Go Jindabyne study.

Examples of PCT 1110 River Tussock - Tall Sedge - Kangaroo Grass moist grasslands may form part of the Commonwealth Natural Temperate Grassland of the South Eastern Highlands TEC, subject to key diagnostic characteristics and condition thresholds contained in the Commonwealth Conservation Advice for the TEC (DOE 2016). The advice references community *Poa labillardieri* – *Themeda australis* – *Juncus* sp. wet tussock grassland of footslopes, drainage lines and flats of the South Eastern Highlands bioregion, in Armstrong *et al.* (2013). This community is found on colluvium or alluvium and on drainage lines particularly on broad flats associated with creeks and rivers. The TEC sub-community is characterised by at least 50% foliage cover of *Poa labillardieri*, generally in flats and drainage lines. The advice states that intact *Poa labillardieri* grassland is rare and such grasslands have very important landscape and catchment values (DOE 2016). Patches within 10 metres of a minor watercourse or 300 metres of a major watercourse are highlighted in the listing as having additional conservation value.

### 5.3.2 Field survey methods

**Consultation with OEH**

A draft survey approach, including areas and methods for survey, was provided to OEH for comment prior to the survey (D. Maynard - NGH to M. Boak - OEH, 24 April, 2019). OEH agreed with the approach with the exception of the focus on public over private land for field surveys. OEH stressed the need for surveys on private land in the Study Area. Considering the rapid survey approach proposed, this was not achievable.
for the field program but the results obtained in this report have been scrutinised with the intention of directing ongoing surveys on private land more efficiently.

Areas surrounding the south Jindabyne industrial area were targeted for full floristic survey based on OEH’s request for more quantitative data to identify the status of vegetation around this area. As well, several areas were excluded from the field survey, as OEH provided accurate vegetation mapping for these areas (now included in the PCT, TEC and HEV mapping produced in this report, as appropriate).

Specific methods for classifying secondary grasslands (for Tablelands Snow Gum Woodland TEC) were also discussed with OEH in the week preceding surveys (G. Young - NGH to M. Boak - OEH, email dated 3/5/19). Benchmark data held by OEH for each PCT were suggested as useful to estimate the percentage groundcover of native plants and thereby classify the vegetation as ‘HEV’, ‘HEV lesser value’ or ‘Not HEV’ (refer to Table 5-4). In reality, it was impractical to carry out this method accurately during the rapid surveys. The mapping of grasslands is very challenging given their variability. Recommendations to address this limitation are included in Section 5.5.

OEH also met the field ecologists during the surveys on the 8/5/19 to discuss progress of field work and accompanied them onsite during one floristic survey.
## Table 5-3 Benchmark groundcover values and recommendations for categorizing quality of groundcover for PCTs mapped inside the Study Area

<table>
<thead>
<tr>
<th>BVT ID</th>
<th>PCT</th>
<th>Common name</th>
<th>Closest TEC match</th>
<th>BM Grass/GL</th>
<th>BM Forb</th>
<th>BM Fern</th>
<th>BM Other</th>
<th>BM TOTAL %</th>
<th>%Cover for HEV – lesser value</th>
<th>%Cover for HEV – more</th>
<th>%Cover for Not HEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR501</td>
<td>637</td>
<td>Alpine and sub-alpine peatlands, damp herbfields and fens, South Eastern Highlands Bioregion and Australian Alps Bioregion</td>
<td>Listed EPBC Act,: Alpine Sphagnum Bogs and Associated Fens ; Listed TSC Act,E: Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps Bioregions</td>
<td>98</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>104</td>
<td>52 or more</td>
<td>26-52</td>
<td>25 or less</td>
</tr>
<tr>
<td>MR569</td>
<td>896*</td>
<td>Kangaroo Grass - Snowgrass tussock grassland on slopes and ridges of the tablelands, South Eastern Highlands</td>
<td>Listed EPBC Act,E: Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory</td>
<td>87</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td>43.5 or more</td>
<td>22-43.5</td>
<td>21 or less</td>
</tr>
<tr>
<td>MR614</td>
<td>1110</td>
<td>River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion</td>
<td>Listed EPBC Act,E: Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory</td>
<td>87</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td>43.5 or more</td>
<td>22-43.5</td>
<td>21 or less</td>
</tr>
<tr>
<td>MR631</td>
<td>1202</td>
<td>Speargrass grassland of the South Eastern Highlands Bioregion</td>
<td>Listed EPBC Act,CE: Native Vegetation on Cracking Clay Soils of the Liverpool Plains</td>
<td>87</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td>43.5 or more</td>
<td>22-43.5</td>
<td>21 or less</td>
</tr>
<tr>
<td>MR638</td>
<td>1289*</td>
<td>Wallaby Grass - Red-grass - Tall Speargrass - Kangaroo Grass dry tussock grassland of the North-western and Eastern Southern Tablelands in the South</td>
<td>Listed EPBC Act,E: Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory</td>
<td>87</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td>43.5 or more</td>
<td>22-43.5</td>
<td>21 or less</td>
</tr>
<tr>
<td>BVT ID 1</td>
<td>PCT</td>
<td>Common name</td>
<td>Closest TEC match</td>
<td>BM Grass/GL</td>
<td>BM Forb</td>
<td>BM Fern</td>
<td>BM Other</td>
<td>BM TOTAL %</td>
<td>%Cover for HEV</td>
<td>%Cover for HEV - lesser value</td>
<td>%Cover for Not HEV</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------</td>
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<td>------------</td>
<td>---------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>SR603</td>
<td>1101</td>
<td>Eastern Highlands Bioregion</td>
<td>Listed TSC Act,E: Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions (Part) wholly subset of; Listed TSC Act,E: Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions</td>
<td>68</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>81</td>
<td>40.5 or more</td>
<td>20-40</td>
<td>19 or less</td>
</tr>
<tr>
<td>SR637</td>
<td>1191</td>
<td>Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion</td>
<td>Listed TSC Act,E: Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions</td>
<td>45</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>57</td>
<td>22.5 or more</td>
<td>11-22</td>
<td>10 or less</td>
</tr>
<tr>
<td>SR638</td>
<td>1196</td>
<td>Snow Gum - Mountain Gum shrubby open forest of montane areas, South Eastern Highlands Bioregion and Australian Alps Bioregion</td>
<td>Listed TSC Act,E: Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions</td>
<td>45</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>57</td>
<td>22.5 or more</td>
<td>11-22</td>
<td>10 or less</td>
</tr>
<tr>
<td>SR515</td>
<td>679</td>
<td>Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion</td>
<td>Listed TSC Act,E: Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions</td>
<td>45</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>57</td>
<td>28.5 or more</td>
<td>14.25</td>
<td></td>
</tr>
</tbody>
</table>
Selection of survey areas

The field survey focused on publicly accessible roads and lands within the Study Area. Targeting public over private lands was considered to be the most time-efficient way to cover the greatest area during this survey program. A selection of the existing polygons was identified for survey with reference to the new PCT mapping. The survey targeted areas on public land:

- Where existing vegetation type mapping did not appear to correlate with vegetation observed on the ground
- Where no vegetation was mapped previously
- Which are considered to have greater potential to contain HEV land.

The following areas were excluded from field assessment:

- Private land (with the exception of Lot 14 DP 837559 - two full floristic plots in this area).
- Three sites for which recent ground-truthed vegetation mapping was provided by OEH. This vegetation mapping was added to the vegetation mapping for the Study Area and delineated as ‘field validated’.

Observations of private land visible from the public land survey area were used to inform mapping and assessment during the fieldwork. Permission was sought but was unable to be obtained to access Snowy Hydro lands.

Survey effort

Two senior ecologists conducted surveys for 76 person-hours in total, from 6-10 May 2019. Rapid surveys (105 sites) and full floristic surveys (14 plots) were undertaken in the Study Area.

Rapid surveys

The rapid field assessments were used to:

- Confirm the best matching PCT in the area inspected.
- Identify if the vegetation may qualify as a Threatened Ecological Community (TEC).
- Log incidental sightings of key habitat features (e.g. hollow-bearing trees, rocky outcrops, aquatic habitats), important connectivity features in the landscape, rare or threatened flora and fauna species and dominant weeds.

The rapid survey methodology involved the identification of at least three key dominant species in each stratum present to enable PCT determination. Polygons were drawn onto GIS tablets in the field to represent the general boundary of the patch that could be subjected to a rapid survey.

The groundcover was the most challenging vegetation stratum to identify with a high level of accuracy during a rapid survey. Binoculars were used to assess any large patches of trees distant from the survey site (some up to 500 metres away). Where groundcover was viewed greater than 300m away, groundcover was determined to be unconfirmed due to the distance of observation. Rapid survey of the upper and mid

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5 The identification of NSW listed Snow Gum Woodland (containing tree cover) could be confirmed with binoculars. Snow gums (E. pauciflora) and Candlebarks (E. rubida) and Black sallee (E. stellulata) were able to be distinguished with binoculars. All PCTs containing these species of trees (PCT 679, 1101, 1191 & 1196) are classified as NSW listed TEC inside the study area.
stratum only was conducted in these cases. A note was included in the survey data if binoculars were used to identify key species >50 metres away.

The PCTs were scrutinised as to whether they were TECs; this was most relevant to the NSW Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland (Table 5-4).

Table 5-4 Condition criteria for assigning NSW Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland TEC status

<table>
<thead>
<tr>
<th>Condition criterion</th>
<th>Description</th>
<th>Confirmed TEC?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Snow Gum Woodland with trees up to 15m apart with exotic or native grassland or bare earth between them - map all as EEC</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Snow Gum Woodland with trees between 15m and 100m apart with all native grassland (&gt;50% native) between them - map all as EEC</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Snow Gum Woodland with trees between 15m and 100m apart with all exotic grassland between them - map trees only as EEC</td>
<td>Partial</td>
</tr>
<tr>
<td>4</td>
<td>Snow Gum Woodland with trees between 15m and 100m apart with patches of native and exotic grassland between them - map trees as EEC and any areas of native grassland in between as EEC but exclude exotic grassland areas. OR Area zoned as RS (Large Lot Residential) with infrastructure observed throughout the patch (can include areas subjected to intensive land management including backyards, fences, sheds, driveways inter-dispersed within the Snow Gum Woodland).</td>
<td>Partial</td>
</tr>
<tr>
<td>5</td>
<td>Snow Gum Woodland (ie PCT 1191 or 679) with trees more than 100m apart containing a mix of native and exotic grassland between them. No tree or shrub regeneration observed.</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>Planted vegetation or extensive areas observed to contain groundcover &gt;50% exotic, ploughed or cropped.</td>
<td>No</td>
</tr>
</tbody>
</table>

**Full floristic plot survey**

Full floristic plots were undertaken in selected areas. Specifically, where:

- In representative areas where the Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland TEC was identified, and
- Future development pressure was expected, for example the Leesville Industrial Estate, under the direction of OEH.

The floristic plots were used to provide objective quantitative information about plant species abundance and cover. The floristic plot survey involved collecting floristic and structural data over a 20m by 20m quadrat, in accordance with Chapter 3 of the Biodiversity Assessment Methodology (BAM; OEH 2017). Structural data (in accordance with BAM) were not collected.

**Field survey limitations**

The field survey was conducted in late Autumn, when many species, including some threatened species, may not have been recordable. The dry conditions preceding the survey are also likely to have affected the detectability of some herbaceous species.

The survey was specifically biased toward areas with higher TEC potential, reflecting the aims of the project.
The surveys were specifically biased toward rapid surveys on public land, again intentionally, to best address the aims of the project in the time available.

Given the rapid survey approach, surveys were biased toward areas with close tree cover, which are distinguishable from a distance. Open woodlands and grasslands, where ground cover composition (native versus exotic) is more variable and cannot be distinguished from a distance. As the determination of whether an open woodland or grasslands meets TEC criteria is more dependent on groundcover composition, the results in these areas is less certain and will require further validation.

5.3.3 Mapping updates

The PCT mapping was refined based on the field survey results. The PCT mapping presented in this report now represents the best approximation of the Study Area PCTs that can be made based on work to date. The delineation between high confidence ground-validated polygons and lower confidence desktop extrapolation is discussed below. The Study Area was found to be relatively homogeneous and this mapping is considered to be a good indication of the on-ground distribution of vegetation types for wooded areas.

Regarding TEC and HEV mapping, specific to PCT 1190 - Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion, extrapolation could be undertaken largely based on tree canopy density and thereby used to assist HEV mapping updated. This is seen to be possible because of the homogenous floristics of vegetation observed during rapid survey. PCT 1191 dominated most of the Study Area and based on this observation, recommendations are made for suggested changes and areas to target for further survey and mapping updates.

Table 5-5 Extrapolation of PCT 1191, based on field and aerial imagery observations

<table>
<thead>
<tr>
<th>Condition criterion</th>
<th>Description for PCT 1191</th>
<th>Confirmed TEC?</th>
<th>Recommended HEV Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Trees less than or equal to 15m apart – predict its EEC</td>
<td>Yes</td>
<td>HEV (High)</td>
</tr>
<tr>
<td>2</td>
<td>Trees greater than 15m apart but less than 100m apart – predict its EEC</td>
<td>Yes</td>
<td>HEV (Moderate)</td>
</tr>
<tr>
<td>3</td>
<td>Snow Gum Woodland with trees between 15m and 100m apart with all exotic grassland between them - map trees only as EEC</td>
<td>Partial</td>
<td>HEV (lesser value)</td>
</tr>
<tr>
<td>6</td>
<td>Trees observed to be planted as part of a garden or windbreak. Trees not the same colour as eucalypts in natural patches over the landscape. Trees surrounding</td>
<td>No</td>
<td>Not HEV</td>
</tr>
</tbody>
</table>

Mapping limitations

Due to the field survey limitations, the updated mapping is expected to under represent:

- PCTs, TECs and consequently HEV on public land
- PCTs, TECs and consequently HEV for open woodlands and grasslands, where ground cover composition (native versus exotic) is more variable and cannot be distinguished from a distance.
5.4 RESULTS

5.4.1 Rapid and full floristic surveys

Of the nine PCTs mapped on existing vegetation maps within the Study Area, four were confirmed to exist onsite during the surveys using ground validation:

- 1191 Snow Gum - Candle Bark woodland (33% of Study Area)
- 679 Black Sallee - Snow Gum low woodland (2% of Study Area)
- 1101 Ribbon Gum - Snow Gum grassy open forest (1.5% of Study Area)
- 1110 River Tussock - Tall Sedge - Kangaroo Grass moist grasslands (<1% of Study Area)

The overwhelmingly dominant PCT within the survey area was PCT 1191 Snow Gum - Candle Bark woodland which occurred over the most parts of the Jindabyne Study Area in a range of condition states. Most of this vegetation type existed structurally as a grassy woodland type. This PCT was also confirmed to exist in a shrubby state (same upper stratum species) on the steeper slopes surrounding Jindabyne Dam.

PCT 679 Black Sallee - Snow Gum low woodland was also identified, indicated by Black Sallee (*Eucalyptus stellulata*) dominant in the tree stratum. A small proportion (<1%) of the survey area was validated as PCT 1110 River Tussock - Tall Sedge - Kangaroo Grass moist grasslands, observed to occur in the Mowamba River floodplain, directly west of the bridge on the Barry Way. PCT 679 occurred in very limited areas and was generally confined to lower valleys and frost hollows. The landscape surveyed was found to be relatively homogeneous (dry rolling hills and slopes containing granite soils versus valley floors and frost hollows containing alluvial soils) and the PCTs were able to be assigned with a high level of confidence.

It is considered unlikely that other PCTs occur within the Study Area to any significant extent. However, the current survey was heavily biased toward accessible land where roads were constructed on gentler slopes, lower in the landscape, with higher TEC potential; vegetation on steeper slopes and within private land (and the Snowy Hydro land in the western portion of the Study Area, fringing Mowamba River) has in general not been verified as part of this study. A brief description of the main PCTs identified in the Study Area during the survey is provided in Table 5-6 below.

Table 5-6 Descriptions of the three main PCTs recorded in the Study Area

<table>
<thead>
<tr>
<th>PCT 1191 Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion</th>
</tr>
</thead>
<tbody>
<tr>
<td>An open forest, woodland (occasionally grassland patches) with a sparse shrub layer and a dense grassy groundcover. Occurs on frost-hollow flats and footslopes in undulating tableland areas at 600-1100m elevation. The tree layer can contain <em>Eucalyptus pauciflora</em>, <em>E. rubida</em>, <em>E. stellulata</em>, <em>E. viminalis</em>, <em>E. bridgesiana</em> and <em>E. aggregata</em>. Small tree and shrubs include <em>Acacia dealbata</em>, <em>Acacia melanoxylon</em> and <em>Lissanthe strigosa</em>. The groundlayer has <em>Chrysocephalum apiculatum</em>, <em>Anthosachne scabra</em>, <em>Gonocarpus tetracygnum</em>, <em>Hydrocotyle laxiflora</em>, <em>Hypericum gramineum</em>, <em>Microlaena stipoides</em> and <em>Themeda triandra</em>. Estimated to be 95% cleared. Community profile source: Vegetation Group 153 (Gellie 2005).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PCT 679 Black Sallee - Snow Gum low woodland of montane valleys, South Eastern Highlands Bioregion and Australian Alps Bioregion</th>
</tr>
</thead>
<tbody>
<tr>
<td>A low open woodland often with a wet heath and/or tussock grass understory. Occurs in frost hollow drainage lines in montane and tableland areas. The tree layer has <em>Eucalyptus stellulata</em>, <em>E. pauciflora</em>, <em>E. rubida</em>, <em>E. dalrympleana</em> and <em>E. aggregata</em>. Shrubs include <em>Baeckea utilis</em>, <em>Hokea microcarpa</em> and <em>Acrothamnus</em></td>
</tr>
</tbody>
</table>
hookeri. The groundlayer has Acaena novae-zelandiae, Asperula scoparia, Carex appressa, Carex inversa, Empodisma minus, Poa labillardierei, Poa sieberiana, Hydrocotyle peduncularis and Restio australis. Estimated to be 35% cleared. Community profile source: Vegetation Groups 124 & 146 (Gellie 2005).

### PCT 1110 River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion

A dense tall tussock grassland. Any trees and shrubs present, are only scattered individuals on the edge of the community. Widespread throughout the South Eastern Highlands and NSW South Western Slopes in drainage lines, flats and lower footslopes, mainly in drainage lines or on river flats, often on alluvium. Trees, where present, may be Eucalyptus pauciflora, E. stellulata, E. ovata, E. aggregata and E. viminalis. Small trees and shrubs can include Leptospermum spp., Acacia dealbata, A. mearnsii, A. melanoxylon and Hakea microcarpa. The groundlayer can include Poa labillardierei, Themeda triandra, Juncus spp., Rytidosperma spp., Carex appressa, Hemarthria uncinata, Microlaena stipoides, Lachnagrostis spp., Carex appressa, Euchiton spp., Coronidium gunnianum, Erargrostis spp., Hydrocotyle algida, Schoenus apogon, Anthosachne scabra, Carex inversa, Haloragis heterophylla, Rumex brownii, Asperula conferta, Acaena ovina, Epilobium spp., Poa sieberiana, Pennisetum alopecuroides, Drosera peltata, Solenogyne gunnii, Geranium spp., Lythrum hyssopifolia and Epacris spp. Estimated to be 95% cleared. Community profile source: Vegetation Groups 147, 148 and 151 (Gellie 2005).

Fourteen full floristic plots were undertaken in the Study Area:

- Ten plots were conducted within vegetation confirmed to be PCT 1191
- Two plots were conducted within vegetation confirmed to be PCT 679
- Two plots were conducted in exotic groundcover vegetation surrounding the south Jindabyne industrial area.

The plot locations are mapped on the map sets in 5.4.2. Table 5-7 shows the PCT, condition state, and assigned TEC and HEV status for each of the floristic plots. The plots were used to justify TEC mapping and verify low value areas experiencing development pressure.

### Table 5-7 Full floristic plot results summary

<table>
<thead>
<tr>
<th>Plot number</th>
<th>Ground-validated PCT</th>
<th>Condition state</th>
<th>TEC status 6</th>
<th>HEV status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 6, 14</td>
<td>1191</td>
<td>Criterion 1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>1191</td>
<td>Criterion 2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>1191</td>
<td>Criterion 1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>1191</td>
<td>Criterion 3</td>
<td>Partial</td>
<td>Yes (lesser value)</td>
</tr>
<tr>
<td>11, 12</td>
<td>1191</td>
<td>Criterion 5</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>13</td>
<td>1191</td>
<td>Criterion 4</td>
<td>Partial</td>
<td>Yes (lesser value)</td>
</tr>
<tr>
<td>3, 9</td>
<td>679</td>
<td>Criterion 1</td>
<td>Yes7</td>
<td>Yes</td>
</tr>
<tr>
<td>4, 5</td>
<td>No PCT allocated / Exotic groundcover</td>
<td>Criterion 6</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

6 As described in Table 4-1.

7 Refer discussion in section 4.2.4.
5.4.2 Updated biodiversity mapping

The desktop assessment and field survey results have been used to produce three updated map sets, summarised below.

PCT mapping

The updated maps are provided overleaf. The mapping shows that four PCTs have been verified to occur in the Study Area. Most of the native vegetation in the Study Area (about 33%) is PCT 1191 Snow Gum - Candle Bark woodland. Smaller areas of PCT 679 Black Sallee - Snow Gum low woodland (about 2% of Study Area), 1101 Ribbon Gum - Snow Gum grassy open forest (about 1.5%) and PCT 1110 River Tussock - Tall Sedge - Kangaroo Grass moist grasslands (<1%) were also observed. It is unlikely that additional PCTs are represented to a significant extent (>1%).

TEC mapping

Updated TEC mapping supported by targeted ground validation is provided overleaf. The mapping updates the distribution of two TECs that occur within the Study Area:

- NSW-listed Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions (1,149 ha, representing 32% of the Study Area).
- Commonwealth-listed Natural Temperate Grassland of the South Eastern Highlands (2 ha, representing <1% of the Study Area).

HEV mapping

The updated HEV mapping totals 1,302 ha and is represented by:

- 1,149 ha of the NSW listed Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions.
- 2 ha of the Commonwealth-listed Natural Temperate Grassland of the South Eastern Highlands.
- 12 ha of riparian land (this is sourced from the BV mapping layer with one amendment; plot data collected immediately east of Leesville industrial area justified this area being excised from the HEV layer).
- 138 ha of Key Fish Habitat (sourced from NSW DPI).

To make clear the differences that have resulted from this study, the existing HEV layer that was provided (OEH 2015) and the updated HEV layer (and the components that comprise it; being TEC, Key Fish Habitat and Biodiversity Values Mapping) are both shown below (Figure 5-6 and Figure 5-7). As well, areas that do not currently meet HEV criteria are shown on Figure 5-8. As stated in the limitations above, the updated mapping is expected to under represent HEV:

- On public land, and
- In open woodlands and grasslands, where ground cover composition (native versus exotic) is more variable and cannot be distinguished from a distance.

Areas not currently mapped as HEV will require additional investigation to address this limitation.

These maps are shown overleaf.
Figure 5-6 Existing High Environmental Value (HEV) mapping for the Study Area (OEH 2015)
5.4.3 Other features

Linkages / wildlife corridors (woody vegetation communities)

The existing biodiversity corridors within the South East and Tablelands region (OEH 2017) is shown in Figure 5-9.

In other areas, links were noted as weak and could be strengthened through tree planting. For example:

- Based on field and aerial imagery observations, weak vegetation links can be observed just south of the Jindabyne township and extending to the east. They also extend to the north of the Jindabyne landfill facility. These links are mostly PCT 1191 Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes (containing tree cover) but also includes some mapped secondary grasslands.

- Another weak link occurs within vegetation directly south east of the Jindabyne landfill facility, extending south west and generally following Cobbin Creek. There is a break in woody vegetation (of approximately 600m in width) close to the intersection of Snowy River Way and the Barry Way. It is noted that active tree plantings along Cobbin creek could help to re-establish this important vegetation corridor and to reconnect vegetation from east to west across the Study Area.

The impact of climate change and the need to ensure ‘climate ready revegetation’ in the selection of species planted for future corridors should be considered.

Furthermore, corridors and connections within the town of Jindabyne itself can assist to combat increased heat island affects arising under higher summer temperatures with climate change (as per Draft Urban Design for Regional NSW and Greener Places: draft Green Infrastructure Policy for NSW) and provide more liveable townscapes.
Habitat features

Fauna habitat features observed during the field surveys included:

- Hollow bearing trees, important for hollow-dependant fauna
- Large trees (generally with a diameter at breast height of >100cm), that may become hollow bearing in the future
- Rocky outcrops and fallen timber resources, which provide refuge for various reptiles and small mammals
- Dense midstorey / shrubby habitat
- Areas of extensive tussock and native grasslands
- Aquatic habitats and riparian vegetation

Large and hollow bearing trees were observed regularly over all parts of the Study Area. There appeared to be concentrations within large lot subdivisions towards the end of High Country Drive and directly east of the Lake Jindabyne Sport Centre, both of which contained substantial modification and ground disturbance. An abundance of large hollow bearing trees was also observed in the patch of vegetation directly north of the Leesville industrial estate.

Rocky habitat was prevalent across many parts of the Study Area which would provide habitat for various reptiles and small mammals. In areas devoid of trees, Gruggly Bush (*Melicytus angustifolius* subsp. *divaricatus*) was regularly found growing in cracks and crevices of boulder outcrops further enhancing habitat for these species.

Remnant native vegetation was found in steep hilly country directly east of Lake Jindabyne. This vegetation remnant was unique in that it contained a thick shrub cover of Burgan (*Kunzea ericoides*) under the upper stratum of Snow Gum (*E. pauciflora*) and Candlebark (*E. rubida*). This would provide good protection for the movement of less mobile fauna species (ground dwelling mammals) throughout the patch of vegetation.

Natural Temperate Grasslands are also found along parts of the Mowamba River directly west of the Barry Way.

There is significant aquatic habitat found along the Mowamba River (at the southern boundary of the Study Area) which contains a permanent water resource and extensive native tussock grasslands and snow gum woodland as well as habitat trees and rocky outcrops (in the Travelling Stock Route and adjoining private land).

It is noted that some areas with severe weed invasion also provide habitat resources for observed threatened species. Eight Gang Gang Cockatoos (*Callocephalon fimbriatum*) were observed feeding on a Hawthorn (*Crataegus monogyna*) tree on the shoreline of East Jindabyne Lake.

5.5 DISCUSSION AND RECOMMENDATIONS

5.5.1 Summary of findings

The field investigations confirmed the presence of four PCTs within the Study Area. The great majority of the native vegetation in the area surveyed belongs PCT 1191 Snow Gum - Candle Bark woodland and PCT 679 Black Sallee – Snow Gum low woodland. Both PCTs correspond to the NSW Snow Gum Woodland TEC, and are present in a range of condition states.
This over cleared and under represented community provides important habitat resources, that have been observed in the Study Area, including:

- Hollow bearing trees, important for hollow-dependant fauna
- Large trees (generally with a diameter at breast height of >100cm), that may become hollow bearing in the future
- Rocky outcrops and fallen timber resources, which provide refuge for various reptiles and small mammals
- Dense midstorey / shrubby habitat
- Areas of extensive tussock and native grasslands
- Aquatic habitats and riparian vegetation

Threatened species which have been confirmed to be present within the Study Area for whom these resources may be important are shown in the table below. Note; Hoary sun ray occurs within 10km of the Study Area but no records are currently present within the Study Area.

Table 5-8 Threatened flora and fauna confirmed within the Study Area (Bionet April 2019)

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>BC Status</th>
<th>EPBC Status</th>
<th>FM Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fauna</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Litoria aurea</td>
<td>Green and Golden Bell Frog</td>
<td>E1,P</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Artamus cyanopterus cyanopterus</td>
<td>Dusky Woodswallow</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calyptorhynchus lathami</td>
<td>Glossy Black-Cockatoo</td>
<td>V,P,2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethianura albifrons</td>
<td>White-fronted Chat</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hieraaetus morphnoides</td>
<td>Little Eagle</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neophema pulchella</td>
<td>Turquoise Parrot</td>
<td>V,P,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pachycephala olivacea</td>
<td>Olive Whistler</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroica boodang</td>
<td>Scarlet Robin</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stagonopleura guttata</td>
<td>Diamond Firetail</td>
<td>V,P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gadopsis marmoratus</td>
<td>River Blackfish</td>
<td>E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flora</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calotis glandulosa</td>
<td>Mauve Burr-daisy</td>
<td>V</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Euphrasia scabra</td>
<td>Rough Eyebright</td>
<td>E1,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swainsona sericea</td>
<td>Silky Swainson-pea</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC and FM Acts: E1 = Endangered, V = Vulnerable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPBC Act: V = Vulnerable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are large patches of HEV land in the west and south of the Study Area and there are opportunities to improve connectivity and consolidate patches throughout the Study Area. While existing areas providing connectivity and suggested areas to strengthen for connectivity are identified above (Section 5.4.3) and discussed within Section 5.5.2 below, these areas have not as yet been added to the HEV layer. Further work is required in this area (see Section 5.5.2).

Based on the updated mapping, the Jindabyne Go Study Area contains 1,302 hectares of HEV land, which includes:
Table 5-9 Extent of map changes based on these biodiversity investigations

<table>
<thead>
<tr>
<th>HEV feature</th>
<th>Existing mapping (ha)</th>
<th>Updated in this report (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW Snow Gum Woodland TEC</td>
<td>390.57</td>
<td>1,149.00</td>
</tr>
<tr>
<td>Commonwealth Natural Temperate Grassland TEC</td>
<td>0.52</td>
<td>2.00</td>
</tr>
<tr>
<td>Biodiversity Values Mapping (OEH)</td>
<td>67.62</td>
<td>12.00</td>
</tr>
<tr>
<td>Key Fish Habitat (DPI Fisheries)</td>
<td>138.00</td>
<td>138.00</td>
</tr>
<tr>
<td>South East and Tablelands Regional Plan Corridors</td>
<td>83.93</td>
<td>-</td>
</tr>
<tr>
<td>Potential corridors identified by this report</td>
<td>-</td>
<td>159.32</td>
</tr>
</tbody>
</table>

### 5.5.2 Addressing key information gaps

**Field surveys**

Key limitations of survey program included:

- The accuracy of existing data layers - modelled data sets were found to be highly inaccurate.
- The short duration of the survey program – this lead to a focus on woody vegetation, where extrapolation could be undertaken with more confidence. It has meant that diverse grasslands and open woodlands that may also qualify as TEC Snow Gum Woodland secondary grasslands have been underrepresented.
- The timing of conducting full floristic surveys across the Study Area (late autumn when many native forbs would not be present). This has underrepresented diversity and therefore, where it pertains to grasslands, may also underrepresent TEC Snow Gum Woodland secondary grasslands.
- The inability to access private land, and Snowy Hydro Land, with limited exceptions.

When viewing aerial photos of the Jindabyne Study Area it was evident that existing BVT and HEV mapping was not an accurate representation of woody native vegetation cover over the landscape. The patchiness of existing HEV mapping may be due to modelling of other environmental attributes. This anomaly is particularly evident in the south eastern portion of the Jindabyne Study Area, where the HEV layer is represented by hundreds of small polygons distributed over the landscape in a mosaic pattern that did not correlate at all with observed vegetation on the ground (refer to Figure 5-2). This anomaly was also confirmed during field survey.

The issue was also observed for the existing BVT mapping which also contained an array of smaller polygons that did not appear to correspond with observed vegetation on the ground. The field survey aimed to explore some areas. The BVT mapping indicated the presence of ten biometric vegetation types inside the
Study Area which were converted to PCTs. Only four of these converted PCTs were actually confirmed to exist during field survey indicating major inaccuracies in this dataset.

Rapid survey methods were generally confined along public roads with a reliance on observing vegetation from a distance with binoculars to view adjacent private land. In general, the public road network provided access to most larger sections of the Study Area. The exceptions were large areas covered by Snowy Hydro Land along the eastern boundary of the Study Area, and Snowy Hydro land found directly north of the Jindabyne airport and extensive private property in the south western corner of the Study Area. Some limited parts of Snowy Hydro land were accessed where it was open to public access, including:

- Between Snowy Highway and East Lake Jindabyne - where mountain bike trails and walking tracks are established.
- Areas close to Kosciuszko Road reserves.

**Recommendation**

Previously mapped BVT and HEV mapping was determined to be largely inaccurate. The updated PCT, TEC and HEV mapping in this report should supersede the modelled data sets, within the Study Area.

That said, the updated mapping has limitations as set out above. Areas that would be particularly beneficial to access for further field surveys, to improve the accuracy of the PCT, TEC and HEV mapping, would be:

- Private land.
- Areas of open woodlands and grasslands, not currently assigned to a PCT or TEC.
- South-eastern section of the Study Area, where existing HEV mapping shows an array of smaller polygons that did not appear to correspond with observed vegetation on the ground.
- Snowy Hydro Land, in particular the track access along the Mowamba River on the south eastern boundary of the Study Area.
- Private property in the south western corner of the Study Area (i.e. west of the Barry Way and south of Cobbin Creek).

Field surveys undertaken above should:

- Target grasslands and derived grasslands preferentially.
- Include full floristic plot surveys, in accordance with Chapter 3 of the Biodiversity Assessment Methodology (BAM; OEH 2017). This allows consistency and is in line with Biodiversity Conservation Act mechanisms for biodiversity assessment and stewardship options, as well as Biodiversity Certification.
- Be timed to coincide with maximum floristic diversity of native forbs for grassy woodlands which will assist in the detection of relevant threatened flora species.

**Linkages / wildlife corridors**

Two specific areas, identified through field observations, that could be strengthened through tree planting, enhancing fauna movement and the increasing the reliance of remnants in the landscape were identified as:

- Vegetation directly south east of the Jindabyne landfill facility, extending south west and generally following Cobbin Creek.
- South of the Jindabyne township and extending to the east. They also extend to the north of the Jindabyne landfill facility.
Additionally, it is noted that the current South East and Tablelands Region Plan Corridors mapping (OEH 2017) contains a broad swathe of land in the north east of the Study Area that has not been assigned to a PCT and may in fact be exotic grassland.

A recommended approach to further investigating and identifying the presence of local vegetation corridors across the Study Area would be to:

- View aerial photography and rapidly assessing the distance of tree canopies over the landscape. For areas ‘generally’ containing trees <100m apart but greater than 50m apart, this would form a low to moderate quality vegetation corridor inside the Study Area. It would most likely be used by highly mobile species such as birds. This could be married up with the existing South East and Tablelands Region Plan Corridors mapping outside the Study Area.

- If tree canopies were less than 50m apart, it could be considered a higher quality corridor. A dense midstorey present (with tree cover) could be classified into this category (such as the hills surrounding Lake Jindabyne). This habitat would allow movement of less mobile species across the landscape.

- Validate the South East and Tablelands Region Plan Corridors mapping in the Study Area.

A plan of management that sets out active management strategies, such as planting, weed control, fencing and signage to restrict access and conservation protection mechanisms to preserve the areas in the long term would be beneficial with a view to improving biodiversity corridors. Options under the *Biodiversity Conservation Act* are discussed in Section 5.5.3 Conservation and enhancement opportunities; Protection mechanisms, below.

**Recommendation**

- Undertake further analysis of the location of biodiversity corridors in the Study Area.
- Undertake further investigation of ‘climate ready revegetation’ in the selection of species planted for future corridors.
- Develop a strategic plan of management to protect and enhance these corridors.

Refer to Section 5.5.3 for further information.

### 5.5.3 Conservation and enhancement opportunities

**Identifying areas to develop and protect**

The updated HEV land areas identified in this report are intended to assist in Council strategic planning and development control decisions, consistent with the South East and Tablelands Regional Plan 2036. Areas in the updated mapping which have not been shown as HEV and not assigned a PCT are likely to represent the least constrained areas (but require further field validation). They are most likely to be dominated by exotic vegetation. These typically include areas of observed exotic groundcover in the land directly east of the Leesville Industrial subdivision. Utilising the exotic groundcover areas for greenfield or intensification development, would relieve pressure on important natural values in the Study Area.

Many riparian areas, especially surrounding Lake Jindabyne were observed to contain extensive plantings of exotic trees including Poplars, Pines, Willows. These areas could be targeted for intensive environmental enhancement projects to firstly remove these exotics and gradually re-establish local provenance species to these areas. Extensive plantings of common tree species such as Snow Gums (*E. pauciflora*), Ribbon Gums (*E. viminalis*) and Black Sallees (*E. stellulata*) and common groundcover species (such as *Poa,*
Themeda, Bothriochloa and Lomandra) would enhance native habitat and provide connectivity of areas surrounding Lake Jindabyne to more extensive native vegetation found directly west of the Study Area. It would also assist in being able to generate grant application opportunities for local Council. This in turn will assist in engaging and educating the public and provide potential opportunities for voluntary contributions to promote biodiversity around Jindabyne township and Lake.

Recommendation:

**Development focus** -

- Within the areas mapped as not being HEV (Figure 5-8), it is recommended Council focus on areas where no PCT has been assigned. While on-ground verification will be required, these areas have the highest chance of being exotic dominated and least constrained in terms of biodiversity impacts.
- Development in these areas will still require assessment and management of relevant environmental factors. Refer to Section 7 for this discussion.

**Conservation focus** -

- It is recommended that Council review the updated HEV and TEC mapping to develop a long term strategy to enhance biodiversity connectivity and resilience for these areas. The strategy could cover planning mechanisms such as zoning, awareness and assistance for private landholders, corridor and buffer plantings, re-introduction of rare and declining plant species, roadside vegetation management and the management of threats. Grassy ecosystems in the region are likely to require active management to maintain biodiversity values.
- Within the mapped HEV area, priority for conservation actions should be given to protecting and expanding woodland and grassland areas which area dominated by Kangaroo Grass and Snow Grass. These key grass species provide important groundcover habitat resources and are likely to harbour rare terrestrial groundcover species (such as rare daisies and orchids) associated with Snow Gum TECs. They also protect fragile granite soils susceptible to erosion and filter nutrients into waterways. They are considered to be keystone species for grassy ecosystems in the region.
- Where development must occur in these areas, careful assessment and management of relevant environmental factors will be required. Refer to Section 7 for this discussion.

Protection mechanisms

Biodiversity certification is included under the Biodiversity Conservation Act 2016. It is a streamlined biodiversity assessment process for areas of land that are proposed for development and is particularly suitable where strategic land use planning is proposed. Where land is certified, development may proceed without the usual requirement for site-by-site assessment of impacts on biodiversity. Biodiversity certification provides a mechanism to address the potential impacts on biodiversity during the early planning of land use change and encourages planning authorities and landholders to design their development footprint in a way that avoids and minimises impacts on biodiversity values and protects those areas. The process:

- Achieves better environmental outcomes compared to site-by-site assessment.
- Provides upfront certainty to developers and the community about the development potential and conservation outcomes for an area.
- Strategically conserves areas that provide the most benefit to the conservation network.
Biodiversity certification is available to local government and individuals can also seek biodiversity certification (such as for large subdivision proposals). Two types of biodiversity certification are available:

1. Standard – available to both landholders and planning authorities.
2. Strategic – available only to planning authorities, to support significant regional development and planning processes.

Specific to Strategic Biodiversity Certification, this is available only to planning authorities, to support significant regional development and planning processes.

The Minister for the Environment will determine whether to declare a proposal as 'strategic', taking into account criteria set out in the Biodiversity Conservation Regulation 2017. A formal request must be made to the Minister to have an application declared strategic. Loans and other financial assistance may also be available from the Biodiversity Conservation Trust for planning authorities undertaking biodiversity certification.

Strategically protected vegetation may also benefit carbon sequestration programs and generate credits in any such program.

**Recommendation:**
- Consider using Biodiversity Certification as a strategic means to protect HEV lands.
- Prescribe BAM survey methodology, which is consistent with this process (in accordance with Chapter 3 of the Biodiversity Assessment Methodology, BAM; OEH 2017).

**Revegetation activities**

Revegetation activities are recommended to be targeted within the following areas:

- Cleared sections of Cobbins creek (near the intersection of Barry Way/Snowy River Way) should be planted with common species such as Snow Gums (E. pauciflora) and Black Sallees (E. stellulata) to try and re-establish the tree canopy of wooded Snow Gum patches found directly north east and south west of this area. This would allow the reconnection of a local vegetation corridor across the Study Area.
- Passive bush regeneration should begin to occur within disturbed vegetation fringing the lake within the East Jindabyne township. Weeds which are suppressing already existing native trees should prioritised for stem injection (Including Hawthorns, Pyracanths and Privets).
- Revegetation (use of *Lomandra longifolia*) should be used with hydromulching in areas treated for erosion and sediment control (see landscaping below). If Lomandra can be re-established in highly erosive areas it will prove beneficial in preventing further sedimentation into Lake Jindabyne.
- Where exotic trees are removed or killed (see weeds section below), supplementary tree species (Snow Gum and Black Sallee) should be planted if no natural regeneration of eucalypt seedlings are observed onsite. Trees should be established as early as possible so they can establish in areas with available space and be established before weeds re-invade the area. Annual monitoring of new weed outbreaks is critical in the first 5 years of control to ensure trees can establish themselves and be resilient to future competition of weeds.
Protecting waterways

Extensive erosion and sediment control works are required for the creeks flowing into Lake Jindabyne from the East Jindabyne township to protect water quality and aquatic habitat. The soils in this area contain highly erosive granite sands combined with steep slopes. This has resulted in extensive gully erosion around existing stormwater infrastructure leading to generation of sediments flowing into Lake Jindabyne. The gullies intersecting with stormwater infrastructure were observed to be 3 metres in depth (in some areas).

Of critical importance is the need to establish groundcovers on soils fringing the creek and stormwater infrastructure to reduce the incidence of raindrop impacts further eroding soils.

Weed management

Weeds are a priority environmental impact inside the Study Area. A summary of the most dominant weeds is provided below with some methods recommended to control and suppress them.

Exotic trees

There are extensive plantings of Poplars (Populus nigra) and Pines (Pinus radiata) and Willows (Salix spp.) around Lake Jindabyne. These trees are inter-dispersed with existing mapped PCTs, especially within the north eastern section of the Jindabyne township fronting the lake. Although these species are not considered highly invasive (in being readily spread by seed), they are having an influence on suppressing natural regeneration of Snow Gums (E. pauciflora) and Black Sallees (E. stellulata) where PCTs have been mapped in these areas. Further planting of these exotics is not recommended, where they abut remnant vegetation.

Various bush regeneration techniques are recommended including aerial stem injection of Poplars and Willows that are identified for removal around Lake Jindabyne to prevent herbicide drift into Lake Jindabyne and surrounding native vegetation. Where pine trees are recommended to be cut down and removed from the site, use of herbicide is unlikely to be required. Its removal will allow light into the area for allowing natural regeneration of trees over the site.

Once the trees are poisoned or removed, annual monitoring of treated trees should occur to ensure that any suckers (especially for Poplar/willow trees) and seedlings are treated again to terminate any live rootstock. Monitoring can also be used to inspect the progress of natural regeneration in areas once covered by weeds.

Exotic shrubs and vines

Hawthorn (Crataegus monogyna), Pyracantha (Pyracantha angustifolia), Blackberry (Rubus fruticosus) and Briar (Rosa rubiginosa) were the most common woody shrubs inside the Study Area. Hawthorn was a particular issue along the lake foreshore of East Jindabyne and was often found as a monoculture invading areas of existing native vegetation. Blackberry tended to be invasive in steeper gullies, watercourses and inaccessible areas across the Study Area. Briar and Pyracanthas tended to be broadly distributed in the drier slopes and hills containing a dominance of Snow gums and Candlebarks.

All of the exotic shrubs and vines are considered to be highly invasive weeds inside the Study Area. They are primarily spread by birds (such as Currawongs and Rosellas) feeding on the fruit and digested seeds dispersed through bird droppings over all parts of the landscape. Controlling these weeds will be difficult due to the high densities of these weeds and extensive populations across the Study Area. As a priority for weed control, it is recommended that where mapped PCTs/TECs occur, that they be targeted for removal to improve the biodiversity value and opportunity for natural regeneration of these mapped PCTs. Again,
annual monitoring will be essential to control and suppress regrowth and new seedlings after initial treatment.

**Exotic groundcovers**

African Lovegrass (*Eragrostis curvula*), Vipers Bugloss (*Echium vulgare*) and St Johns Wort (*Hypericum perforatum*) are a major problem in the Jindabyne Study Area. New outbreaks of African Lovegrass are occurring adjacent to Kosciuszko Road near the electricity substation (Widows Inlet section of Lake Jindabyne). Another outbreak of African Lovegrass is occurring along the roadside of Mowamba Way. African Lovegrass is a highly invasive species which will be extremely difficult to treat where extensive outbreaks are found. It is considered a high threat weed to Snow Gum Woodland TEC and priority should be given to control and suppress any new outbreaks of African Lovegras within the Study Area.

Great Mullein (*Verbascum thapsus*) was also a common groundcover species discovered in rapid assessment sites. It does not tend to invade all ground areas (like African Lovegrass) but is still quite abundant over disturbed vegetation inside the Study Area. Areas noted to contain a high abundance of Great Mullein include land surrounding the Jindabyne Sporting Complex and Landfill Facility and the lake foreshore around East Jindabyne.

The identification of HEV areas which are potentially vulnerable to weed invasion and spread can be used to prioritise weed control efforts within the Study Area. Weed data was collected during the survey opportunistically and as part of full floristic plot surveys. HEV status should also guide the selection of species for amenity and restoration plantings.

**Recommendation:**

- Priority weeds should be controlled in the Study Area and should target HEV areas as a priority.
- Planted species which can become invasive weeds within HEV areas, or with potential to spread into HEV areas, should be removed wherever practicable. This may include species which may have perceived cultural or heritage values, such as willows and poplars, particularly in riparian situations.
- In HEV areas, it is recommended that priority be given to biodiversity conservation, unless a compelling case can be made for retaining exotic species to protect identified heritage or amenity values.
- In HEV areas, local native species, preferably local provenance seed and plants, should be used as a matter of policy, unless changed site conditions require alternatives. Tree planting density should not be so high as to damage native ground layer vegetation.
6 HERITAGE

6.1 HERITAGE CONTEXT OF THE STUDY AREA

6.1.1 Aboriginal Cultural Heritage

Ethnohistory

TRIBAL BOUNDARIES

Traditional cultural areas are difficult to define but “must encompass an area in which the inhabitants have cultural ties, that is, closely related ways of life as reflected in shared meanings, social practices and interactions” (Egloff, Peterson & Wesson 2005, p.8). Depending on the culture defining criteria chosen - i.e. which cultural traits and the temporal context (historical or contemporary) - the definition of the spatial boundary may vary. In Australia, Aboriginal “marriage networks, ceremonial interaction and language have been central to the constitution of regional cultural groupings” with the distribution of language speakers being the main determinant of groupings larger than a foraging band (Egloff, Peterson & Wesson 2005, pp.8 & 16).

While an examination of these cultural traits in isolation produces differing boundaries, the ethnographic accounts describes the territory of the Ngarigo tribal language group to extend across the Monaro tablelands.

The Ngarigo had the Wolgal on the north, the Ya-itmathang on the northwest, the Kurnai on the west and south-west, and the Yuin or Coast Murring to the southeast. The Ngarigo in fact occupied the Monaro tableland. The name of this tribe was that of its language, and the tribespeople called themselves “Murring”, that is “men”, indicating that it belongs to another nation who used that term in common (Howitt, 1996, pp. 78-79).

It is likely however that these tribal borders were not static, they were most likely fluid, expanding and contracting over time to the movements of smaller family or clan groups. These boundaries ebbed and flowed through contact with neighbours, the seasons and periods of drought and abundance. It is likely that the Ngarigo people would have interacted with the neighbouring groups including the Ngun(n)awal, Djilamatang, Jamathang, Wolgal and the Yuin people (Howitt 1904).

The boundaries of the Ngarigo extended from the western slopes of the coastal ranges to the eastern side of the Kosciuszko plateau and further north, between the coastal ranges and the mountains on the banks of the Murrumbidgee River. The tribal boundaries also included the peaks of Mount Kosciuszko and the Snowy ranges (Chapman 1977:17).

People from all tribal areas would meet along the Tumut River and move south towards the Bogong Mountains along walking trails marked by guiding stones to celebrate the feasting of the Bogong Moth (Vince Bulger in Waters 2004, p.62). Vince Bulger refers to the Yorta Yorta, Wiradjuri and Ngumbalal people as well as coastal groups having paths up to the Snowy Mountains (Waters 2004, p.62).

SOCIAL STRUCTURES

It was the small family group that was at the core of Aboriginal society and the basis for their hunting and gathering life. The immediate family camped, sourced food, made shelter and performed daily rituals together. The archaeological manifestations of these activities are likely to be small campsites,
characterised by small artefact scatters and hearths across the landscape. Places that were visited more frequently would develop into larger site complexes with higher numbers of artefacts and possibly more diverse archaeological evidence.

These small family units were part of a larger band which comprised a number of families. They moved within an area defined by their particular religious sites. Such groups might come together on special occasions such as pre-ordained times for ceremonies, rituals or simply if their paths happened to cross. They may also have joined together at particular times of the year and at certain places where resources were known to be abundant, such as during the Bogong Moth season (Flood 1973, 1980; Waters 2004). The archaeological legacy of these gatherings would be larger sites rather than small family camps.

Identification and differentiation of such sites are difficult in the field. A family group and their antecedents and descendants occupying a particular campsite repeatedly over a long period of time may leave a similar pattern of archaeological signatures as a large group camped over a shorter period of time.

Flood (1980; 67-70) suggests that the ceremonial aspects and utilisation of Bogong moths were a predominantly male practice and several ethnographic accounts suggest that very few women were observed within the highlands during these times. However, it seems unlikely that the women were not allowed to eat the abundant months although Flood noted that it is possible that the act of hunting and cooking was an exclusively male affair given that involved traveling through rugged country and climbing rocky tors more suitable to young male hunters. It is likely that women with young children or old people who may have also travelled to the area stayed at the camps to collect and prepare other locally available food sources.

MATERIAL CULTURE

In an archaeological context, few items of material cultural survive particularly in an open site context. Anything made from bark and timber and animal skins would decay quickly in an open environment, especially in acidic granitic soils of the Study Area. However, other items, in particular those made of stone would survive where they were made, placed or dropped. Sources of raw materials, such as the extraction of wood or bark would leave scars on the trees that are archaeologically visible, although few trees of sufficient age survive in the modern context. Outcropping stone sources also provide clues to their utilisation through flaking, although pebble beds also provided sources of stone which leave no archaeological trace (Chapman 1977).

In an attempt to understand the material culture used by the Aboriginal people observations recorded in letters, journals and books by early settlers and pastoralists, surveyors, explorers and administrators who observed traditional Aboriginal activities and general way of living are used. These early records assist in understanding parts of the traditional Aboriginal way of life, albeit already heavily disrupted at the time of the observations.

The early observations of the general tool kit of Aboriginal people note that some weapons and tools were carried, some made from wood such as barbed and unbarbed spears, spear throwers, clubs, shields, boomerangs, digging sticks, bark vessels and canoes. Other materials were observed in use such as stone axes, shell and stone scrapers, bone needles. Skins from kangaroos and possums were also used for apparel including cloaks in winter (Helms 1895; Bennet 1834; Flood 1980).

Within the southern highlands accounts focus on the presence of Yam digging sticks and moth catching nets. These accounts suggest that “the commonest implement was the yam stick, a plain stout cudgel about four feet long, sharp-ended and hardened in the fire at one end. It was used for digging out roots and other food from the ground, and in case of need served for defensive purposes (Helms 1895, p.400). One
example of this implement has been found in the mountains within Namadgi National Park, south of Canberra (Argue et al 2001).

Both bark and bough huts were used in the high country of the Alps although bark huts are thought to have been prevalent with Helms mentioning the habitations were a "simply shelter made of a few sheets of bark put against a pole on the windy side" (1895; p.397).

Helms also notes that fine nets made of Kurrajong fibre for collecting the Bogong moths.

“The fine nets made of kurrajong fibre mentioned above seem to have been especially designed for the purpose of collecting the “Bugong”. They had very fine meshes and were manufactured with great care, and being attached to a couple of poles they could be readily folded up when they had to be withdrawn from the crevices. A shrub, (Pimelia sp.), growing abundantly in places by the river sides to a height of three to four feet, furnished the fibre. The bark of this bush was stripped and allowed to dry, was then placed in water and weighted down with some stones for several days till the non-fibrous portions were partly rotted. It was then taken out of the water and spread in the sun to dry till it was quite crisp, after which the fibre was freed by beating with sticks or flat stones. All this was the women’s work, and they managed to produce a tenacious material from it that could be spun into the finest threads” (Helms 1895:396).

BURIALS

An historic Aboriginal burial located just north of Cobbin Creek was recorded originally by Richard Helms in 1889 and the account published in the Proceedings of the Linnean Society of NSW; Anthropological Notes in 1895. Helms (1895) recorded a burial site of an older man who the run owner recalls having been carried by his tribesmen for several years prior to his death due to hip disease preventing him from walking. The burial was suggested to have taken place 17 years earlier in 1872 and the run owner, Mr Thompson, recalled three nights and three days of mourning with many people assembling to assist in the funerary ceremony (As cited in Young 2000, p.211-213).

The grave was located on an elevated but low rise with a circular mound that rose two and a half feet from the base and was upwards of five feet in diameter and irregularly flattened at the edges. In the centre of the mound there were three posts. The grave itself was dug over six feet deep and was an oblong shape measuring about four feet long by two and a half feet wide. Into the long edge of the grave a dome like excavation about three feet long and two feet high was made and into which the body had been placed. This opening had been covered by bark and grass and flat stone slabs had been placed. The hole was filled with granite slabs with grass in the interstices and overlain by stones and earth. A strong sapling had been placed upright either side of the cavity and a third was placed midway between them once a few feet of the grave had been filled in. These saplings were the posts visible in the mound and extended about four feet above the ground (As cited in Young 2000, p.211-213).

Helms records that the individual had been tightly bound with the knees drawn up the abdomen and elbows laid close to the sides and hands flat to the face. The individual was then wrapped in a blue blanket and subsequently wrapped in thick fibrous bark (As cited in Young 2000, p.211-213). This burial is assumed to be the recorded AHIMS sites # 62-1-0186 and #62-1-0149. Helms does not state what he did with the skeletal remains once he excavated the grave.

FOOD AND RESOURCES

Early observations provide an indication of the food and other resources used by the Aboriginal people of the area. They include animal food sources such as possum, snakes, wallabies and kangaroos, wombats,
emus, brolgas and other birds, lizards, turtles, fish, yabbies, Bogong moths and plant foods such as yams, berries and seeds of grasses and some trees (Flood 1980).

Flood’s 1973 work for her PhD thesis, culminating in the popular book The Moth Hunters (Flood 1980) identified ethnohistoric sources referencing Aboriginal people eating the Bogong moth in large feasts and ceremonies. Flood correlated the Bogong moth feats with ceremonial activities and examined the archaeological evidence and concluded that Aboriginal people moved below 600 meters in the winter months to places such as the lower Snowy River valley. Such an emphasis on the value of the Bogong moth as a food has been debated and it may be that other food sources, as well as the moth brought people to the region (Chapman 1977, Grinbergs 1993, Theden-Ringl 2016, 2017a, 2017b).

Payten (1949) provides a description of the gatherings during the Bogong moth feats from the accounts of European settlers on the Monaro.

“From Eden, Bega, Braidwood, Tumut, the Upper Murray and Gippsland the tribes wended their way to the tablelands and thence to the foot of the main range. Here a halt was made to observe certain formalities before commencing the feast of several months’ duration, usually November, December and January. For these three months the aborigines feasted on the moth, to them a great delicacy and a food which was both plentiful and easily acquired. The excursions of these tribes and groups were contrary to the usual fixed tribal boundaries and knowing the ways of the Aboriginal we would expect that such a migration would be carried out under proper rules and procedures” (in Grinbergs 2008:10).

Plants that grow at high altitudes are generally only accessible during the summer and correlate with gatherings of Aboriginal people in the alpine regions during the warmer months and during the Bogong moth feats. The most common plant food that may have been eaten within the area would have been Microseris scapigera (Yam daisy), which have a coconut-like flavour (Flood 1980; 91). This is a perennial herb that springs up from a swollen tuber resembling that shape of a small radish or a tapering carrot. The tuber is usually found in the top 10 cm of soil and in the alpine region lies dormant during winter (Gott 1983). The tubers of the Microseris scapigera have been noted to be larger in dimension when located above approximately 1800 m. Other plant foods that may have been exploited over 1500 meters are the tuber of orchids (Orchidaceae), native carrot (Blechnum spp.) native flax seeds (Linum marginale) fern roots (Blechnum spp.) and a number of berries (Flood 1980; 92 and Table 7).

Additionally, researchers such as Bowdler (1981), Cooke (1988), Gott (1982) and Kamminga et al. (1989) have noted the presence of a broader range of locally available vegetable food resources that would have been routinely accessed. Bowdler (1981) also suggested that the yam daisy would have provided a more reliable food source than Bogong moths.

A number of records note that kangaroos, wallabies and possums were of primary importance in the diet of Aboriginals. Kangaroos and wallabies in the Kosciusko region are found up to 1830m however from June to September the winter the snow drives them down to at least below the snowline around 1300m (Flood 1980;85).

6.1.2 Regional Archaeological studies

Aboriginal people have occupied what we now know as the Australian continent for at least 40,000 years and perhaps 60,000 years and beyond (Mulvaney & Kamminga 1999; Hiscock 2007). All major environmental zones in Australia, including preglacial environments of Tasmania, have been occupied for the last 35,000 years (Mulvaney and Kamminga 1999:114). The earliest archaeological dates for occupation in the Australian Alps bio-region dates back to over 20,000 years from a rock shelter at Birrigai, near
Canberra. However there is physical surface evidence of Aboriginal use across the region in the form of stone artefacts, scarred trees, stone quarries, ceremonial grounds, stone arrangements, rock art and rock shelters with cultural deposits (Flood 1980; Grinbergs 1993a; Goulding et al. 2000; McConnell et al. 2002a, 2002b; Freslov et al. 2004).

In the south eastern Australian highlands there has been limited evidence of Pleistocene occupation with most sites dating to approximately 4,000 BP (Flood et al. 1987). Only three Pleistocene sites have been recorded and excavated in the region. The Birrigai rock shelter near Canberra, has been dated to 21,000 BP and was thought to have been above the tree line during this period (Flood et al. 1987). New Guinea II on the lower Snowy River was recorded by Ossa, Marshall and Webb (1995) with a similar basal date of approximately 21,000 BP. The third site, Cloggs Cave, located in the lead up to the Victorian highlands was dated to approximately 18,000 BP (Flood 1974). The archaeological evidence from these sites, mostly faunal remains and lithics, suggests limited non-intensive use of the sites during the Pleistocene before a more intensive Holocene occupation. This model of occupation contrasts strongly with previously recorded sites in Southwest Tasmania, which is climatically and temporally similar, where it appears that Pleistocene highland occupation was intensive and evidence of subsistence specialisation is recorded (Ossa, Marshall & Webb 1995; Cosgrove 1999).

While there are not enough sites currently identified in this region to clearly inform upon patterns of Pleistocene highland usage it is suggested by Ossa, Marshall and Webb (1995) that the drivers of highland occupation in south eastern Australia were very different between the Pleistocene and Holocene. Holocene occupation of these areas has been strongly associated with ethnographic evidence of Bogong moth hunting as part of feasts and ceremonies (Flood 1980, 1973). It is important to note however, that Bogong moths could not have been a highland resource prior to the present climatic conditions of the Holocene and consequently present models of site identification proposed by Flood (1980) are only appropriate for Holocene Aboriginal cultural sites.

Flood’s 1973 work for her PhD thesis, culminating in the book The Moth Hunters (Flood 1980) proposed five archaeological sites types for this region:

- Large lowland base camps – open artefact scatters containing over 1,500 artefacts that may extend over several kilometers;
- Medium sized lowland camps;
- Valley camps at altitudes between 745 – 1,160 m;
- High summer camps at elevations of 1,160 – 1,525 m; and
- Camp sites above 1,525 meters (the snow line)

This model revolved around both seasonal resource availability (eg. Bogong moths) and seasonal movement through the landscape, with lowland areas occupied during the winter months and the alpine areas occupied during summer (Flood 1980). Flood recognised three main resource zones that were exploited by Aborigines. These resource areas were:

1. The riverine plains on the tablelands, where the great variety of riverine foods would have been easily exploited.
2. The mountain slopes and wet sclerophyll forests where mammals and vegetable foods were obtained.
3. Sub-alpine and alpine areas with the Bogong moths and daisy yams (Flood 1980:159).

Flood (1980) suggested that camp sites would be located:
• Within access to water (all sites within one kilometer of a water source and most sites within 100 m);
• Not directly along water courses, with Flood (1980) suggesting that poor drainage, risk of flash flooding and mosquitoes would have deterred long term camps immediately adjacent to rivers and creeks;
• With an aspect that allows people to sight game and/or the approach of strangers;
• In close proximity to shelter or materials from which to construct shelters; and
• In close proximity to food and other resources.

More recent research by Chapman (1977), Theden-Ringl (2016, 2017a, 2017b), Grinbergs (1993) and Freslov et al (2004) have found evidence of high altitude human occupation that does not fit well within Flood’s original model. Grinbergs (1992) identified a significant number of stone artefact scatters at intermediate altitudes between 300 and 2000 meters that had not previously been included in archaeological research. His research proposed a broad-spectrum model of highland occupation based on seasonally scheduled movement throughout a range of economically exploitable environments (Grinbergs 1992). The identification of a much broader range of sites when combined with the large occupation sites identified by Flood (1973) led Grinbergs (1992) to suggest that the “numerically and spatially large artefact scatters found at lower elevations along the Lower Snowy River Valley such as those at the confluence of the Jacobs and Snowy Rivers, Sandy Creek and at the Pinch River site were interpreted as sites of extensive raw material exploitation rather than being indicative of large scale human occupation” (Grinbergs 2008, p.12). Grinbergs (1992) further suggests that these areas were raw material procurement sites and areas where people sheltered during the coldest months of winter.

Theden-Ringl conducted excavations of several rock shelters in the Namadgi Ranges (ACT) with cultural deposits dating to the early to mid-Holocene. Theden-Ringl’s research has provide the first substantial evidence that people were active in the high country during the Holocene Optimum (ca 9,000–6,000 years BP). In combination with previously dated Namadgi sites, the new data also confirmed an increase in activity at around 2,000 years BP (2016).

Dibden’s recent work on the Snowy 2.0 Exploratory Works (Dibden 2018) identified that Lobs Hole valley was utilised for relatively intensive Aboriginal occupation. The valley would have provided protection from poor weather conditions and supplied resources such as firewood, water and lithic material. Artefacts recovered from the subsurface testing program indicated that area has a continuous distributions of stone artefacts rather than individual site locales, although considerable differences in artefact densities were noted across landforms. The highest density of artefacts were located on elevated crest landforms with lower densities on flats. The lower densities on flats was noted to likely be due to the flats retaining water and being boggy prior to European modification of the landscape.

In addition, other studies have shown that there are large numbers of sites within areas above 600 meters in the Alps and this leads to the conclusion that Aboriginal people were living in the high country all year round (Chapman 1977, Geering 1981, Grinbergs 1992, Dibden 2018). Chapman (1977) argues that the Jindabyne Valley would have been occupied consistently throughout the year. That is not however, to say that people were living in the higher elevations during winter, as there would not have been the shelter and resources available to sustain a population during the winter months when snow blankets the high alpine areas.
6.1.3 Local Archaeological context

A relatively large number of archaeological surveys have been undertaken in the vicinity of the townships of Jindabyne and East Jindabyne. Most of these archaeological surveys have been conducted as part of larger assessments required prior to development approval. The Aboriginal occupation modelling of the area is therefore relatively well understood however relatively few subsurface excavations have been undertaken which limits our understanding. What is clear however, is that Aboriginal sites are found within most survey contexts within the Study Area which indicates that the Aboriginal occupation and land usage was widespread across the landscape. It is important to note however, that the survey of land within the Study Area does not negate or reduce the archaeological potential of the area. If there are landforms present with archaeological potential it is still possible that further Aboriginal cultural heritage items could be identified. The following summaries are based on previously documented archaeological surveys within the Study Area.

In 1976 Chapman investigated and excavated a hearth on the eastern bank of the Snowy River between Cobbin Creek and the Mowamba River. The hearth was found in association with 123 stone artefacts located on level ground on a small knoll about 60 metres from the river (as cited in Williams Barber Archaeological Services 1993:3).

In 1977 Chapman examined the archaeological evidence that had emerged through erosion around the foreshore of Lake Jindabyne as part of an Honours thesis. The sites were all artefact scatters located on slopes and near creeks and the Snowy River around Lake Jindabyne. A total of 34 sites were recorded, 27 of which contained less than 50 artefacts. Three of the sites recorded by Chapman contained more than 100 artefacts. Chapman recorded a variety of artefacts including pebble choppers, hatchet heads, geometric microliths, Bondi points, cores, scrapers and waste flakes. Quartz was the dominate material recorded. Chapman’s study showed that there was a large number of sites in the Jindabyne valley and she argued that Flood’s model of only limited occupation during the summer months did not have any environmental, ethnographic or archaeological evidence to support such a theory (as cited in Williams Barber Archaeological Services 1993:3).

In 1977 Gallard surveyed the site of the proposed Jindabyne sewerage works however no Aboriginal sites were identified (as cited in Williams Barber Archaeological Services 1993:3).

In 1982 Chapman conducted a survey at East Jindabyne. A total of six artefact scatters were recorded on lower slopes or slope termination contexts near water (as cited in Ecological 2018).

In 1982 Djekic conducted the survey for the proposed transmission line from Cooma to Jindabyne. A total of 12 sites were recorded that included six culturally modified trees (none definite), four artefact scatters and two isolated finds. Four of the artefact sites were recorded within 200 meters of the Snowy River on spurs, crests and flats (as cited in Williams Barber Archaeological Services 1993:3-4).

In 1988 Walkington conducted a survey for the proposed Mill Creek subdivision south of Lake Jindabyne in an area characterized by minor drainage lines, low ridges, gentle slopes and marshland. No sites were recorded (as cited in NGH Environmental 2005).

In 1990 Packard conducted a preliminary survey for archaeologically sensitive areas for the East Jindabyne sewerage scheme located between East Jindabyne and the township of Jindabyne. Two artefact scatters were recorded located on a gently sloping area below a steep slope and along a low ridge (as cited in NGH Environmental 2005).

In 1990 Navin conducted the survey for the Tyrolean Village Estate at East Jindabyne. The Study Area comprised of approximately 102 ha of hill slopes, spurs and ridgelines which border the eastern shore of
Lake Jindabyne. A total of 11 artefact scatters and seven isolated finds were recorded mainly located along ridges. The artefacts recorded were predominately silcrete and quartz with river pebbles also noted. Eight of the sites were noted to be low density scatters while the other three sites were medium density artefact scatters. All the sites recorded had some degree of disturbance.

In 1991 Navin conducted a survey for the proposed Rush’s Resort complex in East Jindabyne. A total of 18 artefact scatters and two isolated finds were recorded. The majority of the sites were of low to medium density however one site was noted to have more than 100 artefacts. The sites were generally located on flat ground on ridge crests and less frequently on ridge slopes and flats adjacent to drainage lines. Navin concluded that the apparent concentration of sites in the area may indicate that it served as a preferred access route between the Jindabyne Snowy River plain and the tablelands to the east. Navin also noted that the sites with higher artefact densities were situated closer to more permanent water sources.

In 1993 Williams Barber Archaeological Services undertook the survey of 183 ha for the proposed Cobbin Estate within Lot 4 DP 817374 approximately 5km south of Jindabyne. A total of four artefact scatters were recorded. The sites were all small, low density scatters with two sites located on a broad flat between ridges, one on the upper slope of spur and the other on a flat spur above a creek. The raw material recorded was all quartz, except for one silcrete piece. The artefact types recorded were generally flaked pieces with very few flakes and cores also recorded.

In 1997 Navin Officer Heritage Consultants conducted an archaeological survey of 14 ha for the proposed Alpine Sands Estate within Lot 1 Kunama Drive, East Jindabyne. Three artefact scatters and three isolated finds were recorded. The artefact scatters were recorded on flat and gently sloping ground on spur crests. The artefacts were made from silcrete, chert, volcanics, quartz and river pebbles. All the sites recorded had some degree of disturbance.

In 1998 Oakley conducted a survey at the proposed Alpine Air Service Complex at Widows Inlet on the foreshore of Lake Jindabyne. A single artefact scatter was recorded that was noted to have up to 50 artefacts. The assemblage was dominated by quartz (as cited in NGH Environmental 2005).

In 1998 Oakley conducted a survey of approximately 13.5ha for a residential subdivision at Jerrara Drive, East Jindabyne. The Study Area consisted of mid-slope spurs, steep slopes and an intermittent watercourse. A single low density artefact scatter was recorded along a tack that consisted of silcrete and quartz artefacts (as cited in Oakley 2000:8).

In 1999 Oakley inspected three sites initially recorded during the survey for Cobbin Estate by Williams Barber Archaeological Services (1993) which had apparently suffered disturbance due to grading of the farm track. Oakley also conducted further survey in areas for proposed access roads but no additional sites were found. Oakley assessed the property to be of low potential to contain subsurface sites, mainly given the shallow soils encountered (as cited in NGH Environmental 2005).

In 2000 Oakley undertook survey for the MR 286 Kosciuszko Road Jindabyne NSW proposed pavement rehabilitation, east of Jindabyne. The survey relocate one previously recorded site (AHIMS# 62-1-0019) and recorded a new site which consisted of a single isolated quartz flake. Both sites were outside the area of proposed impact. No Aboriginal archaeological sites or areas with the potential to contain sites were found within the proposed impact area.

In 2000 Oakley conducted the survey of 145 ha at “Mary’s Hill” in East Jindabyne for a proposed residential subdivision. The Study Area was located within gently undulating terrain on the high ridge/plateau east of the Snowy River Valley. Six low density artefact scatters, three isolated finds and three areas of potential archaeological deposit were recorded. The majority of the artefacts recorded were manufactured from silcrete. Four of the sites were located in the vicinity of a permanent watercourse, and it was assessed that
these sites could possibly be an extension of a site complex identified on an adjoining property at Rush’s Resort surveyed in 1991 by Navin (as cited in NGH Environmental 2005).

In 2003 Navin Officer conducted an audit of sites within the Tyrolean Village footprint. While Navin Officer were able to relocated all of the previously recorded sites in the area, they also recorded an additional 10 artefact scatters, all which had less than 10 artefacts. Navin Officer noted that the East Jindabyne area was rich in archaeological sites which were suffering from the effects of cumulative impacts (as cited in Feary 2018:21).

In 2003 Saunders conducted the survey of 14 ha of land adjacent to Rushes Creek. Two sites were recorded which included an extensive artefact scatter with over 100 artefacts on a low gradient, north facing secondary spur crest above Rushes Creek and on the crest of a narrow ridge. The extensive site EJ1 was noted to encompass three previously recorded sites (as cited in Dibden 2017:16)

In 2003 Biosis conducted survey for the proposed new spillway and outlet works for the Jindabyne Dam. The majority of the development footprint was associated with areas that had been previously subject to high levels of disturbance that were deemed to have very low or nil archaeological potential. Areas outside the proposed development footprint where transport and construction activity was likely to occur was also inspected. During this assessment the area near Cobbin Creek was identified as an archaeologically sensitive landform and a new site (AHIMS # 62-1-0228/ JB1) was recorded. An addendum to the project was conducted by Barber in 2003 to ensure that additional areas proposed for disturbance outside the initial survey footprint were adequately assessed. Barber (2003) identified 13 new sites that contained a range of artefact types including flakes, cores, backed artefacts and anvil/hammerstones. A range of raw materials was also found including quartz, silcrete, quartzite, volcanics and chert. The sites recorded by Barber (2003) were noted to indicate that the copper Tom ridgeline and the associated spurs were used by Aboriginal people for camping.

In 2004 Dibden (2004a) conducted survey for the proposed Industrial Estate Leesville on Lot 10 DP 1044719 approximately 1.6km to the south of Jindabyne. Two low density artefact scatters and two isolated stone artefacts were recorded. Dibden noted that the location of the sites recorded was situated away from reliable water sources and concentrated resource zones, consequently the Aboriginal occupation of the area was noted to likely to have been transient rather than the focus of repeated habitation.

In 2004 Dibden (2004b) conducted survey for the proposed rural tourist recreational facility at Mill Ridge approximately 2 km east of Jindabyne. Two sites were recorded outside the areas proposed for works. The sites recorded were an artefact scatter located on the crest of a ridge and an isolated find located on the upper ridge slope. The artefacts recorded consisted of silcrete flakes and flaked pieces, a volcanic flake and a quartz flake.

In 2005 NGH Environmental conducted an analysis of the natural and archaeological values around Jindabyne, Adaminaby, Berridale and Dalgety. It was primarily a desktop study that collated previously recorded archaeological information and studies in the area. The desktop study of the Jindabyne area noted that sites were nearly always found during archaeological surveys and that it was clear that stone artefact scatters and subsurface deposits were widely distributed within the Jindabyne area. However, artefact distribution would vary in terms of their density and nature. Flat or gently sloping land situated in elevated contexts adjacent to major creeks and rivers was assessed to have a high potential to contain relative high densities of stone artefacts. Additionally, elevated land situated within close proximity to the confluence of a number of different environmental contexts was also noted to have been utilised as base camp locations. Artefact density was noted to likely be relatively sparse further away from a reliable water source, although it should be noted that the region is well watered and few places are distant from a water source. It was concluded that archaeological sites representing Aboriginal occupation would be present
within the Jindabyne area within a variety of environmental contexts. Archaeological sensitivity mapping was also undertaken that noted areas of high, moderate and low archaeological sensitivity. Areas of high archaeological sensitivity were generally within 300 meters of major creek and rivers and along relatively flat spurs and crest in close proximity to the shore of Lake Jindabyne.

In 2005 Dibden conducted survey for the proposed Highview Estate residential subdivision of Lot 1 DP 1064075 in Jindabyne. A total of six locales with stone artefacts and eight areas of potential archaeological deposit were identified. The artefacts recorded were manufactured from silcrete and quartz with a lesser number of chert artefacts. The sites were predominately located on saddles, elevated spur crest or terraces in close proximity to a water source. Dibden notes that the focus of Aboriginal occupation within the proposal area would likely have been on elevated and flat areas situated in close proximity to Lees Creek. Further archaeological investigation in the form of subsurface testing was recommend in the if impacts to the areas with potential archaeological deposit could not be avoided.

In 2005 Saunders surveyed a proposed 6.3 ha residential subdivision to be known was Kunama Ridge that was boarded to the east by Kosciuszko Road and to the west by the Alpine Sands Estate subdivision. A total of three low density artefact scatters were recorded. The sites were recorded on a spur crest and a gently inclined mid to upper north facing slope. It was noted that the sites would likely be more extensive than was visible. A scarred tree site originally recorded by Chapman in 1982 (AHIMS #62-1-0067) was confirmed to not be Aboriginal in origin and was likely the result of European activities.

In 2006 Saunders conducted assessment of Lots 2 and 6 DP 259723 Kunama Drive, East Jindabyne for the residential subdivision to be known as the Ridge Estate. Two small sites and an associated area of potential archaeological deposit were recorded. It was recommended that a testing program was undertaken to determine the extent and significance of the Aboriginal site present with the proposed subdivision area given that the scatters were likely representative of two exposures of a more extensive Aboriginal site in the area.

In 2007 Saunders conducted further assessment of Lots 2 and 6 DP 259723 as part of a subsurface testing and surface collection salvage program. A total of 15 test pits were excavated across three transects with 16 artefacts recovered from the subsurface testing program. The subsurface testing program identified an extensive low density artefact scatter within the upper 25cm of soil deposit across the crest, northern shoulder and upper northern slope of the spur. Saunders noted that the potential for Aboriginal objects to occur outside the crest, northern shoulder and upper northern slope of the spur was low to very low.

In 2008 Dibden conducted survey for the proposed bridge replacement of Mowamba Creek near Jindabyne. The survey did not identify any sites and the area was deemed to have low archaeological potential given the high levels of previous disturbance.

In 2009 Dibden conducted an Aboriginal archaeological assessment of a proposed substation at East Jindabyne. The field survey was comprehensive and encompassed a broad area including the proposed substation site. Two Aboriginal object locales, each comprising of a low density stone artefact distribution, were located within the Study Area. The artefacts recorded consisted of grey silcrete flakes, a quartz flake and a silcrete core.

In 2012 Dibden surveyed a section of the larger Tyrolean Village estate which contained four previously recorded sites. Of the four previously recorded sites only one was able to be re-located during the survey and no new sites were recorded. In contrast to earlier comments on the Study Area made by Navin Officer, Dibden concluded that the archaeological landscape of the Tyrolean Village estate was still relatively intact however sub-surface testing was not warranted (as cited in Feary 2018:21).
In 2014 Dibden conducted survey for the proposed subdivision of Lot 15 on DP 236151 approximately 3.7 km northeast of Jindabyne. A total of 59 Aboriginal stone artefacts were recorded at nine locales within Survey Unit 2. Survey Unit 2 was noted to consist of spur crest and simple slopes landforms with a gentle to moderate gradient. The survey unit was also noted to be rocky with boulders in benches across the landform which dropped away steeply towards Rushes Creek. High levels of previous disturbance from clearance, grazing, bike riding, erosion and large areas of active sheetwash erosion were noted. Due to the high levels of prior ground disturbance and the low density distribution of the artefacts, the heritage value of the proposed impact area was assessed by to be very low.

In 2015 NGH Environmental conducted a due diligence assessment for the proposed upgrade of the Barry Way and Snowy River Way intersection, south of Jindabyne. Three potential extraction sites were also assessed along Barry Way. Two locations were identified to be archaeologically sensitive that may contain Aboriginal objects. These were a small spur crest south of the Barry Way – Snowy River Way intersection and a remnant spur crest at one of the proposed extraction areas. It was recommended that further assessment, including subsurface investigation, would be required if works could not avoid the archeologically sensitive landforms identified.

In 2015 Feary conducted a due diligence assessment for a marine rescue shed proposed to be constructed adjacent to the Widows Inlet boat ramp. Two new sites, both small artefact scatters, were recorded during the survey including one immediately north of the boat ramp (AHIMS #62-1-0351) and another between the boat ramp and the Curiosity Rocks peninsula (AHIMS# 62-1-0352) (as cited in Feary 2018:23).

In 2015 Feary & Niemoeller conducted a survey for the proposed extension of the shared path around Lake Jindabyne from Curiosity Rocks to Hatchery Bay, as part of a larger investigation for the Lower Thredbo valley shared path. Four new sites, all artefact scatters, were recorded between Hatchery Bay and Curiosity Rocks (as cited in Feary 2018:24).

In 2015 Feary conducted a due diligence assessment for the proposed improvements to boating and recreation facilities at three boat ramps in Snowy River Shire, including the Widows Inlet boat ramp. Three quartz flakes were recorded on a low bank immediately north of the unsealed road at the Widows Inlet boat ramp (as cited in Feary 2018:24).

In 2016 Biosis conducted an Aboriginal due diligence assessment for the Alpine Sands residential subdivision. Two new isolated stone artefact sites were recorded along disturbed tracks. One site consisted of a quartz flake on the margins of an access track running along a ridgeline with the other site recorded on the slope of a ridgeline. Biosis suggested that both of these artefacts were no longer in their original context due to disturbances from the track (as cited in Biosis 2018b:32.

In 2017 Dibden undertook a due diligence assessment for the proposed construction of an additional westbound lane on Kosciuszko Road between Barry Way and Alpine Way on the western outskirts of Jindabyne. The Study Area contained a series of upper valley side landforms that were assessed to be of low archaeological sensitivity primarily due to the high levels of previous disturbance. Dibden noted that focused Aboriginal occupation in the local area was expected to have occurred in closer proximity to the major rivers and creeks. The Widows Creek corridor was noted to have likely attracted a locally higher degree of Aboriginal occupation, both as a water source and also as a potential route of movement between the river valley and the more elevated terrain to the south. The proposed road corridor was assessed to have low archaeological potential given the highly disturbed context.

In 2018 Ecological Australia conducted a due diligence assessment of the proposed residential development concept plan of 415-417 Barry Way Jindabyne of approximately 83ha within Lots 50. 95, 111, 140 and 142 DP756686. Four Aboriginal sites were noted during an AHIMS search as being recorded within.
700 meters of the Study Area including two artefact scatters and two isolated finds. A burial and stone arrangement site was also noted to be located approximately 400m to the east of the Study Area. During the field inspection of the Study Area two areas of potential archaeological deposit (Coobon Farm PAD 1 and 2) were recorded. These two areas of potential archaeological deposit were noted to be located on a gently sloping terrace above the western banks of Cobbin Creek. No other sites or areas or potential archaeological deposit were recorded within the area assessed.

In 2018 Cultural Heritage Management Australia (CHMA) undertook an assessment of a portion of the proposed Highview residential estate at Lot 23 DP 12270747. The area had been previously assessed by Dibden in 2005 however to meet legislative guidelines a new assessment was required. A test excavation program in line with the recommendations and areas of archaeological potential noted in Dibdens (2005) assessment was undertaken. The test pitting program excavated 71 test pits and recovered 436 stone artefacts. A total of 263 artefacts were recovered from a single pit (Pit 83) and it was noted that the 320 of the 374 artefacts recovered from the broad flat crest of a spur between large granite boulders and outcrops were from two test pits located with 5 meters of each other (pit 83 and 86), with the other pits located 10-15 meters from this concentration of subsurface artefacts containing less than 10 artefacts. This high density concentration of artefacts at pit 83 and 86 were noted not to be representative of the occupation of the wider landform which had a significantly lower density of artefacts. The majority of the artefacts were recovered from the upper 25 cm of the deposit. The spatial distribution of the artefacts was noted to support the predictive models of the area with focussed occupation occurring on crest and flat landforms in elevated positions in close proximity to a water source.

In 2018 Past Traces (2018a, 2018b) undertook an assessment for the proposed Alpine Sands Residential Development located on Lot 32 DP1215502 Kunama Drive East Jindabyne. Two previously recorded AHIMS sites were known with the Study Area which consisted of an isolated artefact (AHIMS #62-1-0161) and a large artefact scatter (AHIMS #62-1-0064). A due diligence survey was undertaken by Biosis in 2016 over the Study Area that identified an additional two isolated finds and recommended that a test pitting program occur within the site AHIMS #62-1-0064 and along the crest line. Past Traces undertook survey of the Study Area and a test pitting program within the extent of the site AHIMS #62-1-0064 and along the crest line. The test pitting program identified that low density cultural deposits are present associated with the site AHIMS # 62-1-0064 that extend across the lower slopes and Lake Jindabyne foreshore. Given the results of the testing program and survey of the Study Area Past Traces concluded that five low density Aboriginal sites and a large surface scatter of artefacts (AHIMS #62-1-0064) were located within the Study Area.

In 2018 Feary conducted survey for the proposed upgrade of parking and recreational facilities at the Widows Inlet boat ramp on the western shores of Lake Jindabyne. Fearys assessment was subsequent to a due diligence survey in 2016 that identified a small artefact scatter located close to the existing unsealed access road to the boat ramp. During the fieldwork conducted by Feary in 2018 the previously recorded artefacts were re-located and several previously unrecorded artefacts were identified across the flat benched area below Kosciuszko Road, all of which were assigned to the existing recorded site AHIMS #62-1-0362. The majority of the artefacts recorded were quartz flakes.

In 2018 Biosis (2018 a and b) undertook a survey and testing program for the proposed Stage 2 Kunama Ridge residential development which would include the subdivision of approximately 3.2 ha of part of Lot 2 DP 858483. No additional surface objects were identified during the survey and testing was conducted within the area of potential archaeological deposit associated with the previously recorded site AHIMS #62-1-0286 on a crest landform. A total of 23 test pits were excavated across the crest, mid slope and lower slope landforms with a total of 165 artefacts recovered from 17 of the test pits. The majority of the artefacts...
were recovered from between 10 – 30 cm below the surface. The test excavations revealed the presence of three relatively intact knapping floors (one of quartzite material and two of silcrete material) identified in three different test excavation units and the site was assessed to have high scientific significance. The subsurface assemblage was dominated by angular fragments or debitage with lesser numbers of broken flakes, complete flakes, cores, geometric microliths, and retouched flakes.

In 2019 Biosis conducted the archaeological salvage excavation for the site AHIMS # 62-1-0286 located within Lot 2 DP 858483, East Jindabyne. Four open areas (OA 1-4) and 12 mechanical excavation areas (MA 1-12) were excavated within the extent of the site AHIMS # 62-1-0286. A total of 4925 Aboriginal artefacts were recovered from approximately 102 square metres of deposit excavated across the site. The average artefact density was 43.97 artefacts per square metre. The artefact assemblage was dominated by angular fragments, complete flakes and broken flakes. Artefacts were manufactured predominately from silcrete with lesser numbers of quartz, basalt, crystal quartz, quartzite, rhyolite and chert. Three stratigraphic layers were noted during the excavation with artefacts concentrated at 10-30 cm below the surface within a moderately compacted brown sandy loam deposit. The results of the testing and salvage excavations were noted to indicate a relatively intact archaeological deposit. One charcoal sample was collected during the excavation that while not associated with a hearth feature was associated with a number of in-situ artefacts. The charcoal sample was dated to 4188 +/- 17 BP. This date indicates that the archaeological deposits fall within the mid Holocene period which supports the archaeological occupation model for the area. Biosis concluded that the site AHIMS # 62-1-0286 was representative of a long term camp site with evidence that backed artefact manufacturing activities, food processing activities and other activities such as woodworking and hide working were occurring at the site. The site was located on a level crest landform overlooking where the Snowy River would have originally flowed. The crest landform would have provided an elevated vantage point over the Snowy River valley with easy access to resources such as water and food.

**OEH ASDST Predictive Model**

OEH has developed a NSW wide modelling system known as the Aboriginal Sites Decision Support Tool (ASDST) to assess the likelihood of encountering Aboriginal sites across the landscape. The model is a GIS based approach providing raster data that consider a range of variables that affect the location of Aboriginal sites, across the state of NSW. These variables include:

- Location of recorded AHIMS sites;
- Proximity to water;
- Vegetation;
- Terrain;
- Soils, and
- Accumulated impacts.

There are some limitations to the ASDST modelling including that variables are derived from known and accessible data sets, the model has not been ground-truthed. The model has a range of products, with a separate raster file for different site types, accumulated impacts, current site models, pre 1750 models, survey priority and model reliability. The ASDST model was examined for the current Study Area combining all possible site types in pre 1750 landscape as a way of comparing the pre 1750 likelihood of site locations with the current situation. Figure 6-1 below indicates the likelihood of the study area and the surrounding region containing Aboriginal heritage sites.
Figure 6-1. ASDST model of Aboriginal heritage site likelihood.
6.1.4 Historic Cultural Heritage

Brief history of Jindabyne Region

The region known as the Monaro was first accessed by Europeans in 1823 when Currie and Ovens crossed the Bredbo River and noted the rolling grassy plains to the south. The name Monaro (with multiple variable spellings such as Monaroo) was provided by local Ngarigo Aboriginal people Currie encountered although Currie originally named the region Brisbane Downs (Hancock 1972).

The Monaro region was quickly settled by squatters thereafter with the first run at Gegedzerick near Berridale by Richard Brooks in 1827. It is likely that many others also worked their way south and west toward present day Jindabyne as early as possible in search of new grazing land, with cattle the favoured stock although many also ran sheep. The earliest recorded white settlement in the Jindabyne area was by Henry Badgery who had a run in 1836 and probably earlier, and Andrew Badgery held the Jindobin run licence in 1839 (CME n.d.). One of the earliest recorded (recognised) runs in the Jindabyne district was held by James McEvoy in 1837 (Wollondiby 11,520 ac.) who also established an Inn on the run. In the 1840’s Stewart Ryrie took over the Jindabyne stations and also built a flour mill on the river about a mile downstream of the old town.

Changes in squatting rules and introduction of licence fees for grazing of land through increasing government interest in the process of land acquisition led to the Legislative Council Orders in 1847, where more reliable lists of pastoralists and their runs were possible (Monaro Pioneers 2019, CME n.d.).

It wasn’t only squatters and pastoralists exploring the region. In 1834 John Lhotsky, a Pole, made an expedition trip to the Snowy Mountains and in 1840, Edmund Strzelecki, another Pole ascended Mount Kosciuszko and named it after Polish patriot Andrzej Tadeusz Bonawentura Kościuszko, although there is some conjecture as to who actually was first to climb the mountain (Hancock 1972). By the late 1800’s, towns and settlements had been established across the Monaro Region in Old Jindabyne, Michelago, Bredbo, Cooma, Jerangle, Numeralla, Nimmitabel, Old Adaminaby, Berridale, Dalgety, Ando, Bombala, Cathcart, Delegate, and Bibbeenluke (Snowy Monaro Regional Council 2016).

The old town of Jindabyne developed at a crossing place of the Snowy River as a small local centre for surrounding pastoral properties (NGH 2015, 7). A punt operated on the Snowy River at Jindabyne by 1880 until 1893 when the bridge was constructed. The establishment of the flour mill, which changed hands a number of times was joined in industry by a butter factory in 1899 although this did not last long as a venture.

Prior to the bridge being built, the area south of Jindabyne at Leesville was possibly the centre of district activity, where in the 1850’s a shepherd hut was soon converted into the Leesville Hotel in the early 1860’s, operated by Patrick and Maria Crawford on behalf of Thomas Baggs. The hotel was even the location of the celebratory ball for the opening of the Jindabyne bridge (NSW Heritage 2015).

The goldrush at Kiandra and later Crackenback in the 1860’s led to an influx of people and the hotel being on the main road from Cooma to Gippsland saw the Leesville area become the first township. However, with the opening of the punt and later the bridge at Jindabyne in 1893, Leesville declined as Jindabyne became the focus of commercial activity, where a hotel, post office and local store all operated (Inspiring Place Pty Ltd 2007, CME n.d.). A coach service was introduced between Cooma and Jindabyne in about 1900.

The first European settlement in the Jindabyne area was at Moonbah, approximately 16 kms southwest of the town. The main stock route to Victoria from Cooma passed though Jindabyne and passed by early
stations such as such as Mowenbah and Moonbah. The route was likely an Aboriginal pathway originally and was an important travel link to Victoria during the short lived Thredbo goldrush period but also well after. As the gold quickly gave out, the grazing base of the district continued to be the economic mainstay.

The modern road alignment of that stock route (the Barry Way in New South Wales, and the Snowy River Road in Victoria) was constructed between the Great Depression and 1960 (NGH 2015, 7). Sustenance labour, men who had no other option but to work in return for food and clothing, were used during the depression years of the 1930s, with labourers undertaking much of the work using only pick and shovel. The men were housed in tents at what became known as sustenance camps. Each camp held between 30 and 60 men. They were supplied with provisions sourced from the surrounding community and were semi-permanent fixtures in the sense that they remained at one location as long as it was feasible to transport the labourers to and from their place of work (AHD 2015). The job took 26 weeks to complete with the Victorians reaching the border shortly before the New South Wales construction crew. The road was opened in May 1961 by Leo Barry (Snowy River Shire) and Keith Rogers (Tambo Shire), with some 400 people in attendance (NGH 2015, 7).

Tourism was a major source of growth in the region from 1909 when the area became a popular destination for trout fishing after brown and rainbow trout were introduced into the local streams.

In 1949 the Snowy Hydro Power Scheme was first introduced, with water diverted and dammed from the Snowy River and its tributaries for irrigation and hydro-electric use, eventually flooding the original town of Jindabyne. The new town of Jindabyne was declared open in 1964 and the site of the old town disappeared beneath the waters of Lake Jindabyne in 1967 with the completion of the dam (Australian Alps 2015).

The establishment of Perisher Blue (established between 1939-1987) and Thredbo Skiing resorts (post-1957) resulted in further growth of the town for tourism purposes. It was not until the Snowy Mountains Hydro Electric Scheme that widespread development and growth was seen throughout Jindabyne and the surrounding region.

Modern industry in the region of Jindabyne centres mostly on agriculture, forestry and tourism linked to the snowfields. While some industries have died off over time, the region remains a large producer of wool, sheep and cattle (Snowy Monaro Regional Council 2016).

6.2 HERITAGE STUDY OBJECTIVES

This study presents the opportunity to incorporate Aboriginal and European histories, stories and people into the Jindabyne narrative and influence the ongoing development of the Jindabyne area.

Broadly, the aims of the heritage study were to:

- Establish a heritage constraints model for the study area;
- Identify sites and landscapes of cultural heritage value and sensitivity;
- Record any pre-historic or historic sites/objects identified during targeted surveys within the study area; and
- Identify lands recommended for conservation.
6.3 HERITAGE STUDY METHODS

6.3.1 Desktop Assessment

The desktop assessment including the following:

- Undertake searches of the following data bases;
  - AHIMS Register;
  - The Australian Heritage Database;
  - NSW State Heritage Inventory; and
  - Heritage schedule of Snowy River LEP 2013
- Review of background information relevant to the study area.
- Review site predictive modelling and sensitivity mapping to create a preliminary predictive model of archaeological potential within the study area using;
  - Previously established predictive models for the region
  - DEM Data
  - Landform Mapping using topographic data
  - OEH Landforms of potential

6.3.2 Community Consultation

Community Consultation was undertaken with both Aboriginal and Historical groups as part of this study and involved the following.

- Notification of the study to groups identified by DPE including:
  - Bega Local Aboriginal Land Council
  - Southern Kosciuszko Aboriginal Working Group
  - Ngarigo Nation Indigenous Corporation
  - Australian Alpine and Snowsports History Association
  - Snowy Alpine Heritage Association
  - Jindabyne Trail Stewardship
  - Snowy Mountains Neighbourhood Centre
  - Tourism Snowy Mountains
- Consultation with additional groups identified as being of relevance to the study including;
  - Snowy River Historical Society
  - Snowy Monaro Regional Council
  - TRC Tourism
- Providing details of the study and the initial predictive modelling and mapping to those groups listed above.
Series of one on one and group meetings were held in Jindabyne between the 8th and 9th of May and intended to identify any information regarding known places or objects of cultural significance to people within the study area.

Map areas noted during community consultation as requiring further investigation.

Limitations

As this assessment is not a standard Aboriginal Cultural Heritage Assessment consultation was not undertaken in line with the *Aboriginal cultural heritage consultation requirements for proponents 2010*. While ideally consultation would occur within this framework, due to the short timeframe for report completion and client identified community groups to engage with for consultation it was not required or possible to work within the statutory timeframes as outlined in the *Aboriginal cultural heritage consultation requirements for proponents 2010*. Despite this however, NGH believe that they have appropriately consulted with relevant community groups inline within the scope and timeframes surrounding this project.

6.3.3 Field Work

A program of ground truthing the heritage constraints modelling and locations of community identified sites of cultural significance as identified and refined during the desktop assessment and subsequent community consultation workshops was undertaken by NGH Archaeologists Kirsten Bradley and Emily Dillon between the 20th and 24th of May 2019 and involved the following steps.

- Ground truthing the heritage constraints model in publicly accessible land to confirm the accuracy of the modelling and data.
- Ground truthing the areas identified during the community workshop as possibility having historical significance within the study area.
- Recording any heritage objects identified during the fieldwork using standard archaeological techniques including location, environmental context and content.
- Visiting historic sites currently listed on the LEP.

Limitations

Due to the nature of the Study Area the ground truthing was only able to be undertaken within publicly accessible land. The site inspections were designed to relocate previously recorded AHIMS sites in a range of landforms to confirm their accuracy and compare the sensitivity mapping and the delineation of areas having high, moderate or low heritage potential.

In effect this was only partially achieved due to access restrictions to land. Despite this however, some site locations were verified and additional sites were located and recorded. What was achieved was a clear indication of the areas of high disturbance where it is unlikely that Aboriginal heritage sites would remain.

6.3.4 Mapping Updates

Following the desktop assessment, community workshops and subsequent field assessment it was determined that the mapping of Aboriginal Cultural Heritage constraints should be divided into areas of high, medium and low value. These values are based upon the likelihood to identify specific types of archaeological sites and subsequently the landforms in which these site types are more likely to occur. These values are outlined in Table 6-1 below and are represented in Figure 6-2.
Table 6-1 Archaeological site values and landforms

<table>
<thead>
<tr>
<th>Archaeological Site Value</th>
<th>Site Description</th>
<th>Landforms in which sites are most likely to occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Value</td>
<td>High density and frequency artefact scatters representing long term or repeated occupation events. Increased variability of raw materials and frequency of formal tool types and manufacturing areas. These sites have high research and educational values and present the highest development assessment constraints.</td>
<td>Within 200 meters of major water source Ridge or spur lines leading to the Snowy River Flat ground between two major water sources</td>
</tr>
<tr>
<td>Medium Value</td>
<td>Medium to small density occupation sites with moderate artefact and site frequency across the landscape. Moderate artefact densities with reduced or absence of formal tool types and more restricted raw material sources.</td>
<td>Ridge or spur lines 200-500 meters from major water sources 200 meters from minor water sources Slope must be &lt;10 degrees</td>
</tr>
<tr>
<td>Low Value</td>
<td>Small, low density or single artefact sites representing transient movement through the landscape and/or accidental discard events. Tend to have very limited raw material types. These sites tend to have the lowest development constraints.</td>
<td>Over 500 meters from major water source Slope &gt; 10 degrees Over 200 meters from minor water sources</td>
</tr>
<tr>
<td>Disturbed</td>
<td>Areas where extensive ground disturbance has occurred, modifying the original topography. Does not remove the potential to identify archaeological sites, however they are likely to have been disturbed.</td>
<td></td>
</tr>
</tbody>
</table>

The foundation of the GIS predictive model used the sensitive landforms outlined above. The model was built using 2 meter Digital Elevation Models (DEM) publicly available for the entirety of NSW (ELVIS 2019). Slope analysis was undertaken in QGIS and the areas of the Study Area with a slope less than 10 degrees were mapped. A buffer of 5 meters was placed on all layers to account for errors in the DEM which resulted in a slightly larger area with a slope of <10 degrees. Areas with a slope greater than 10 degrees were assigned a low archaeological potential rating.

Major named creek lines within the Study Area were buffered by 200 meters and assigned as areas with ‘High Constraints’, additionally spur lines and flat ground leading to the now dammed Snowy River and any flat ground in the confluence between different major creek lines were mapped as having High Constraints.

Subsequently all minor creek lines were buffered by 200 meters and assigned a moderate constraint value and any ridgeline or spur identifiable on the DEM located between 200 and 500 meters from major named water sources were also mapped as having moderate constraints.

The remaining areas within the Study Area, i.e. those being over 500 meters from major water, over 200 meters from minor water and those areas with greater than a 10 degree slope, were assigned a low value.

Finally, any areas where extensive and significant ground disturbance had occurred, particularly where it was difficult to determine the original topography were mapped as being disturbed ground. The assignment of disturbed does not negate the potential for Aboriginal objects to occur. It does however, significantly reduce the potential that those objects will be in situ. Farmed land may also have disturbed sites, but the nature of stone artefacts means that they are resilient and still likely to occur.
Limitations

It is important to note that it was difficult to determine accurately areas of raw material resources or rock shelters within the predictive model and so these features are not reflected in the current mapping. These areas should be targets of community feedback and further research.

Additionally, there were some limitations to the project as individual histories for several sites identified during the community consultation were difficult to research due to the time frame available for the project. Their nomination as a heritage item in the Study Area should be seen as an indicator for further investigation to substantiate their significance. The sites identified in this study should be used as a base for further study prior to any development at these locations given that the sites identified each require extensive individual review which is well beyond the scope of this study.

6.4 ABORIGINAL CULTURAL HERITAGE RESULTS

6.4.1 Community Consultation

Community workshops for Aboriginal heritage were undertaken over the course of a single day at Jindabyne in May 2019. Given the sensitivity of information that may be provided the three Aboriginal community groups (Bega Local Aboriginal Land Council, Southern Kosciuszko Aboriginal Working Group and Ngarigo Nation Indigenous Corporation) were invited to attend individual meetings. The aim of the workshops were to provide an opportunity for local Aboriginal community members and organisations to provide NGH with information they believed to be important to the study and to discuss areas/places of heritage value and possible conservation and to capture important people and events that may not be as well known.

The Southern Kosciuszko Aboriginal Working Group and Ngarigo Nation Indigenous Corporation both participated in the community workshops in Jindabyne however, the Bega Local Aboriginal Land Council where unable to attend. An opportunity for an alternative meeting was proposed however the Bega Local Aboriginal Land Council subsequently nominated Graham Moore to speak on their behalf regarding this study. A phone conversation was held with Graham Moore and some general information was provided by NGH regarding the project but no detailed information regarding the Study Area was provided. The timeframe for consultation for this study was noted by the Bega Local Aboriginal Land Council to be inadequate.

The Ngarigo Nation Indigenous Corporation representative Michelle Francis met with NGH archaeologists prior to the workshop to discuss the project. Over the course of conversations held during the initial meeting and at the subsequent workshop Michelle Francis noted that the presence of an Aboriginal burial on Cobbin Creek was an important site that had conservation value. While the exact location of the site was not provided the burial is assumed to be the recorded AHIMS sites # 62-1-0186 and #62-1-0149. Following recent archaeological assessments, the East Jindabyne area was also noted to have conservation value. No additional cultural or intangible values were identified by the Ngarigo Nation Indigenous Corporation other than those already known within the study area.

The Southern Kosciuszko Aboriginal Working Group representatives Deanna Davison and Iris White participated in the workshop and noted their preference to be the sole Aboriginal group consulted with for this study. They noted that given the work that had previously gone into establishing the Southern Kosciuszko Aboriginal Working Group it was inappropriate to consult with other Aboriginal groups for a study over the Jindabyne area. During the workshop Deanna Davison and Iris White provided NGH with a number of public documents and stories regarding their family connection to the Jindabyne area post
European settlement. The site modelling that had been developed across the study area was discussed. A subsequent meeting following the workshop was arranged with Iris White where additional information regarding Curiosity Rocks, recent archaeological assessments in the East Jindabyne area and her family connection to the Jindabyne area was discussed in detail. The Cobbin property and Curiosity Rocks were noted to be important areas that had conservation value. The Aboriginal people who lived and worked in the area including James, Emily and Alec Brindle, Harry and Lizzy Bradshaw, Billy Rutherford Senior and Billy Rutherford Junior were noted to be Aboriginal people who should be recognised and whose stories have not been incorporated into the broader Jindabyne narrative to date.

An overview of the key information obtained from the Aboriginal community workshops relevant to the Study Area is outline below.

- Curiosity Rocks is an important Aboriginal place to the Ngarigo people with both tangible and intangible values.
- Ngarigo people have a right to be consulted in relation to their cultural heritage.
- All Aboriginal objects and sites hold cultural importance to the Ngarigo people.
- Ngarigo culture and heritage should be incorporated into the narrative of Jindabyne.
- More research and recognition into key people and events in Aboriginal life of the district is required, including in more recent times and the association with early European settlers.
- The Cobbin property, Curiosity Rocks, East Jindabyne and an Aboriginal burial on Cobbin Creek (AHIMS sites # 62-1-0186 and #62-1-0149) were noted to be important sites and areas that had high conservation value.
- No additional intangible values were identified by the Aboriginal groups other than those already known within study area.

It should be noted that the absence of consultation with specific Aboriginal groups or individuals in this study in no way affects the cultural connection Aboriginal people may have to the area of Jindabyne and/or their involvement in future studies in the area. Determining who has the right to speak for County is beyond the scope of these works and NGH was directed by DPE on which Aboriginal community groups to contact as part of this study.

6.4.2 Field Work

As part of the ground truthing program it was established that the GPS locations of several AHIMS sites of significant cultural value and rarity within the region including bora grounds and burials with scarred tree were not accurate and reflected ethnographic or oral history accounts of these types of sites occurring within the region. The AHIMS location of these sites were ground truthed and site cards requested to confirm site details. Following fieldwork, it can be confirmed that the features summarised below in Table 6-2 do not occur at the registered GPS location or are not Aboriginal cultural heritage items. This does not mean these types of sites do not occur within the broader Study Area but further research is needed to accurately confirm their true location.
Table 6-2 Previously recorded AHIMS sites with inaccurate GPS coordinates.

<table>
<thead>
<tr>
<th>AHIMS #</th>
<th>Feature</th>
<th>Site card location</th>
<th>Ground truthed GPS location</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>62-1-0018</td>
<td>Bora Ground and Axe Grinding Grooves</td>
<td>At Junction of Rivers</td>
<td>On hilltop behind airport. No evidence of cultural heritage identified.</td>
<td>Not at this location. Exact location not known. Possibly the bora ground referred to between the Wollondibby and Snowy Rivers, now submerged.</td>
</tr>
<tr>
<td>62-1-23</td>
<td>Carved Tree</td>
<td>On Snowy River, Monaro district. Trees were marked for noted men whose corpse was placed inside the tree trunk</td>
<td>At Trig point along ridge within the Jindabyne Township. No evidence of cultural heritage identified.</td>
<td>Not at this location Exact location not known</td>
</tr>
<tr>
<td>62-1-67</td>
<td>Scarred Tree</td>
<td>Incorrect</td>
<td></td>
<td>Not Culturally scarred</td>
</tr>
</tbody>
</table>

In addition to establishing the accuracy of the above sites the fieldwork also intended to assess the reliability of the heritage constraints map. Targeted fieldwork where access to public land was possible confirmed the high archaeological potential of East Jindabyne, Curiosity Rocks and the associated foreshore. Survey along the lake foreshore between the boat ramp and Curiosity Rocks confirmed an extensive and fairly continuous scatter of artefacts, often eroding from in situ archaeological deposits. Several AHIMS sites have been recorded through this area and so no additional site cards were submitted. In East Jindabyne four previously unrecorded sites were located all along spur lines leading down to the now submerged Snowy River, confirming the site modelling. These sites are summarised in Table 6-3 below.

Table 6-3. Newly recorded sites during this project.

<table>
<thead>
<tr>
<th>AHIMS #</th>
<th>Site Name</th>
<th>Site Type</th>
<th>Raw Material Types</th>
<th>Landform</th>
</tr>
</thead>
<tbody>
<tr>
<td>62-1-0374</td>
<td>Go Jindabyne AFT 1</td>
<td>Artefact Scatter</td>
<td>Silcrete, Quartz, Quartzite</td>
<td>Spur line adjacent to Rushes Creek</td>
</tr>
<tr>
<td>62-1-0375</td>
<td>Go Jindabyne AFT 2</td>
<td>Artefact Scatter</td>
<td>Silcrete, Quartz</td>
<td>Spur line</td>
</tr>
<tr>
<td>62-1-0376</td>
<td>Go Jindabyne AFT 3</td>
<td>Artefact Scatter</td>
<td>Silcrete, Quartz</td>
<td>Spur line</td>
</tr>
<tr>
<td>62-1-0377</td>
<td>Go Jindabyne AFT 4</td>
<td>Artefact Scatter</td>
<td>Silcrete, Quartz, Volcanic</td>
<td>Spur line</td>
</tr>
<tr>
<td>62-1-0378</td>
<td>Go Jindabyne IF 1</td>
<td>Isolated Find</td>
<td>Quartz</td>
<td>Disturbed context</td>
</tr>
</tbody>
</table>

Additional survey along the foreshore from Widows Creek to approximately 400 meters east of the Jindabyne Sailing club determined that the area previously mapped as having a high heritage constraint was amended to moderate as a result of the steep slopes and lack of suitable camping locations.

A site inspection to the west of the current Leesville Industrial estate identified a single quartz artefact within an area of heavily disturbed earth stockpiling. The location of the stockpile adjacent to Lees Creek was however considered to have heritage constraints. Visibility was very restricted due to vegetation and further investigation is warranted.

6.4.3 Updated Aboriginal Cultural Heritage Constraints Mapping

Results of previous archaeological surveys as outlined in section 6.1.3 above has shown the Study Area contains a widespread distribution of archaeological material, the majority of which are stone artefacts. It
is however expected that stone artefact density (and possibly the nature of the material) will vary significantly across the Study Area. The development of an Aboriginal site location model has been primarily based on appraisal of key characteristics of previously recorded sites and conclusions drawn from those previous archaeological studies. In particular, the 2005 NGH Environmental study, outlined below, provided a baseline model that can be refined using the results of more recent archaeological assessments.

The landforms which were predicted to contain relatively high artefact densities were flats and gentle slopes situated above the flood zone in reasonably close proximity (≤ 200 metres) to major streams and rivers. Flats and elevated ground near the confluence of major streams are of high sensitivity while ridge crests which possess flat or gentle gradients are also archaeologically sensitive. Slopes with higher gradients (<10-15+ degrees) are considered to have lower archaeological sensitivity (NGH Environmental 2005:58). Therefore, archaeologically sensitive landforms within the Study Area are likely to include:

- Elevated land situated within 200 metres of major streams or reliable water sources;
- Elevated land situated near the confluence of major streams;
- Any elevated and reasonably flat landforms located in valley contexts on either side of Lake Jindabyne not subject to lake inundation.
- Ridge and spur crests which possess flat or gentle gradients situated within reasonable proximity (within 500 m) to sources of reliable water;
- Small scale micro-topographic features of low gradient or benches on otherwise steep landforms;
- Land which contains large boulders or rock outcrops providing shelter; and
- Land which contains outcrops of stone suitable for artefact manufacture.

As with all archaeological models the modelling was based on a number of factors that could potentially influence the presence or absence of sites. These factors include; topography, slope, soil and geology, proximity to resources such as water, food and raw materials. These factors are able to be mapped to at least some degree and can therefore underpin a sensitivity mapping approach.

Due to the size of the study area and limited nature of the targeted field work it was not possible to map the entire study area to the resolution required under the Code of practice for Archaeological Investigations of Aboriginal Objects in New South Wales and typical of a standard archaeological assessment. This type of mapping is reliant systematic field survey to identify both micro and macro topographic variations within a study area. The modelling for the entire study area could therefore not be realised at this resolution and instead concentrates on general macro topographic features.

It must however be acknowledged that there are other variables, unable to be mapped, that relate to social, religious and other intangible cultural behaviours. Societal taboos, attitudes and inhibitors as well as an individual’s comfort and familiarity with certain places and landscapes can also influence people’s actions and the way in which they move and use space, consequently influencing the archaeological record. While this record is able to be used to confirm the presence and sometime absence of human activity, it may not be able to explain what other features of a landscape may have been important.

The sensitivity modelling therefore only identifies the potential for physical evidence, generally of camping and resource gathering activities, to be present within a landscape. It is generally not able to appropriately capture intangible values and identify the location of cultural and religious sites of importance or departures from 'standardised' human behaviour. In essence, while the model and sensitivity mapping can have a reasonably high predictability success rate, there will be occasions when sites are located outside these parameters.
Additionally, in a region where cold air drainage is a significant environmental factor during winter there should, theoretically, be a patterning of winter occupation sites within the past tree lines rather than in the lower and colder valley floors. Due to extensive clearing of trees in the Jindabyne area it is difficult to determine using satellite imagery where the treeline would have been prior to European settlement. In summer however, it is expected that occupation would not have been limited to higher ground within the treeline and occupation sites would have expanded into the valley flats associated with creek lines. Thus, the archaeological evidence of the area is therefore likely to occur in a variety of ecotones and landscapes.

Similarly, without significant ground truthing and access to private property it is difficult to determine accurately areas of raw material resources or rock shelters within the predictive model and so these features are not reflected in the current mapping. Resource areas such as these should be a focus of further research.

**Comparisons with the ASDST model**

It should be recognised that the NGH model outlined below and shown in Figure 6-2 would be considered to have a higher degree of accuracy compared to the ASDST modelling. The NGH model is specific to the study area and incorporates the results from numerous archaeological studies, previously recorded sites in the study area, high accuracy digital elevation data and takes into consideration a tailored local model of site distribution. Additionally, the NGH heritage constraints model produced for this report, unlike the ASDST model, has been ground truthed where possible to confirm the studies predictions.

It should be acknowledged however that the results of the NGH predictive mapping and the ASDST mapping show a high level of similarity. Like the NGH Model, the ASDST model indicates that water courses are a key factor in the predictability of sites within the landscape and similarly elevated flat ridges also have moderate to high likelihood of sites occurring.

The benefit of the ASDST model particularly is that the pre 1750 model as shown in Figure 6-1 includes the Snowy River Valley prior to the flooding of Lake Jindabyne.Providing an indication of the sites that have been lost through dam construction. In line with the NGH predictive model the pre 1750 model visually depicts the importance of the Snowy River and surrounding ridgelines in the region. This has implications for the potential to find sites in a modern context, for example East Jindabyne today is a lake shore but would have been prehistorically significant due to the area’s proximity to the Snowy River. As a consequence of this relationship a large number of sites have been recorded around the lake foreshore on elevated ridges that would have once led to the Snowy River. These sites are continually being exposed along the current lake edge as a result of wave action causing erosion and tend to become exposed during low lake fill conditions.

As the NGH model is able to factor in the results of regional predictive models and recently recorded sites the level of value given to the East Jindabyne area is significantly greater than the ASDST model. The number of sites recorded in AHIMs, the information available in development driven consulting reports and the results of the present studies site surveys undertaken in East Jindabyne clearly show this area to have a high concentration of sites, most notably large stone artefact scatters.

As a consequence of this the NGH model has identified the East Jindabyne area as having high potential, whereas the ASDST shows a more moderate rating. NGH considers our current modelling to be more reflective of the actual known archaeological value in this area.

The ASDST modelling also shows the likelihood for sites to occur in the region surrounding Jindabyne and our study area. The potential of the surrounding landforms is important to note as movement of people from the lower valleys to the high country is an important aspect of Aboriginal landuse in this region. The
ASDST shows that areas along the Thredbo River, were likely important movement corridors but that high ridges immediately north of the river were possibly even more important as pathways to the high country. The ASDST mapping also shows those areas to the south of the Jindabyne Study Area, within the open valley of the Mowamba River and its tributaries such as Rendezvous Creek and Grosses Plains Creek were also likely to be important areas of Aboriginal occupation and use.
Figure 6-2. Predictive model for Aboriginal sites.
6.5  HISTORICAL CULTURAL HERITAGE RESULTS

6.5.1  Community Consultation

Two community consultation workshops for non-Aboriginal heritage were undertaken in Jindabyne over the course of a single day in May 2019. Local historical community groups and individuals were invited to attend the workshop and/or meet with NGH personal over the course of the day. The aim of the workshops were to provide an opportunity for local community members and organisations to provide NGH with information they believed to be important to the study and to discuss areas/places of heritage value and possible conservation and to capture important people and events that may not be as well known.

From the meetings a number of places and stories that have heritage value to the community within the Study Area were identified. An overview of the key information obtained from the community workshop relevant to the Study Area is outline below.

- Leesville Hotel was one of the original building in the area and has been prominent in social events for the area.
- The Leesville Hotel was the location where an Aboriginal man (Boney Jack) was shot in the 1860-80’s. It is believed that he was buried towards the back of the hotel near the old police holding yards. The burial was noted to be located along a fence line which is no long there however the area is now part of the pony club grounds.
- The old police holding yards were located in part of the pony club grounds adjacent to the Leesville Hotel.
- The Cobbin Farm property was prominent in the history of the Study Area.
- The original Mill Creek homestead was prominent in the history of the Study Area and was constructed when the first flour mill was built in the area near the present day dam wall. There are still plantings and possibly footings from the original homestead at the site. The land was bought by the Snowy scheme as the construction of the dam was though likely to affect the location.
- There is a stone wall constructed along Mill Creek in the East Jindabyne area that now runs from the edge of the dam up a slope near a walking trail. Its origin and purpose remain unknown.
- The destruction of the bridge into Old Jindabyne as the dam filled had a significant emotional effect on locals that had moved from the old town.
- The relocation of the cemetery from Old Jindabyne to the new town was significant.
- The gates at the cemetery are original and were relocated from Old Jindabyne. This is significant to locals.
- The gate from the original Presbyterian Church was relocated from Old Jindabyne and is significant to locals. The gate is currently in the care of the Alpine Uniting Church.
- Five of the original houses from Old Jindabyne were relocated to the new town and are significant to locals as items connected to the original town.
- The Jindabyne sailing club house is one of the original buildings of the Jindabyne West homestead. Noted to be built not long before Lake Jindabyne created.
- The sale yards and bush races were great social and community events for locals in the area in more recent times.
- The Eaglehawk Chapel was relocated to the Alpine Uniting Church.
• Snowy mountain scheme and the Jindabyne Camp were important parts of the town history.
• Women played an important role in the town especially with the move into the new town.
• The Bush nurses was important to the history of Jindabyne with particular mention to the individual Sister Passmore.
• Local pioneering families have a prominent role in the area.
• There are a number of old family names no longer around that are still important to the history of the area.
• More recently the NPWS Information Centre is fixture in the local area as the diorama which shows Old Jindabyne township.

The key outcomes the community noted they would like to see from the study for the future development of the town were:

• Interpretive signage along the foreshore and in the town.
• Construction of a heritage centre.
• Appropriate street and suburb naming that incorporates the local family names and history of the area.
• Restoration of historic building such as Leesville Hotel.
• Greater community understanding of the history of the town and its pioneering families and significant individuals.

6.5.2 Field Work

Due to the present project funding, detailed archaeological investigation of individual sites was not undertaken however where possible a program of ground truthing the location of historical items within the Go Jindabyne Study Area was undertaken by NGH archaeologists. Due to the nature of the Study Area the ground truthing was only able to be undertaken within publicly accessible land.

The site inspections were designed specifically to locate items/places noted in the community consultation that are not currently listed on any statutory or non-statutory heritage registers. As part of the ground truthing program local resident Greta Jones assisted the NGH archaeologists to identify the location of her original family home, the Old Mill Creek homestead and its gardens. Greta Jones also assisted NGH archaeologists to identify the location of the five original houses that were relocated from Old Jindabyne. The location of the historic places that were noted from the community consultation and those listed on the LEP that were relocated during the ground truthing program are detailed in Table 6-4.
Table 6-4. Places identified with non-Aboriginal heritage values.

<table>
<thead>
<tr>
<th>Item Name</th>
<th>ID</th>
<th>Location</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relocated House 1</td>
<td>GJ1</td>
<td>1 Munyang Street, Jindabyne</td>
<td>Ethel Canton’s house from Old Jindabyne. Relocated by the Snowy Scheme to New Jindabyne.</td>
</tr>
<tr>
<td>Relocated House 2</td>
<td>GJ2</td>
<td>6 Munyang Street, Jindabyne</td>
<td>Police house from Old Jindabyne. Relocated by the Snowy Scheme to New Jindabyne.</td>
</tr>
<tr>
<td>Relocated House 3</td>
<td>GJ3</td>
<td>8 Gippsland Street, Jindabyne</td>
<td>Fran Sturgeon’s house from Old Jindabyne. Relocated by the Snowy Scheme to New Jindabyne. Sister Passmore lived in this house when moved to new town.</td>
</tr>
<tr>
<td>Relocated House 4</td>
<td>GJ4</td>
<td>38 Banjo Patterson Crescent, Jindabyne</td>
<td>House from Old Jindabyne. Relocated by the Snowy Scheme to New Jindabyne.</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Location</td>
<td>Information</td>
</tr>
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<td>---------------------------------</td>
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</tr>
<tr>
<td>Relocated House 5</td>
<td>GJ5</td>
<td>40 Banjo Patterson Crescent, Jindabyne</td>
<td>Ken Kidman’s house from Old Jindabyne. Relocated by the Snowy Scheme to New Jindabyne.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Leesville Historic Complex</strong></td>
</tr>
<tr>
<td></td>
<td>GJ6</td>
<td>Lot 118 DP 721919 Lot 194 DP 721919</td>
<td>Site of the original Leesville town, features include the Leesville Hotel and associated activities, possible location of burial for Boney Jack, police holding yards, burnt down police station, general store, blacksmiths store.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Mill Creek Homestead</strong></td>
</tr>
<tr>
<td></td>
<td>GJ7</td>
<td>Along unnamed dirt road location GDA 94 Zone 55 Easting 645033 Northing 5967130</td>
<td>Homestead belonging to the McGuffick family that was sold to the Snowy Scheme. Homestead demolished however footings remain as well as pine trees and old orchard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Stone Wall</strong></td>
</tr>
<tr>
<td></td>
<td>GJ8</td>
<td>Off Mill Creek Bike Trail GDA 94 Zone 55 start point Easting 647032, Northing 5967712 end point Easting 646988 Northing 5967720</td>
<td>Stone wall noted in journal article see Pickard, J (2015) Stone Walls near Jindabyne NSW: European fences, not Aboriginal stone arrangements. Australasian Historical Archaeology Vol 33; 64-71.</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Location</td>
<td>Information</td>
</tr>
<tr>
<td>---------------------------------</td>
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<td>--------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Old Racecourse</td>
<td>GJ9</td>
<td>Southern side of Cobbin Creek, north of The Station Resort</td>
<td>Racecourse used in the 1870’s onwards likely located on the south side of Cobbin Creek, north of The Station Resort. Several references of the racecourses association with the Leesville Hotel</td>
</tr>
<tr>
<td>Jindabyne West</td>
<td>GJ10</td>
<td>Lake Jindabyne Sailing Club house. On part of Lot 16 DO 242010</td>
<td>One of the original buildings of the Jindabyne West homestead. Noted to be built not long before Lake Jindabyne created.</td>
</tr>
<tr>
<td>Snowy Seismic Station</td>
<td>GJ11</td>
<td>Round Hill</td>
<td>Seismic monitoring station installed as part of the Snowy Scheme.</td>
</tr>
<tr>
<td>Historical Aboriginal Burial</td>
<td>GJ12</td>
<td>Cobbin Creek</td>
<td>Historic Aboriginal Burial site located along Cobbin Creek. Historic accounts relate to Helms (1895) excavating the burial.</td>
</tr>
<tr>
<td>NPWS Information Centre and diorama</td>
<td>GJ13</td>
<td>49 Kosciuszko Road, Jindabyne, NSW 2627</td>
<td>Large stone building with landscaping designed for use as the Snowy Mountains visitor center. Including parks offices, visitor center, historic display and large Diorama of the Jindabyne area made by Jimmy James</td>
</tr>
<tr>
<td>Sale Yards</td>
<td>GJ14</td>
<td>Lot 1 DP 204602</td>
<td>Old Sale Yards, likely 1960s.</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Location</td>
<td>Information</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----</td>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lake Jindabyne Conservation Area</td>
<td>C4</td>
<td>Jindabyne</td>
<td>Lake Jindabyne, including the dam wall, is an important component of the historic Snowy Scheme. It contributes significant landscape value to the town of Jindabyne as well as providing opportunities for water sports, general tourism while the lake foreshores are popular for community celebrations and leisure activities. The lake is representative of the man-made Snowy water bodies.</td>
</tr>
<tr>
<td>Jindabyne Cemetery</td>
<td>I145</td>
<td>Barry Way, Jindabyne</td>
<td>This is representative example of a relocated cemetery associated with the development of the Snowy Mountains Scheme. It is evidence of the establishment of the new town of Jindabyne. It is a significant site for the local community whose friends and families have graves which were relocated to the site or have been buried there more recently. Further the memorial gates have significant social and historic heritage value.</td>
</tr>
<tr>
<td>Jindabyne Winter Sports Academy</td>
<td>I146</td>
<td>207 Barry Way, Jindabyne</td>
<td>The lodges are significant because of their association with the snowy Scheme. They are tangible evidence of post World War II temporary workers’ single accommodation. The Love Shack is particularly significant as it was used by Sir William Hudson when visiting the Scheme.</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Location</td>
<td>Information</td>
</tr>
<tr>
<td>------------------------</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Leesville Hotel</strong></td>
<td>I147</td>
<td>218 Barry Way, Jindabyne</td>
<td>Leesville is a group of vernacular rural buildings. The shepherd’s hut section of the hotel dates from the mid-19th century, while the later building is probably 1860s. The hotel was built in response to the need for accommodation for travelers to the Thredbo Valley gold diggings in the 1860s. The place was owned and operated by the Sturgeon family. It is a landmark on the Barry Way with its distinctive front verandah. The cottage, shearing shed, and old plantings contribute to the place’s heritage significance.</td>
</tr>
<tr>
<td><strong>St Andrews Uniting Church</strong></td>
<td>I150</td>
<td>19 Gippsland Street, Jindabyne</td>
<td>This is a representative example of 20th century period ecclesiastical style church construction. It is a landmark in the local district. The hall is an example of the re-use of building built and used for the Snowy Mountains Scheme.</td>
</tr>
<tr>
<td><strong>Jindabyne Foreshore Park</strong></td>
<td>I151</td>
<td>Banjo Paterson Park, Kosciuszko Road, Jindabyne</td>
<td>This is a representative example of a cultural landscape developed in the 1960s which is significant to the local community as a recreational area. Date significance updated: 16 Feb 12</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Location</td>
<td>Information</td>
</tr>
<tr>
<td>------------------------</td>
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<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Strzelecki Monument</td>
<td>I152</td>
<td>Banjo Paterson Park, Kosciuszko Road, Jindabyne</td>
<td>The statue was donated by the Polish government to Australia’s bicentenary and is evidence of the long-standing links between the two countries. It is a representative example of a landmark monument dedicated to Paul Strzelecki, a significant explorer, scientist, geologist, surveyor and philanthropist. It has aesthetic significance as a fine bronze sculpture by renowned Polish sculptor Jerzy Sobocinski and it is rare to have such well-crafted monument in a rural setting.</td>
</tr>
<tr>
<td>St Columbkille’ s Church and Hall</td>
<td>I153</td>
<td>24 Kosciuszko Road, Jindabyne</td>
<td>A representative example of 20th century ecclesiastical style church construction and is evidence of the era of establishment of the town. The building is sited in a prominent position and makes a significant contribution to the townscape. It is an important site for the Roman Catholics of the district. The hall, an ex-Snowy building, contributes to the heritage significance of the site.</td>
</tr>
<tr>
<td>Memorial Hall</td>
<td>I154</td>
<td>45 Kosciuszko Road, Jindabyne</td>
<td>A representative example of a late 20th century period construction of a community building. Significant to the district as a place for gatherings, meetings and concerts.</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Location</td>
<td>Information</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>St Andrews Anglican Church</td>
<td>I155</td>
<td>3 Park Road, Jindabyne</td>
<td>The church is a significant site for the Anglican community of the district and a representative example of 20th century ecclesiastical architecture.</td>
</tr>
<tr>
<td>Cobbin</td>
<td>I166</td>
<td>504 Barry Way, Moonbah</td>
<td>The Cobbin property was recorded to be settled by John Lambie in 1840. The homestead, built around 1856, is a representative example of a mid-Victorian period Georgian style Monaro stone farm house with a quite a good degree of integrity and intactness.</td>
</tr>
</tbody>
</table>

### 6.5.3 Updated Historical Constraints Mapping

The following maps show the locations of previously recorded historic sites identified in the register searches that were undertaken for this project. The listings are from the Local Environmental Plan.

The maps also show the additional locations identified through research and consultation with the local community and through field verification. It should be noted that due to limitations of access to private property, some of the locations are only indicative. Further research and field survey would be required to verify some locations, particularly in the Leesville area.
6.6 JINDABYNE NARRATIVE

Based upon the background research, predictive modelling, field inspections and extensive discussions with the Community of Jindabyne, it has been possible to begin to collate a narrative of human occupation of the Study Area over the last several thousand years. This document does not intend to provide a complete and detailed history of the area but instead begins to highlight the rich, diverse and extensive history of people and their connection with the land. It highlights the richness and importance of the Jindabyne narrative and provides context to inform upon the ongoing development of the town and broader region and how the Jindabyne area fits within the broader NSW Historic Themes.

6.6.1 Dreamtime – 1800 Prehistory of Jindabyne

Aboriginal people were the first people of this land. The Jindabyne area has been occupied by Aboriginal people since the Dreamtime. Aboriginal people in the Snowy Mountains have a close association with the area that extends over many thousands of years. European settlement of the area in the early 1800s however, resulted in displacement and dispossession from traditional lands. This caused significant social upheaval and impacted on traditional ways of life, meaning access and understanding of traditional resource gathering and hunting areas, religious life, marriage links and access to sacred ceremonial sites in many instances were disrupted or destroyed.

Despite the affects of colonisation however, many Aboriginal people maintain strong and lasting connections to the Snowy Mountains area and the way people related to land in the region was considerably influenced by their experience of disruption (Goulding & Buckley 2002; Australian Heritage Council 2008).

“Others know they belong to that country but have minimal direct knowledge of cultural connections. Others still have no traditional links but have historical ties. The past use of the area for annual ceremonies which brought different tribal groups together from many areas is seen by some Aboriginal people today as an important part of their heritage” (Wesson 1994; Waters 2004; Young 2005; as cited in Australian Heritage Council 2008).

Importantly the region is known to Aboriginal people as a meeting place.

“a visitin' area, visitin' for huntin', gatherin', ceremonies, disputes, settle disputes. So it's a big meeting place. You come here, you settle your differences, introduce new members to your neighboring clans, all the clans come together, settle disputes” (Rod Mason in Waters 2004, p.61).

Aboriginal occupation and land usage was widespread across all landscapes within the Jindabyne area. Small family groups, that were at the core of Aboriginal society and the basis for their hunting and gathering life, likely occupied the Jindabyne area all year round. They camped, sourced food, made shelter and performed daily rituals together.

There is only limited information about Aboriginal occupation of the region during the early stages of European occupation. The resources that do exist however, tend to be focused on Bogong moth procurement (Flood 1980) which is generally considered to be a biased and severely limited understanding of Aboriginal subsistence in these areas (Chapman 1977, Grinbergs 1993).

The Bogong Moth season occurred annually during the summer months with tribes travelling great distances to participate in the feast with the Ngarigo people.

“About the year 1840 my friend, the late Mr A. M, McKeachie, met to young men of the Ngarigo tribe at the Snowy River, near Barnes’s Crossing; one of them carried two peeled sticks each about
two feet long, and with notches cut in them, which they told him reminded them of their message. The sticks were about one half inch in diameter. Their message was that they were to collect their tribe to meet those of the Tumut River and Queanbeyan, at a place in the Bogong Mountains, to eat the Bogong moths.” (Howitt, 1904, pp. 693)

The traveling paths to and from these places would have likely intersected the Jindabyne area. A place of particular value to Ngarigo people within the Jindabyne area is Curiosity Rocks (see Appendix B, Plate 20). The site is situated along the traditional travel pathway up the Snowy River to the Mt Twynam area. The area holds a deep spiritual connection for the Ngarigo people, particularly women, and is significant as it provides a line of sight towards Kalkite Mountain and is adjacent to a camping area and ceremonial grounds. Archaeological evidence of occupation and use of the area by Ngarigo people has also been recorded with a number of stone artefacts recorded in the area.

While the Bogong moth feasts and associated gathering of neighbouring groups was certainly important in the cultural and religious landscape, it tends to overshadow what would have been the daily life of Aboriginal people across the region. Aboriginal people were most likely living in the Snowy Valley around Jindabyne and surrounds all year round (Chapman 1977, Grinbergs 1993). This is important to recognise for a few reasons.

1. The archaeological record is likely to tell us much more if we study it within a paradigm of occupation not being restrictive to the seasonal feast time.
2. The acknowledgement that the Aboriginal people may have influenced the landscape as first Europeans saw it through traditional burning practices.
3. The continuity of association with the area, even if few Aboriginal people now live there, is important.

Chapman (1977) noted that Aboriginal populations in the region had declined dramatically by the 1880’s. Despite this however, Avery noted that Aboriginal people continued to live in the area and exploit local resources up until the late 1800s (Avery 1997). Indeed, it is likely that Ngarigo people continued to walk across their land even into the early 1900’s, with local farmers in the region south of Dalgety recalling Aboriginal people crossing their land only three generations ago.

Today the Aboriginal community continue to work with archaeologists to find and record the physical evidence of their ancestors occupation and use of the Jindabyne area. Recent archaeological excavations at an area in East Jindabyne on a level crest overlooking where the Snowy River would have originally flowed has provided a date of Aboriginal occupation in the area to approximately 4,200 years ago. Over 120 Aboriginal sites containing stone tools predominantly manufactured from quartz and silcrete have also been recorded to date in the study area. There are likely to be many more such sites that have yet to be recorded.

6.6.2 1800-1840’s Early European Exploration and Pastoralism 9

As early as the 1830’s cattle were known to be grazing in the broader Jindabyne area as European settlers and cattleman began to encroach upon the area. As early as 1836 Henry Badgery had a run in the area and in 1839 Andrew Badgery held a licence for Jindobin (Neal 1976: 142).

9 Property names listed in this section are spelt differently by different authors. The spelling identified in each reference is retained for referencing integrity.
Between 1839 and 1840 John Lambie, the first public official of the Monaro, undertook a census of the district. Of the 173 stations he visited during this period there were 1708 residents including men women and children (Andrews 1998). It was not until 1840 that Lambie surveyed the area around present day Jindabyne where he established three properties within the approximate Study Area including Genderbine, Mowenbar and Cobbon Table 6-5. Several of the recorded stations had small groups of people living and working, Cobbon particularly had 13 people living on the land and it can therefore be assumed that these properties had been in operation for several years prior. Badgery’s Genderbine property particularly is known from as far back as 1836.

Table 6-5. Early properties and occupants.

<table>
<thead>
<tr>
<th>Property</th>
<th>Owner</th>
<th>Occupants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genderbine</td>
<td>Badgery Hill and Roberts</td>
<td>9 people</td>
</tr>
<tr>
<td>Cobbon</td>
<td>Joseph Taylor</td>
<td>13 people</td>
</tr>
<tr>
<td>Mowenbah</td>
<td>Owen Boyne</td>
<td>2 people</td>
</tr>
<tr>
<td>Mowenbah</td>
<td>Thomas Hyland</td>
<td>6 People</td>
</tr>
</tbody>
</table>

Following Lambie’s census, between 1839 and 1841, Stewart Ryrie Junior was employed by the direction of the Governor to carry out survey work in the Monaro, “distinctly as an amateur”. On the 18th of February 1840, Stewart Ryrie Junior, while mapping the Monaro, noted that he travelled from Thompson’s station to arrive at the Snowy River in the evening, near Badgery’s station called Jinderbine (Ryrie1997). Stewart Ryrie Junior, then returned to the area in the 1840s when he took over the Jindobin runs and established a flourmill with William Jardine on the banks of the Snowy River, near the present day dam wall (see Appendix B, Plate 15). The waters of the Snowy River were used as motive power for the machinery of the mill. The mill was managed by Charles McGregor and later his son Daniel on behalf of Ryrie and Jardine until 1900 when the plant was relocated into old Jindabyne and run by steam (Mitchell 1926).

Several years later when the first government gazetting of the runs in the Jindabyne area occurred in 1847 the following leases were claimed in proximity to the Study Area (see Table 6-6). Ryrie’s Jindabyne East is now included and properties such as Mowenbah had consolidated their boundaries to the south of the Mowamba River, just outside of the present study area. Interestingly Cobbon was not included in the listing as the land was likely vacant during this period and not advertised for lease again until 1851.

Table 6-6. Properties listed in 1847 census, summaried from The Jindabyne Saga 1967 and Hancock 1972).

<table>
<thead>
<tr>
<th>Run</th>
<th>Owner</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jindabyne</td>
<td>Richard Brooks</td>
<td>22,400 acres</td>
</tr>
<tr>
<td>Mowenbah</td>
<td>William Holland</td>
<td>16,000 acres</td>
</tr>
<tr>
<td>Moonbah</td>
<td>J Pendergrass</td>
<td>24,000 acres</td>
</tr>
<tr>
<td>Jindabyne East</td>
<td>Stewart Ryrie</td>
<td>3000 acres</td>
</tr>
</tbody>
</table>

Recollections from the early settlers in the area and their descendants often note the presence of Aboriginal people passing through the Jindabyne area on their way to the mountains for the Bogong moths and working on the stations in the area, such as Cobbin and Woolandibby, undertaking household chores, station work and working as stockmen (Young 2005).
Lambie in his 1839/1840 census notes that he recorded 177 Aboriginal men, 142 women, 80 boys and 49 girls in the broader Monaro region. In 1845 Lambie subsequently estimates the Aboriginal population of the entire Monaro area to be approximately 1,382 individuals. A census in 1856 showed that the number of Aboriginal people in the Monaro area had dramatically decreased with 166 Aboriginal people recorded in the Cooma district.

While it is difficult to establish the accuracy of such recordings the official census population recording is noted to decline. Despite this however, there are still a number of accounts and recollections by early settlers and their descendants of Aboriginal people living and passing through the Jindabyne area. William Jardine notes in 1845 that while at Jindabyne he saw “about one hundred aborigines on their way to the mountains, one of them died and was buried according to the aboriginal rites.” (Young 2005:245-46).

Another prominent account from the early settlers of the region notes that the local Aboriginal people in the area referred to the daughter of James and Mary McEnvoy, born in 1838, as “the little white queen” due to the novelty of a white baby in the area (Neal 1976).

### 6.6.3 1850’s – 1890s Pastoralism and Gold

The establishment of the squatting runs in the 1840’s and the influx of people into the Jindabyne area saw the population increase through the next 40 years. The district was consolidated into established and formalised grazing properties and many of the people who moved into the region during this period became the familiar family names still present in the region today. Leesville proper became a small regional hub before the establishment of the Snowy River crossing and old Jindabyne. This shift in routes of movement through the region moved the focus of occupation away from Leesville and into Old Jindabyne.

Leesville, located approximately 3 miles from the Jindabyne crossing of the road to Gippsland was a small town, likely founded through the need for supplies and accommodation along the stock route to Gippsland. Sometime in the 1850’s a general store was established at Leesville in response to the increased droving traffic though very little information about this earliest incarnation of the store is available. It has been suggested that the store was operated by Patrick and Maria Crawford on behalf of Thomas Baggs, who as he was unmarried, could not hold a licence (JPSCC 1984). It is likely that the short lived gold rush at Kiandra and Crackenback spurred greater numbers of people through Leesville and increased its importance to the area.

In 1871 however, The Manaro Mercury (16 Sep 1871). reported that Thomas Baggs completed the construction of a ‘commodious store and dwelling place’ at Leesville, likely an upgrade of the supposedly existing shearers hut at this location. There are few references to the store and hotel operating in the intervening years however, Baggs was known to periodically hold footraces on the property during this time.

On the 2nd of June 1874, Baggs officially opened the “Leesville Hotel” which was advertised to have a ‘first class assortment of wines and spirits.” (The Manaro Mercury, 23 May 1874) and extended an invitation to the Manaro region to attend the grand opening of the hotel. The event was to include a cricket match, dinner and horse racing and was intended to extend over several days. The Manaro Mercury published an account of the opening celebrations and reported that over 100 people from the wider region attended.

The Manaro Mercury reported that the first event was the return match of the Leesville vs Seymour Cricket clubs, with the cricket pitch situated just in front of the Hotel where the game could be viewed from the verandah. These cricket matches held at Leesville hotel would continue for several years to come with teams traveling from Cooma to attend. Following the match Baggs hosted dinner with the celebrations extending into the early hours of the next morning.
The subsequent day the party walked the one and a half miles to Thompson’s Training Ground near Cobbin Creek to attend the horse racing (The Manaro Mercury, 13 Jun 1874). Dinner was again hosted by Baggs and the following day those in attendance departed.

The Leesville Hotel continued to be the focus of community events with regular cricket matches, athletics and horse racing hosted from the premises and the adjacent race grounds. The addition of a hall, likely in front of the shearing sheds shortly after the opening of the hotel also allowed balls to be held for the local residents.

Local Aboriginal men including James Brindle and Harry Bradshaw were known to participate in the athletics events. The Manaro Mercury (8 Jan 1876) reported that Bridle had won the hop, step, jump and that he could have gone three feet further. Recordings such as these show that Aboriginal men in the area were included in the social events of the region and competed regularly against white men. While we cannot know exactly how these men were treated, accounts such as this indicate that there was a level of inclusion and acceptance.

There were however incidences of violence against Aboriginal people at the Leesville Hotel. The most well-known account was of the shooting death of Bony Jack.

Bony Jack was an Aboriginal man reportedly a member of the Currawang tribe of Maneroo (Young 2005, p.256).

“A well known character amongst the blacks with whom the early settlers came into contact was Bony Jack, a man who was apparently of superior intelligence and has considerable amount of influence over his associates” (Felix Mitchell as quoted in Young 2005: 260).

There are accounts of him throughout the 1850s shearing sheep in the region and being paid at the same rate as other white shearers (Young 2005, p.260). On a Tuesday evening in May 1875 however, Bony Jack was shot dead at the Leesville Hotel and The Queanbeyan Age (26 May 1875) reported the following.

“Boney had been drinking at the Leesville Hotel on Wednesday evening, and became a nuisance. He took his departure once but returned and let his horse loose, when Larkins took a gun and pointed it at Boney, telling him to return to his camp. Boney seized the barrel of the gun and in the struggle it went off, killing the unfortunate aboriginal instantly” (The Queanbeyan Age, 26 May 1875)

It appears that while the incident was investigated and an inquest held, Larkins did not receive any serious punishment for the act. There are several local accounts of what happened to Bony Jack but most note him being buried outside of the pub in what is today the Pony Club grounds.

By 1881 the Leesville hotel had however, been converted to the Leesville Temperance Hotel. Sporting events and social balls were still regularly advertised however, suppers and tea meetings were advertised instead of wine and spirits. The temperance movement did not however last long at Leesville and in 1882, Thomas Baggs left the property and Crawford took over the Leesville Hotel Publicans license and converted the site back to a pub.

In addition to the hotel at Leesville there was a Blacksmiths shop operated by George Richardson located by the creek, a pound yards and a police station (JPSCC 1984). A police station was opened in Leesville, primarily to deal with stock theft and the first police to be located there were Constable Dawson and Constable Colyer. The Leesville station was however short lived as the Jindabyne Police Station was opened in June of 1883.

As noted above it seems that the Cobbon Run was vacant for part of the late 1840s until in 1852, Richard Brooks, owner of Jindabine station (also spelled Genderbine and Jindobin) took over the lease and operated
the 6,400 acre property. In the mid 1850s James Thompson rented Cobbon and subsequently bought the station around 1864. It is suggested that Thompson built the Cobbon Homestead (see Appendix B, Plate 16) around 1856 as his daughter Faith Mary (1853-1946) recalls moving into the house when she was three (Cantlon 1981, p.38).

The homestead is thought to be one of the earliest in the region and is a representative example of mid Victorian period Georgian style. The house was built by contractor, Philpot and a Czech mason named Frances Rubin. The building is stone which was thought to have been transported by three-horse dray from Crackenback (Cantlon 1981, p.38). The house is a “single storey painted stone house with loft accommodation, front verandah with strangers’ rooms at each end, rear skillions and two short squat chimneys” (OEH 2011).

Reminiscences from Mrs Williams from the 1860’s note that Aboriginal people used to work about the stations in the Snowy River area and makes reference to two Aboriginal people that spent most of their life on Cobbin. She notes that

“Black Jimmy came there as a young man and died there an old man. He is buried at Cobbin. Black Harry spent the great part of his life on Cobbin. His gin was Lizzie. He was a very smart man, a great athlete and held the belt around the district for running and jumping. He was also a great horseman. His name was Harry Bradshaw. I do know where he died but his widow Lizzie later married Billy Rutherford, a much esteemed and respected half caste of Jimenhuen” (Young 2005: 250-251).

Hansen (2009) suggests that Harry Bradshaw was an integral member of the Cobbin homestead and his year-round occupation suggested that he was likely the head stockman. Unlike Mrs Williams account however Hanson (2009) suggests Bradshaw died as a fairly young man, leaving his wife Lizzie and two small children.

While Bradshaw and Lizzie were at Cobbin, an Aboriginal couple, James and Emily Brindle passed through likely as one of the seasonal workers. Notably James was the son of Alex Weatherhead of Nungatta station and a Ngarigo women (see Appendix B, Plate 21). The storey goes that the child was not to take the Weatherhead name and so Alex’s father named the child Brindle after his cattle (Hansen 2009). Emily gave birth to their son and named him Alex Brindle at Cobbin in 1888. Alex Brindle grew up to become one of the renowned Aboriginal Trackers based out of Dalgety and later Cooma (Hansen 2009: 203) (see Appendix B, Plate 22).

Following Bradshaw’s death Lizzie went on to marry Billy Rutherford snr. Their son Billy Rutherford jnr went on to become a police tracker with Alex Brindle.

Bradshaw was known to have been buried at Cobbin and it is likely that other Aboriginal people who were living and working in the region would have been buried on the stations they were working on. Little is known about this to date.

An Aboriginal burial was noted by Richard Helms during his visit to the area in 1889 located just north of Cobbin Creek. The run owner of the property, Mr Thompson of Cobbin, noted that the elderly man had been carried by his tribe from place to place for several years prior to his death as he suffered from a hip disease that rendered him unable to walk. The accounts of the funeral and grave preparation note that “a great many natives assembled to assist in the funeral ceremonies”. Helms account that the death had occurred 17 years prior to his visit suggest that the death of this man occurred in 1872 and that Aboriginal people were still activity camping, traveling through the area and practicing burial rituals (Young 2005:243-44).
Mrs Williams also notes an Aboriginal family living at Mowenbah station which is located on the southern boundary of the Study Area on the southern side of Mowamba River. The family consisted of Black Bob and Mary Anne with their two little girls Eliza and Topsy. Mrs William recounts the unfortunate death of Mary Anne at the hands of her husband and the burial of Mary Anne on a hill in a paddock, which is most likely just outside the Study Area. Mrs Thompson of Cobbin is noted to have taken in Eliza and Mrs Spellman of Mowenbah took in Topsy. Topsy was noted to have died not long after and was buried with her mother. Eliza’s whereabouts seems to have been lost with a Mrs Shiels noted to have her last (Young 2005: 252).

6.6.4 1890’s-1960’s – Development of the Area

From the 1890’s the Study Area had established pastoral properties on the outskirts of the township of old Jindabyne. Very little information is available about the use of the area during this time as recorded histories focus more on the activities of the old town and the development of surrounding areas such as the Kiandra goldfields and the Snowy Mountain ski industry until the development of the Snowy Scheme camp in the 1950’s. A brief overview of the major influences of the area are noted below.

By 1890 the Jindabyne area was recognised as an ideal spot for trout fishing and in 1909 the Government Tourist Bureau opened The Creel, a lodge for fisherman and visitors on the Thredbo River which increased tourism in the general area. Fisherman would come from all parts of Australia to fish in the Jindabyne area (CME n.d.) (see Appendix B, Plate 19).

In June 1911 the first Bush Nursing Centre in NSW was opened in Jindabyne with Nurse Twelvetrees in charge. A notable figure, Sister Eileen Passmore came to Jindabyne in 1950 working with the bush nurses (Young 1993). She served the local community as a nurse for 15 years and is noted to have been the frontline medical support in Jindabyne for both locals and the Snowy Scheme workers and their families (Gough 1998:83) Sister Passmore (see Appendix B, Plates 11-14) is well remembered today for providing a great service to the people of Jindabyne and the area especially in times of sickness, great suffering and loss (Gough 1998:90).

Although not directly involved in the development of the ski industry in the Snowy Mountains the residents of Jindabyne have been continuously affected by the development and growth of ski tourism to the area since the 1900’s.

In the 1940’s the planning of Lake Jindabyne and the Snowy Mountain Hydro-Electric Scheme commenced. Soon after negotiations with landowners began for the purchase of lands and relocation of local families.

This time in Jindabyne’s history was one of change but also consolidation for the many early European families. As an example, at Mill Creek homestead (see Appendix B, Plates 17), which is actually located on Lee Creek, Norman and Katie McGufficke extended the original homestead. The house was a weatherboard house with fibro extension built on original stone foundations (Gough 1998:60). An orchard, pig sty and toilet block were located near the house. Norman and Katie raised fourteen children at Mill Creek (Herbie, Jack, Teddy, Amy, Norman (Dick), Edna, Norma, Bruce, Derek, Kevin, Walter, Leslie, Greta, Marilyn). Greta Jones (nee McGufficke) recalls growing up on the property and her brothers driving their cars at full speed down the hill and through the front gates and the semi regular flooding of the area along Lee Creek (Greta Jones pers com).

The property was sold to the snowy River scheme in 1950 and the family was given two years to move out. The family relocated and built a new house at the far side of their property on Cobbin Creek. The “George Hudson Ready-Cut” home was built by Bob Whiting and the family relocated to the new house in 1952 (Gough 1994, p.60).
Once the Snowy took ownership of the property, Mill Creek was leased to a couple, Emil and Veronica, who operated a general store in the Jindabyne Camp, located just adjacent to Mill Creek. Eventually the house was sold to George Collman who demolished the old Mill Creek homestead (Gough 1994, p.60). Today however, some foundations, orchard and the original pine trees still exist on the flat above Lee Creek (see Table 6-4).

Migrants began to arrive to work on the Snowy Scheme in the late 1940s establishing a tent camp on the bank of the west bank of the Snowy River just below the original Ryrie’s flour mill site. Later a permanent camp, located directly opposite the Mill Creek homestead and just west of the Leesville Hotel, was built to house the employees of the Snowy Scheme. Construction began in the early 1950s with the establishment of twenty Barracks, ablution blocks and a batching mess accommodating twenty men (Gough 1998:58). Today this is the location of the Jindabyne Winter Sports Academy. By the 1950’s the area was a service hub for the Snowy Scheme.

In the 1950’s gambling nights were known to be held in various farm sheds outside of town to raise money for charitable organisations. One such example was held at the Leesville shearing sheds adjacent to the Leesville Hotel, by this point owned by the Weston Family. The Leesville property (see Appendix B, Plate 18) continued to be a hub for community social events up until the present day. Many local residents of the Jindabyne community fondly recall having balls and dances at the hall in front of the shearing sheds at Leesville. Other social events such as a football day, rodeo and a day at the sale yards were noted to be great social events in the local area (Gough 1998).

By December 1956 with the impending flooding of the town through construction of Jindabyne dam, any new construction in the town of old Jindabyne was banned by the Government and renovations were restricted to the value of £250. Tom Barry, a local resident from one of the early Jindabyne families noted that the knowledge that the inundation of the old town was inevitable lead to a resigned atmosphere to the town:

> The people of Jindabyne knew for many, many years that the town was going to die, and to a degree, Jindabyne died a little at a time. It had a complete embargo on any building taking place, and people couldn’t renovate their homes, It was rather sad to see the old town just wind down, and eventually the day came that they declared it dead. I think it might have been nicer if the town had died overnight like Adaminaby, and just been replaced... Jindabyne was definitely a long time dying (McHugh 2019:281).

### 6.6.5 1960’s – Present

The site of the new town was announced in 1960 and between 1961 and 1964 the residents of the old Jindabyne moved into the newly constructed town that would overlook Lake Jindabyne once the dam was completed and the lake full (see Appendix B, Plates 1-8). The new township of Jindabyne, including the shopping centre were officially opened on the 19th of December 1964 by Sir Eric Woodward, Governor of NSW (Young 1993:1 -8). The main consideration in planning the new Jindabyne town was locating the main road in a position that would take advantage of the lake views. The new town of Jindabyne was planned to ensure the town had the opportunity to develop as an important centre for tourism as well as being a desirable township for residents (Young 1993:3).

A number of houses and building in the old town were demolished including the churches. The only remaining item from the original Presbyterian Church, a gate, was relocated to the new town which is believed to currently be in the care of the Alpine Uniting Church (Greta pers Com).
Before the old town was flooded the individuals buried in the old town cemetery were exhumed and transferred to the new cemetery along with the headstones (HGSC 1999: 158). The gates of the old town cemetery were also relocated to the new town cemetery (see Appendix B, Plate 9 &10).

Only the more recent buildings from the old town were relocated to the new Jindabyne. Alice Kidman recollects that sometime after her and her husband Ken moved into the new town” she remembers seeing her old home being transported past her front yard to be relocated in Banjo Patterson Crescent. The weatherboard house next door was also moved from the old town, where it had been the police station” (Young 1993: 25-26) (see Appendix B, Plates 3-4).

As a new Jindabyne was built new religious centres for the town were also constructed as was the case with all the other public buildings in the new town, including the Memorial Hall. The churches that were constructed in the town were the St Columbkille’s Church, St Andrews Uniting Church and St Andrews Anglican Church. Women played an important role in the town especially with the move into the new town.

The people of the old town made their last farewell from their town with the Jindabyne Saga pageant and procession that crossed the bridge over the Snowy River and lead up to the new township on the 3rd of April 1967. On the 17th of July 1967 the army demolition team blew up the old bridge which crossed the Snowy River (see Appendix B, Plate 6). The bridge is remembered as a symbol of the old town that connected the community to the surrounding region and recollections of the demolition of the bridge is still an emotional tale told by locals who witnessed the event. The old town now lies beneath the water of Lake Jindabyne and its only when the water levels are low that you can make out the remnants of the old church stairs (Young 1993).

Today, new Jindabyne is a very different town to old Jindabyne and even to the sparkling new town of Jindabyne in the 1960’s. Today the area is a tourist mecca through both the winter and summer seasons. The town has grown to accommodate the tourist load and new suburbs and industrial estates have been established. The NPWS Information Centre is also fixture in the local area with the diorama located in the foyer of the building displaying the old Jindabyne township a special feature for the residents who once lived there.

As the town has grown and changed new families have moved into the area and many of the old families have slowly begun to move away. Despite the rich and varied history of the town and its importance in the social history of Australia, both pre and post contact, very little information about the area is available to the public. There are likely a variety of reasons for this lack of acknowledged history, one of which may be the lack of a formalised historic society within Jindabyne despite having many extraordinarily dedicated members of the local community committed to telling and preserving the history of Jindabyne. While we acknowledge that there are plans in place to rectify this situation, NGH would like to emphasise the diversity and significance of the Jindabyne area as a social and cultural landscape.

6.7 DISCUSSION AND RECOMMENDATIONS

6.7.1 Heritage Summary of Findings

The heritage values of the Jindabyne Study Area have not been truly captured by previous heritage studies. While a number of heritage places, both Aboriginal and non-Aboriginal are recorded, there has not been to date a detailed synthesis of the places and values that have been identified in this study. The history of the town is inextricably linked to the Snowy Scheme, but there is a wider and broader history that is present. It is beyond the scope of the present study to detail in depth all the heritage values associated with this area and further research and verification regarding these values may be required.
Based upon the research undertaken for this report and the narrative of the area there are some clear themes that can be identified and are valuable considerations in the Masterplan development process. Some of these major themes, not previously clearly captured for this area include the following.

- **Aboriginal history.** The archaeological assessments that have been undertaken for development purposes have provided a sound basis for identification of landscapes that have potential to contain archaeological material. There is however, another part of the Aboriginal history of the area that has not been acknowledged to date relating to the continuity of Ngarigo people in the area. This continuity of occupation and connection to country is not a unique feature of the Jindabyne area but is nevertheless important to recognise, particularly in a period where extreme prejudice and racism was prevalent amongst many European settlers across Australia. There are several references to Aboriginal people’s involvement in pastoral life of the region. This extends from employment of Aboriginal men as stockmen and managers on stations, involvement of Aboriginal people in sporting events and the highly regarded roles of the Police trackers in this region. The telling of Aboriginal histories of this area is additionally important as it dissuades the ideas that Ngarigo people “died out” with the death of Biggenhook, as some history books report. Instead the Ngarigo people continue to be present and active in the region and maintain a strong connection to the landscape.

- **European families.** The Jindabyne area is typical, in many ways, of other parts of Australia where early Europeans tried to find better pastures for their stock and in so doing, squatted on land beyond the recognised boundaries of the colony. There were a number of people in the area from the 1830s with additional families moving to the area in the 1850s and 1860s. What is perhaps of note is that while there were some early families who moved away, a large number of families have remained. Many of family names to present day including Pendergast, Thompson, McGufficke, Barry and Woodhouse as well as other family names that may have ended but whose bloodlines continue in the region as descendants of the first Europeans in the region (see Appendix C). The continuity of families in the area indicates a resilience amongst the Jindabyne community in the presence of often harsh and challenging environmental conditions.

- **Jindabyne landscape.** The Jindabyne landscape has been influenced by many factors. The most notable of which was the damming of the Snowy River to create Lake Jindabyne, and the deliberate and planned construction of the new town making this area a modern, man-made cultural landscape. The vistas from almost anywhere in the new town are filled with the lake and acknowledgement that this is a new and manufactured environment. However, once one passes over the top of cemetery hill on the Barry Way leading south, the landscape is no longer so obviously a modern cultural landscape. It becomes a constructed rural landscape and one that may not have changed greatly for hundreds of years. The area was not conducive to cultivation and so grazing was the main land use for European farmers. The area would have been extensively cleared to allow for increased stock grazing, thus significantly modifying the vegetation landscape. There is little evidence in the records to understand what Aboriginal landuse practices occurred here but it may be assumed that some use of burning probably occurred. The natural frost hollows and the periodic snow falls would have influenced the natural landscape and that is perhaps why early graziers decided to stay. The more recent housing and industrial developments in the southern part of the Study Area is changing the nature of the landscape but there is still a natural feel and outlook that is an important part of the heritage of the area.
Recommendations:

- Ngarigo culture and heritage should be incorporated into the heritage narrative of Jindabyne and surrounds. This could include options such as:
  - Interpretive signage in key places such as foreshore walking trails;
  - Recognition in street and place names;
  - Engagement in public events and recognising appropriate welcome to country messages, and
  - Detailed research into key people and events in Aboriginal life of the district, including in more recent times and the association with early European graziers.

- The historic themes identified would be a starting point for further discussion and interpretation of the unique and valuable heritage values of the Study Area. Such values could be recognised in interpretation material and form the basis of a local heritage centre.

- Interpretation signage should be erected within the Study Area where appropriate to provide locals and tourists within information about the Study Area and the township of Old Jindabyne.

- Future development plans incorporate appropriate suburb and street names that are relevant and recognise the history of the area, including local family names.

- Preservation of the rural character of the different landscapes between town and rural settings.

6.7.2 Conservation Opportunities for Aboriginal Cultural Heritage

There are hundreds of Aboriginal heritage sites recorded within the Study Area and many more presently unrecorded. Some parts of the Study Area have been highly disturbed and it is not expected that Aboriginal sites would remain. Other areas though disturbed through historic land use and development are likely to retain sites where the physical objects remain but the context has been lost. In other areas however, there are landforms that remain largely undisturbed where sites would occur in a mostly intact condition. It is these areas that hold the greatest potential for site integrity and value and should be the focus of protection measures and wherever possible avoided by development.

Based upon the predictive model establish by NGH 85% of previously recorded AHIMS sites are located within the High Constraints areas, 7% in the medium and 8% in the low constraints. The similar number of sites in the medium and low constraints areas is mostly attributed to a lack of comprehensive systematic survey in these areas. Limited surveys and due diligence style assessments are most likely to identify sites within high constraints areas. These sites tend to be larger and more spatially extensive and consequently easier to identify, even with visibility constraints, than sites within low and moderate areas.

It is important to note that while the predictive modelling shows the likelihood of sites to occur using a high, medium and low rating system it in no way suggests that there are areas where there is no potential for sites to occur. A landscape assessed as having a low heritage constraint still reflects the potential for sites to exist in comparatively lower frequencies than a moderate or high value area. Consequently there are no landscapes mapped within the Study Area where NGH suggest that there are no Aboriginal Heritage constraints. The areas mapped as disturbed may be considered to have very low archaeological potential but any development in these areas should be assessed on a case by case basis as the level of disturbance and the type of landform has implications for assessments at a finer scale than the mapping is able to present.

All Aboriginal objects, whether an isolated stone artefact or a large site complex are protected under the NSW National Parks and Wildlife Act. As such any disturbance of an Aboriginal object without a valid Aboriginal Heritage Impact Permit is a breach of the Act and the offender liable to prosecution. To avoid
such a scenario, and to ensure the Aboriginal heritage values are recognised and managed appropriately, all development activities within the Study Area should be subject to an Aboriginal heritage assessment prior to any work commencing.

Recommendations:

- Any development activity must be subject to an Aboriginal heritage assessment in compliance with the appropriate codes of practice and guidelines and the requirements of the planning process.
- Ngarigo Aboriginal people have a right to be consulted in relation to their cultural heritage and should therefore be involved in the development assessment process.
- Curiosity Rocks, East Jindabyne, The Cobbin property, sections along Cobbin Creek, the Aboriginal Burial along Cobbin Creek and the Leesville historic complex as shown in Figure 7-1 are areas of high Aboriginal Cultural Heritage Conservation Value and should be avoided by future development.
- The conservation areas as listed above should also be avoided by future development wherever possible. There is high potential for surface and subsurface archaeological deposits with intact cultural heritage within these locations. While theoretically development, with the appropriate permissions could occur in these areas, NGH recommends that where possible avoidance is observed, and these areas protected for future and intergenerational equity.
- Curiosity Rocks, a statutorily recognised and protected Aboriginal Place, must be avoided by all future development impacts. Management of erosion is a priority for this site as currently lake operation is causing significant impact to the cultural and archaeological integrity of the site. The completion of an overall management plan is the responsibility of DPIE (formerly OEH).
- The management of the lake foreshore should be addressed to better protect Aboriginal Cultural Heritage. Like Curiosity Rocks, the East Jindabyne foreshore is subject to significant erosion resulting in high impact to Aboriginal Cultural Heritage sites.

### 6.7.3 Conservation Opportunities for Historical Cultural Heritage

While there are a number of existing historical places and objects listed on the current Snowy River LEP there have been 14 additional sites identified as part of this assessment that NGH consider are likely to meet the threshold listing as a heritage item on an updated LEP (GJ1-14). Table 6-7 below indicates the heritage item and the relevant NSW Heritage themes associated with the sites. Through the primary research and community consultation several additional historical themes have been identified for sites already listed on the existing LEP. Of significant note is the Cobbin property that has a strong connection with not only pastoralism and families in the area but also has a strong history of employing Aboriginal people and is likely the birth place of Aboriginal Tracker Alec Brindle. It was beyond the scope of this study to undertake specific significance assessments of individual places, NGH does believe that at a minimum the additional sites identified should be listed on the LEP and consequently subject to specific requirements in relation to development impacts. It would be valuable for further targeted research and significant assessments to be undertaken to determine whether additional listings (State or National) and protections are warranted at some of these sites.

Table 6-7. Identified historic heritage places and possible associated theme.

<table>
<thead>
<tr>
<th>Item Name</th>
<th>ID</th>
<th>Possible NSW Heritage Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relocated House 1 - 5</td>
<td>GJ1, GJ2, GJ3, GJ4, GJ5</td>
<td>Ethnic influences; Migration; Towns, suburbs and villages; Accommodation; Domestic life; Health; Labour; Events</td>
</tr>
<tr>
<td>Item Name</td>
<td>ID</td>
<td>Possible NSW Heritage Themes</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Leesville Historic complex</td>
<td>GJ6</td>
<td>Aboriginal cultures and interactions with other cultures; Commerce; Industry; Pastoralism; Transport; Towns, suburbs and villages; Accommodation; Law and order; Domestic life; Sport</td>
</tr>
<tr>
<td>Mill Creek Homestead</td>
<td>GJ7</td>
<td>Pastoralism; Agriculture; Accommodation; Domestic life; Government and administration</td>
</tr>
<tr>
<td>Stone Wall</td>
<td>GJ8</td>
<td>Land tenure; Pastoralism</td>
</tr>
<tr>
<td>Old Racecourse</td>
<td>GJ9</td>
<td>Sport; Aboriginal cultures and interactions with other cultures</td>
</tr>
<tr>
<td>Jindabyne West</td>
<td>GJ10</td>
<td>Pastoralism; Agriculture; Accommodation; Domestic life;</td>
</tr>
<tr>
<td>Snowy Seismic Station</td>
<td>GJ11</td>
<td>Science</td>
</tr>
<tr>
<td>Historical Aboriginal Burial</td>
<td>GJ12</td>
<td>Aboriginal cultures and interactions with other cultures; Religion; Birth and Death</td>
</tr>
<tr>
<td>NPWS Information Centre and diorama</td>
<td>GJ13</td>
<td>Towns, suburbs and villages; Education; Government and administration; cultural life Creative endeavour; Leisure; Social institutions</td>
</tr>
<tr>
<td>Sale Yards</td>
<td>GJ14</td>
<td>Commerce; Pastoralism; Labour</td>
</tr>
<tr>
<td>Lake Jindabyne Conservation Area</td>
<td>C4</td>
<td>Events; Environment - cultural landscape; Technology</td>
</tr>
<tr>
<td>Jindabyne Cemetery</td>
<td>I145</td>
<td>Birth and Death; Religion; Events</td>
</tr>
<tr>
<td>Jindabyne Winter Sports Academy</td>
<td>I146</td>
<td>Migration; Environment - cultural landscape; Industry; Technology; Towns, suburbs and villages; Accommodation; Labour; Government and administration; Domestic life; Sport; Persons</td>
</tr>
<tr>
<td>Leesville Hotel</td>
<td>I147</td>
<td>Aboriginal cultures and interactions with other cultures; Commerce; Industry; Pastoralism; Transport; Towns, suburbs and villages; Accommodation; Domestic life; Sport.</td>
</tr>
<tr>
<td>St Andrews Uniting Church</td>
<td>I150</td>
<td>Religion; Towns, suburbs and villages; Creative endeavour</td>
</tr>
<tr>
<td>Jindabyne Foreshore Park</td>
<td>I151</td>
<td>Leisure</td>
</tr>
<tr>
<td>Strzelecki Monument</td>
<td>I152</td>
<td>Exploration; Creative endeavour</td>
</tr>
<tr>
<td>St Columbkille’s Church and Hall</td>
<td>I153</td>
<td>Religion; Towns, suburbs and villages; Creative endeavour</td>
</tr>
<tr>
<td>Memorial Hall</td>
<td>I154</td>
<td>Social institutions; Towns, suburbs and villages; Environment - cultural landscape</td>
</tr>
<tr>
<td>St Andrews Anglican Church</td>
<td>I155</td>
<td>Religion; Towns, suburbs and villages</td>
</tr>
<tr>
<td>Cobbin</td>
<td>I166</td>
<td>Aboriginal cultures and interactions with other cultures; Birth and Death; Persons; Domestic life; Accommodation; Land tenure; Pastoralism; Agriculture; Labour</td>
</tr>
</tbody>
</table>
Recommendation:

- All sites currently listed on the Snowy Valley LEP within the Study Area should be conserved and avoided by development.
- The additional fourteen historic sites as outlined in Table 6-7 (GJ1-GJ14) above should be listed on an updated LEP and provided heritage protection. These sites should also be avoided by development.
- Should any future development work propose to impact the sites currently listed on the Snowy Valley LEP or those additional places, the appropriate level of impact assessment must be undertaken (Statement of Heritage Impact) to ensure no unacceptable impacts occur to these sites.
- Further historical assessment and research is warranted to investigate, record and document the heritage significance and values associated with the identified historic heritage places. This research should include an assessment as to whether any sites as listed in Table 6-7 should be listed on the State or National Heritage Registers.
- The Leesville Historic complex particularly contains a number of potentially highly significant historic places and events. The area includes but is not limited to the former hotel, associated store (dilapidated condition), shearing sheds, the former police holding yards and location of Boney Jack’s grave. This area should be avoided by development and further research should be conducted to further ascertain and document the details and events surrounding the site.
- The Leesville Hotel, one of the few original buildings remaining in the area, is currently in a state of disrepair. Where possible the site should undergo sympathetic restoration to preserve a sites that is an example of early settlement and social activity in the area.
- Cobbin homestead rural landscape is an area that should also be subject to specific research to document its history and confirm its heritage significance.
7 INTEGRATED VALUES MAPPING

The identified areas mapped as HEV with areas of high heritage value are shown in Figure 7-1. We have utilised this mapping to produce an integrated map of the highest environmental and heritage values identified during this study and is shown in below. The overlaying of the values mapping shows the interconnectedness of the environmental and heritage values. The mapping includes biodiversity (updated HEV mapping) and heritage mapping, including Aboriginal sensitivity mapping and non-Aboriginal historic features.

7.1 INTERSECTION OF HEV AND HIGH ABORIGINAL AND HISTORIC SENSITIVITY

Through integrating mapping of HEV and high heritage values, a series of high value conservation areas have been identified, shown in and Table 7-1. Such areas should be the focus and priority for conservation and promotion of these values and sympathetically incorporated into the future development design of the Jindabyne Area and the mapping demonstrates the overlapping and complementary nature of both environmental and heritage values.

The identification of conservation areas in this report is intended to provide guidance around areas with extremely high constraints on future development due to heritage and biodiversity values. While theoretically these areas could be developed with the appropriate development consent process, NGH recommends that wherever possible these areas should be avoided due to their unique combination of environmental and heritage values. Discussion of protection mechanisms and mitigation measures is addressed below.

It is important to note that the identification of conservation areas does not reduce the value ratings of areas outside of these conservation zones. The appropriate assessments and approvals are required for any development impact within the broader study area.
Table 7-1. Identified conservation priorities.

<table>
<thead>
<tr>
<th>Conservation Area</th>
<th>Description</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>East Jindabyne -North</td>
<td>Contains threatened ecological community with ridges and spurs with high Aboriginal heritage potential for relatively intact sites and Rushes Creek.</td>
</tr>
<tr>
<td>B</td>
<td>East Jindabyne -South</td>
<td>Contains threatened ecological community with ridges and spurs with high Aboriginal heritage potential for relatively intact sites in proximity to Snowy River.</td>
</tr>
<tr>
<td>C</td>
<td>East Jindabyne -foreshore</td>
<td>Contains pockets of threatened ecological community with areas of key fish habitat with sections of ridges and spurs with high Aboriginal heritage artefact density and deposits exposed by erosion on lake edge in close proximity to preferential camping areas adjacent to Snowy River.</td>
</tr>
<tr>
<td>D</td>
<td>Curiosity Rocks</td>
<td>Key fish habitat with areas of very high Aboriginal heritage value inclusive of the Aboriginal Place and site density along foreshore.</td>
</tr>
<tr>
<td>E</td>
<td>Cobbin Creek</td>
<td>Contains mosaic of threatened ecological community with areas of key fish habitat with buffer of creek flats and spur terminations with high Aboriginal heritage potential and the Cobbin LEP listing with early European and Aboriginal interaction.</td>
</tr>
<tr>
<td>F</td>
<td>Leesville Complex</td>
<td>Contains threatened ecological community with areas of high historic heritage value and associated with key Aboriginal and European contact period interaction.</td>
</tr>
</tbody>
</table>
7.2 BIODIVERSITY

7.2.1 Updated HEV mapping\textsuperscript{10}

The HEV mapping presented in Section 5.4.2 and summarised in this section, designates areas of High Environmental Value, that have been field validated by the rapid survey program set out in this report. They contain vegetation of conservation significance, are likely to contain important habitat resources that may be used by threatened species, include areas of key fish habitat and of OEH Biodiversity Values mapping (reduced in one location based on floristic plot data).

Future development options to protect HEV values

The HEV mapping can assist with strategic planning in identifying areas which are unlikely to be suitable for future development. Areas of HEV would be best protected via conservation mechanisms to preserve biodiversity and broader environmental values.

Protecting HEV mapped areas, and areas of connectivity between them, will provide better resilience and overall ecosystem health in the Study Area. This will benefit resident threatened and rare species, enhance riparian areas and movement corridors and improve soil, air and water quality inside the Study Area.

It is noted that large contiguous areas will be more resilient than many small fragments; adverse edge effects associated with perimeters include pest and weed ingress as well as more subtle microclimate changes that can affect species persistence in an area. Including additional buffers on high value areas is a good strategy to minimise these effects.

Appropriate protection mechanisms include:

- Environmental zoning, under the LEP.
- Biodiversity certification, under the BC Act.
- Biodiversity stewardship sites, under the BC Act.

Appropriate activities include:

- Restoration of riparian lands
- Restoration of connectivity including areas of tree canopy and ecotones, to allow species movement / dispersal.
- Strategic pest animal and weed programs.

Development activities should seek to avoid these as much as possible and minimise impacts within them, by careful attention to design, i.e. consolidation of the impact footprint; increased building construction standards to minimise clearing for bushfire protection.

Impact Assessment

Any proposed development in HEV areas should carefully consider the potential impacts on the HEV values, pursuant to appropriate environmental assessment pathways\textsuperscript{11}, for example:

\textsuperscript{10} HEV in this section refers to the updated mapping resulting from this report.

\textsuperscript{11} Environmental assessment pathways differ based on the development and location, according to Part 4 and 5 of the EP&A Act.
• What are the likely impacts on NSW and Commonwealth listed threatened entities?
• What are the likely impacts on HEV connectivity, will it lead to fragmentation or increased edge effects in these areas? Will it alter the structure or composition of vegetation adversely?
• What are the likely impacts on water quality, aquatic habitat and riparian vegetation?
• What are the likely impacts on landform stability and potential for erosion?
• What ongoing management actions required for the development could impact the values above; for example, bushfire management.
• What will be the ongoing indirect impacts, on adjacent land?
• Offsetting; what offset obligations result from clearing? (Clearing in these areas is likely to trigger the Biodiversity Offset Scheme and generate high offset requirements, if permissible).

Mitigation measures

Mitigation measures for developments within HEV areas should carefully consider:

• Avoidance and minimisation strategies. Justification should be provided that demonstrates the impacts are warranted. For example, for residential subdivisions and even single house lots, the clearing required for bushfire protection can be large in vegetated areas and sloping areas. The cumulative clearing impacts can impact vegetation structure and function as well as increasing threats such as pest and weed ingress. Siting / impact footprints should demonstrate their ability to reduce edge effects and fragmentation of HEV areas.
• Weed hygiene controls, to control existing infestations and prevent further weed ingress.
• Erosion sediment controls, to minimise soil loss and protect waterways, particularly in high erosion hazard areas in the north of the Study Area.
• Riparian restoration for instream works.
• Monitoring programs to ensure that ongoing and indirect impacts are not greater than anticipated.
• How offsets will be retired, where generated.

7.2.2 Non HEV

Future Development options in areas not mapped as HEV

These areas are more likely to be appropriate for development.

Areas for which no PCT is mapped and no tree cover is observable on Figure 5-4 are likely to be exotic vegetation. These are areas of least constraint (subject to on ground validation).

Impact Assessment

Any proposed development in these areas should:

• Quantify any native vegetation impacts and if present, determine:
  • If there is potential to significantly impact NSW or Commonwealth listed entities (communities, populations and species).
  • If clearing triggers the Biodiversity Offset Scheme and what offset liability results.
• What are the likely impacts on landform stability and potential for erosion?

Mitigation measures

Mitigation measures for developments in these areas should consider:

• Weed controls targeting priority weeds that must be controlled.
• Erosion sediment controls, to minimise soil loss and protect waterways, particularly in high erosion hazard areas in the north of the Study Area.
• Riparian restoration for instream works.
• How offsets will be retired, where generated.

These threats are best addressed strategically, hence plans for subdivisions / precincts will be more effective than smaller scope plans, addressing a single development only.

**HERITAGE**

### 7.2.3 Heritage mapping

The Aboriginal heritage mapping presented in 6.4.3 designates areas of high heritage potential, that have been identified through background research into previous surveys and through some field inspections set out in this report. The areas of high and moderate potential are likely to contain Aboriginal sites of high density, artefact density and variability and have relatively intact subsurface deposits and therefore an increased scientific value. Other areas of heritage value have been identified through the current listing in the LEP as well as others through this current study.

**Future development options to protect heritage values**

The heritage mapping can assist with strategic planning in identifying areas which are likely to have high constraints for future development. Areas of heritage value would be best protected via conservation mechanisms to preserve the values and diversity of sites likely to be present. The potential significance of heritage values in terms of rarity, representativeness, site content and research potential could all be preserved through avoiding development of such areas.

It is noted that a sample of landscapes are also represented and avoiding impacts to these areas would add to the diversity of the Aboriginal archaeological material in particular, likely to be present.

Apart from the NPW Act protections for Aboriginal sites across NSW, other appropriate protection mechanisms could include:

- Environmental zoning, under the LEP.
- Voluntary protection areas on private property.

Development activities should seek to avoid these as much as possible and minimise impacts within them, by careful attention to design, siting and use of open space. Even if such areas were to be used for conservation measures, land management decisions such as maintenance of fire trails, fencing and services and recreation activities would still require an archaeological assessment as under the blanket protection mechanisms of the NPW Act, all Aboriginal objects are protected.

**Impact Assessment**

Any proposed development in areas of moderate to high heritage potential should carefully consider the potential impacts on the heritage values and be subject to appropriate environmental assessment pathways including conducting an Aboriginal Cultural Heritage Assessment (ACHA) with formal Aboriginal community consultation. In particular, consideration of heritage values should include:

- What are the likely cumulative impacts on heritage sites and places?
- What are the likely impacts on heritage diversity, are particular landscapes or site types more affected than others?
- Consideration of the potential for subsurface cultural deposits and undertake testing if considered to be moderate to high.
- What are the likely indirect impacts on adjacent lands including increased erosion through increased visitation or accessibility?
What ongoing management actions would be required for the development to protect sites long term?

Mitigation measures

An important consideration for development actions is what mitigation measures (salvage, interpretation) would be required, appropriate to the level of significance of the sites. The degree and scale of mitigation is often linked to the size and significance of the site impacted.

Mitigation measures for developments within areas of archaeological and historic heritage potential should carefully consider:

- Avoidance and minimisation strategies. Justification should be provided that demonstrates the impacts are warranted. For example, for residential subdivisions and even single house lots, the earthworks required can be large. The cumulative impacts of ground disturbance can affect the preservation of sufficient landforms containing Aboriginal heritage sites in particular.
- Siting / impact footprints should be aimed at avoiding the areas of highest archaeological potential such as spur crests and creek terraces and examine options for building on side slopes of ridges and spurs where sites are less prevalent.
- Ground disturbance activities including roads and services should avoid high sensitivity areas and examine other options such as placement off crests and under-boring.
- Buffering of sensitive areas in planning documents.
- Establishment of larger block sizes to avoid high density impacts in sensitive areas or alternatively restrict high density development to smaller areas allowing for preservation of larger areas between developments.
- Instigate measures to ensure Aboriginal heritage sites are appropriately salvaged (through excavations, collections) prior to development in certain areas.
- Monitoring programs to ensure that ongoing and indirect impacts are not greater than anticipated.
- Ensure planning decisions in proximity to Historic heritage places consider appropriate design and aesthetic visual impacts.

7.2.4 Low sensitivity heritage mapping

Future Development options in areas not mapped as high or moderate

These areas are more likely to be appropriate for development. Areas mapped as having low Aboriginal heritage potential are likely to be in situations where the landforms are well away from major water courses, on steeper land and be subject to disturbances. These are areas of least constraint although will be subject to on ground validation as all Aboriginal objects are afforded protection in NSW. Even where small or isolated Aboriginal objects and sites occur and are considered of low significance, any impact can only be approved with a valid Aboriginal Heritage Impact Permit (AHIP) issued by OEH (or its subsequent authority). To obtain an AHIP, an ACHA must be completed.

Impact Assessment

Any proposed development in these areas should:

- Include as a minimum a Due Diligence assessment under the applicable OEH Code of Practice.
- Include Aboriginal consultation

12 Under the OEH Due Diligence Code of Practice, Aboriginal consultation is not compulsory but it should be undertaken in good faith.
- Acknowledge the potential for significant sites to exist outside of the mapping hierarchy.
- Where significant development is to occur consider the need for subsurface testing based on micro-topographic features in the landscape.
- Examine indirect impacts.

**Mitigation measures**

Mitigation measures for developments in these areas should be based on conclusions from the due diligence (or ACH) assessment and may include:

- Avoidance of areas of raised archaeological potential.
- Salvage of any sites identified (through obtaining an AHIP).

These threats are best addressed strategically, hence plans for subdivisions / precincts will be more effective than smaller scope plans, addressing a single development only.

# 8 CONCLUSION

This Environmental and Heritage Study has been undertaken for the NSW Department of Planning and Environment to assist with the development of the Go Jindabyne Masterplan.

The objective of this Environmental and Heritage Study is to gain a detailed understanding of the unique environmental and cultural heritage features of Jindabyne and surrounds, and their implications for growth and development (NSW Government 2017).

Specifically this report has:

- Summarised the environmental, social and planning context of the Study Area
- Provided a detailed biodiversity and heritage context to the Study Area
- Identified via risk assessment, key values at risk within the Study Area
- Provided more clarity around those values (biodiversity, Aboriginal archaeology, and non-Aboriginal heritage) to assist with their management
- Provided a set of recommendations for further investigation and the management of environmental and heritage values in the Study Area.

The report consolidates and presents key information to help guide planning and development in the Jindabyne Study Area. The report will also support consultation with the local community and relevant agencies in developing the Go Jindabyne 2036 Masterplan.

**Biodiversity**

On the basis of a rapid assessment survey program and analysis of existing mapping layers, biodiversity investigations have concluded that the existing vegetation and HEV layers being based on modelled data were suspect and should not be used. The updated PCT vegetation mapping in this report is now considered relatively robust as are the updated HEV areas added as a result of these investigations.

Additional survey recommendations have been made to increase the accuracy in a targeted and efficient manner. These include recommendations for survey methodology and locations, including a focus on private lands and grasslands, which are known to be underrepresented in the updated HEV mapping. Recommendations have also been made to enhance existing biodiversity corridors.
Areas that are not assigned to a PCT and where no tree cover is visible are most likely to be of lower value and a focus for development. The updated HEV areas should be the priority for conservation actions and protection mechanisms. Biodiversity certification is recommended for consideration for the strategic protection and development in the Study Area.

Heritage

Through an assessment involving background research, discussions with key stakeholders, targeted field inspections and GIS mapping, the heritage investigation has concluded that there is a rich and varied heritage within the study area. While many Aboriginal sites are known, many more remain unrecorded and are likely to be impacted through development. Non-Aboriginal heritage places have also been identified and risks to their preservation may also occur through development.

Based on GIS modelling, areas of Aboriginal site sensitivity have been identified. The best use of this mapping is in overview planning, the nature and distribution of Aboriginal heritage sites means that any ground disturbance activities will require detailed Aboriginal heritage assessment on a case by case basis.

For non-Aboriginal heritage places, identification of their location should be used in planning contexts for avoidance. The area around Leesville in particular is noted as a likely area for further assessment and potentially preservation as a conservation zone. Additional sites identified through this study should be considered for inclusion in the LEP heritage schedule.

The heritage narrative identified within this study should be used as a basis for the enhancement of the heritage values for Jindabyne and the Study Area. While the themes are not definitive, there will be many other aspects to the story of the region, they are themes that may have been overlooked when considering the importance of the development of the Snowy Scheme, the history of Kosciuszko National Park and the tourist industry associated with the snowfields.
REFERENCES


Australia ICOMOS 2013 The Burra Charter (The Australia ICOMOS Charter for Places of Cultural Significance) Canberra.

Australian Heritage Council 2008, National Heritage Assessment Australian Alps.


Barber 2003 Addendum to an archaeological survey of a proposed new spillway and outlet works, Jindabyne Dam, NSW. Unpublished report prepared for NGH Environmental.

Bennet, G. 1834 Wanderings in New South Wales, Batavia, Pedir Coast, Singapore, and China (Vol. 1). London: Richard Bentley.

Biosis 2003 An archaeological survey of a proposed new spillway and outlet works, Jindabyne Dam, NSW. Unpublished report prepared for GHD and Snowy Hydro Limited.


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Department of Planning and Environment (DPE) 2017, South East and Tablelands Regional Plan 2036. July 2017.


Dibden, J. 2017 RMS Development of the West Bound Lane Between Barry Way and Alpine Way, Jindabyne NSW, Due Diligence Assessment. Unpublished report prepared for NSW RMS.

DPI 2018, Invasive Species Plan 2018–2021, March 2018, NSW Department of Primary Industries


Eco Logical Australia (ELA) 2015, Biometric Vegetation Compilation. Prepared for South East Local Land Services.

Eco Logical Australia (ELA) (not known) Flora and Fauna Constraints Assessment - Lots 50, 95 and 111 DP 756686, 417 Barry Way, Jindabyne. Map extract provided by OEH.


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Government Architect NSW (GANSW) 2017a Better Placed: An integrated design policy for the built environment of NSW.


Flood, J. 1973 The moth-hunters: investigations towards a prehistory of the south-eastern highlands of Australia. The Australian National University.


Flood, J. 1980 The moth hunters: Aboriginal prehistory of the Australian Alps.


Inspiring Place Pty Ltd 2007, Jindabyne Open Space and Recreational Land Use Strategy.


NGH Environmental 2003c, Flora and Fauna Assessment for the proposed spillway and outlet works at Jindabyne Dam. A report prepared for GDH and Snowy Hydro Ltd., June 2003.


NGH Environmental 2017, Review of Environmental Factors for the Snowy River Avenue, Jindabyne Upgrade, Report for SRSC


OEH 2015, Developing maps of High Environmental Value for strategic planning - mapping and governance guide (Environmental Programs Branch (EPB)).

OEH 2017, Enabling Adaptation in the South East, NSW Office of Environment and Heritage.

OEH, 2019a, Maps of validated vegetation (Leesville Estate (2017) and Leesville to North of Station Resort (date not provided))


Scientific Committee 2011, Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions - endangered ecological community listing.


Snowy Monaro Regional Council (SMRC) 2018 Snowy Monaro Region Local Weed Management Plan.


Williams Barber Archaeological Services 1993 An archaeological survey for the proposed Cobbin Estate Subdivision, Jindabyne, NSW. Unpublished report for Locale Environmental Planning Services.

## 10 GLOSSARY

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>AHIMS</td>
<td>Aboriginal heritage information management system</td>
</tr>
<tr>
<td>ASL</td>
<td>Above sea level</td>
</tr>
<tr>
<td>AWS</td>
<td>Automatic weather station</td>
</tr>
<tr>
<td>BOM</td>
<td>Australian Bureau of Meteorology</td>
</tr>
<tr>
<td>BVSC</td>
<td>Bega Valley Shire Council</td>
</tr>
<tr>
<td>CEMP</td>
<td>Construction environmental management plan</td>
</tr>
<tr>
<td>Cwth</td>
<td>Commonwealth</td>
</tr>
<tr>
<td>DECCW</td>
<td>Refer to OEH</td>
</tr>
<tr>
<td>DP&amp;I</td>
<td>(NSW) Department of Planning and Infrastructure</td>
</tr>
<tr>
<td>EEC</td>
<td>Endangered ecological community – as defined under relevant law applying to the proposal</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental impact assessment</td>
</tr>
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<td>EPBC Act</td>
<td><em>Environment Protection and Biodiversity Conservation Act 1999</em> (Cwth)</td>
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<tr>
<td>EP&amp;A Act</td>
<td><em>Environmental Planning and Assessment Act 1979</em> (NSW)</td>
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<tr>
<td>ESD</td>
<td>Ecologically Sustainable Development</td>
</tr>
<tr>
<td>FM Act</td>
<td><em>Fisheries Management Act 1994</em> (NSW)</td>
</tr>
<tr>
<td>ha</td>
<td>hectares</td>
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<tr>
<td>Heritage Act</td>
<td><em>Heritage Act 1977</em> (NSW)</td>
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<tr>
<td>ISEPP</td>
<td><em>State Environmental Planning Policy (Infrastructure) 2007</em> (NSW)</td>
</tr>
<tr>
<td>KFH</td>
<td>Key Fish Habitat</td>
</tr>
<tr>
<td>km</td>
<td>kilometres</td>
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<tr>
<td>LALC</td>
<td>Local Aboriginal Land Council</td>
</tr>
<tr>
<td>LEP</td>
<td>Local Environment Plan</td>
</tr>
<tr>
<td>m</td>
<td>Metres</td>
</tr>
<tr>
<td>NES</td>
<td>Matters of National environmental significance under the EPBC Act (c.f.)</td>
</tr>
<tr>
<td>Noxious Weeds Act</td>
<td><em>Noxious Weeds Act 1993</em> (NSW)</td>
</tr>
<tr>
<td>NPW Act</td>
<td><em>National Parks And Wildlife Act 1974</em> (NSW)</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>OEH</td>
<td>(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water</td>
</tr>
<tr>
<td>REF</td>
<td>Review of Environmental Factors</td>
</tr>
<tr>
<td>REP</td>
<td>Regional Environmental Plan</td>
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<td>SEPP</td>
<td>State Environmental Planning Policy (NSW)</td>
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# APPENDIX A DOCUMENT REGISTER

<table>
<thead>
<tr>
<th>ID</th>
<th>Date</th>
<th>Title</th>
<th>Author</th>
<th>Key features:</th>
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<th>Biodiversity</th>
<th>General environmental</th>
<th>General planning</th>
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<tbody>
<tr>
<td>1</td>
<td>2019</td>
<td>Snowy Monaro Regional Council Planning and Land Use Draft Discussion Paper January 2019</td>
<td></td>
<td>Discusses planning issues and opportunities throughout the Snowy Monaro Region. Includes demographic and zoning information specific to Jindabyne.</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>2</td>
<td>2017</td>
<td>South East and Tablelands Regional Plan 2036</td>
<td>DPE</td>
<td>Future planning in context of economy, biodiversity, community health and connectivity, environmentally sustainable housing</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>2013</td>
<td>Snowy River Council Local Environmental Plan</td>
<td></td>
<td>Provides planning provisions for land part of Snowy Monaro Regional LGA to guide planning decisions.</td>
<td>Yes</td>
<td></td>
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<td>4</td>
<td>2011</td>
<td>OEH Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW</td>
<td>OEH</td>
<td>Provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW. Includes OEH's requirements for an ACHAR</td>
<td>Yes</td>
<td></td>
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<tr>
<td>5</td>
<td>2010</td>
<td>DECCW Aboriginal cultural heritage consultation requirements for proponents</td>
<td>OEH</td>
<td>Outlines the purpose, aim, scope and application of consultation requirements. Provides guiding principles and intended outcomes of consultation. Outlines legislative framework. Provides an overview of consultation and associated objectives and information required for decision making. Details the steps for consultation including roles and responsibilities of participants.</td>
<td>Yes</td>
<td></td>
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<td>Yes</td>
<td>Yes</td>
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<td>6</td>
<td>2006</td>
<td>Kosciuszko National Park Plan of Management</td>
<td>NPWS</td>
<td>General background information relating to Kosciuszko national park including size, location, values and history. Includes an overview of values, obligations and constraints that form the basis of management strategies within the plan. Includes key legislation, strategies and policies.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>ID</td>
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<tr>
<td>7</td>
<td>2005</td>
<td>Lake Jindabyne Southern Foreshore Management Plan</td>
<td>Inspiring Place Pty Ltd</td>
<td>Provides a framework outlining improvements to the southern foreshore and management practices to improve amenity of the area. Identifies priorities for work and infrastructure up until 2015, but contains useful background general environmental information and planning pathways</td>
<td>High</td>
<td></td>
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<tr>
<td>8</td>
<td>2014</td>
<td>South East and Tablelands Climate Snapshot</td>
<td>OEH</td>
<td>The NSW and ACT Regional Climate Modelling (NARCliM) project has produced a series of climate change projections for the south-east Australia region, covering the range of likely future changes in climate.</td>
<td>High</td>
<td></td>
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<tr>
<td>9</td>
<td>2012</td>
<td>Integrated Regional Vulnerability Assessment: South East New South Wales Pilot Study Volume 2: Priority Sector Workshops Summary Findings</td>
<td>OEH</td>
<td>The Integrated Regional Vulnerability Assessment (IRVA) (OEH 2012) process for South East New South Wales acknowledges that the region’s ecosystems’ functions and services are vital in supporting the environmental, social and economic viability of the region.</td>
<td>High</td>
<td></td>
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<tr>
<td>10</td>
<td>2017</td>
<td>Enabling Adaptation in the South East</td>
<td>OEH</td>
<td>Enabling Adaptation in the South East [EASE] (OEH 2017) builds on the findings of the IRVA process (OEH 2012) to identify regional vulnerabilities and develop ways to minimise the impacts of climate change on local communities. EASE is intended to help incorporate climate change considerations into long-term planning in state and local governments.</td>
<td>High</td>
<td></td>
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<tr>
<td>11</td>
<td>2018</td>
<td>Draft Urban Design Guide</td>
<td>GANSW</td>
<td>The Draft Urban Design Guide (GANSW 2018a) builds upon the design principles in the Government Architect publication Better Placed: An integrated design policy for the built environment of NSW (GANSW 2017a). The guide is intended to support the goals and directions of the regional plans.</td>
<td>High</td>
<td></td>
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<tr>
<td>12</td>
<td>2017</td>
<td>Greener Places: draft Green Infrastructure Policy for NSW</td>
<td>GANSW</td>
<td>The draft Green Infrastructure Policy (GANSW 2017b) aims to guide the design, planning and delivery of ‘Green Infrastructure’ in urban areas in NSW.</td>
<td>High</td>
<td></td>
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</table>
### Environmental and Heritage Study

**Go Jindabyne 2036 Masterplan**

**Usefulness/relevance of reference:**

Reports and studies already available through Council’s previous commissions:

- High
- Medium
- Low

Use in report:

- Literature Review
- Environmental Analysis

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</thead>
<tbody>
<tr>
<td>13</td>
<td>2018</td>
<td>Climate Ready revegetation guide</td>
<td>Hancock et al.</td>
<td>Provides a pathway for assessing the suitability of species and provenances for revegetation projects based on climate projections and species responses</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td>unknown</td>
<td>Aboriginal People and the Australian Alps</td>
<td>unknown</td>
<td>Educational resource containing basic background information specific to the Alps.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>2018</td>
<td>Alpine Resorts Winter Access</td>
<td>NSW OEH</td>
<td>Gives an overview of vehicle access (including road closures), parking and oversnow vehicles associated with the KNP. Includes village maps for Perisher, Smiggins Holes and Guthega.</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>16</td>
<td>2017</td>
<td>Kosciuszko National Park Cycling Strategy</td>
<td>NSW OEH</td>
<td>Includes a strategy that sets out how proposals for new trails or cycling experiences will be assessed so that they are ecologically sustainable and don’t impact park values.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>17</td>
<td>2001</td>
<td>Perisher Range Resorts Master Plan</td>
<td>NPWS</td>
<td>Framework for future development of Perisher range resorts including Guthega, Smiggins Holes and Perisher Valley. Includes summary of areas/items of significance in regional and local context. Schedule 1, 2 and 3 cover development guidelines and controls and ecological sustainability and performance.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>18</td>
<td>2018</td>
<td>Thredbo Valley Track visitor use</td>
<td>unknown</td>
<td>Mountain bike track usage for FY 14/15, 15/16, 16/17 and 17/18.</td>
<td>Yes</td>
<td></td>
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</tbody>
</table>

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**ADDITIONAL REFERENCES**

- **Kosciuszko National Parks and Resorts**

<table>
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<th>General planning</th>
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</thead>
<tbody>
<tr>
<td>19</td>
<td>2018</td>
<td>Jindabyne Central School Upgrade - Possible location of proposed innovation hub.</td>
<td>Department of Education</td>
<td>Includes background information relating to, and key drivers for the upgrade of Jindabyne Central School.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>2005</td>
<td>Mitchell Reserve Plan of Management</td>
<td>PoM to provide direction for the use and management of the Mitchell Reserve.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>21</td>
<td>unknown</td>
<td>Plan of Management for Jindabyne Sports Ground</td>
<td>PoM to provide direction for the long term improvement/development and management of the Jindabyne Sports Ground.</td>
<td>Yes</td>
<td></td>
<td></td>
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</tbody>
</table>
### Usefulness/relevance of reference:

Reports and studies already available through Council’s previous commissions:

- High
- Medium
- Low

Use in report:

- Literature Review
- Environmental Analysis

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<th>Non-Aboriginal heritage</th>
<th>Biodiversity</th>
<th>General environmental</th>
<th>General planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>unknown</td>
<td>Lake Jindabyne Southern Foreshore Management Plan</td>
<td>Inspiring Place Pty Ltd</td>
<td>Design drawings relating to management and future development of Banjo Paterson Lake, Lake Jindabyne and The Claypits.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>24</td>
<td>unknown</td>
<td>Final strategy as adopted - Jindabyne Open Space a</td>
<td>unknown</td>
<td>Mapping of land tenure and open spaces in Jindabyne.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>25</td>
<td>2007</td>
<td>Jindabyne Open Space and Recreational Land Use Strategy</td>
<td>Inspiring Place Pty Ltd</td>
<td>Establishes a vision and recommendations to guide open space and recreational development, management and acquisition up until 2027. Develops an Open Space and Land Use Strategy and an action plan for the management, development and provision of open space and recreation assets. Similar to the scope of current NGH works for Go Jindabyne.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>26</td>
<td>2013</td>
<td>Jindabyne Town Centre Draft Masterplan 2013 and 17012018090057-0001</td>
<td>unknown</td>
<td>Mapping of Jindabyne town centre illustrating various proposed uses in planning context.</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>27</td>
<td>2010</td>
<td>Lake Jindabyne Recreation Trail Final Report</td>
<td>GTA Consultants</td>
<td>Identifies alignment for a recreational trail that considers the physical constraints and existing environment of the area.</td>
<td></td>
<td></td>
<td></td>
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<td>Yes</td>
</tr>
<tr>
<td>28</td>
<td>unknown</td>
<td>Snowy River Playground Strategy</td>
<td>unknown</td>
<td>Includes an analysis of existing level of playground provisions, condition and maintenance costs. Planning for future development in line with future needs of the community.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>29</td>
<td>2018</td>
<td>Lake Jindabyne Shared Trail Project</td>
<td>Business Sense</td>
<td>Includes up to date background information on the Jindabyne region. Discussed benefits and outcomes of the project, particularly in relation to socio-economic considerations.</td>
<td></td>
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### Usefulness/relevance of reference:

Reports and studies already available through Council’s previous commissions:

- High
- Medium
- Low

Use in report:

- Literature Review
- Environmental Analysis

### ID | Date: | Title: | Author: | Key features: | Aboriginal heritage | Non-Aboriginal heritage | Biodiversity | General environmental | General planning |
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</thead>
<tbody>
<tr>
<td>30</td>
<td>2018</td>
<td>The Future Provision of Residential Aged Care in the Snowy Monaro Region</td>
<td>SMRC</td>
<td>Provides an assessment for the future need for residential aged care services in the region. Provides background information relating to the aged community.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>unknown</td>
<td>Fitness Stations, Jindabyne</td>
<td>SMRC</td>
<td>Concept designs for installation of two fitness stations in Jindabyne to be delivered through the Stronger Communities Fun Major Project Program.</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>32</td>
<td>unknown</td>
<td>Kalkite Playground Project Plan</td>
<td>SMRC</td>
<td>Concept designs for installation of a playground in Kalkite to be delivered through the Stronger Communities Fun Major Project Program.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>33</td>
<td>2018</td>
<td>Jindabyne Concept Design 501</td>
<td>Gary Puksand</td>
<td>Jindabyne Swimming Pool upgrade preliminary concept plans.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>2018</td>
<td>Jindabyne Concept Design 502</td>
<td>Gary Puksand</td>
<td>Jindabyne Swimming Pool upgrade preliminary concept plans.</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>36</td>
<td>2015</td>
<td>Banjo Paterson Park playground draft detailed design</td>
<td>unknown</td>
<td>Detailed concept plans for playground.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>37</td>
<td>2010</td>
<td>Clappts Recreational Area Fitness Stations plan</td>
<td>Sandra Downing</td>
<td>Detailed concept plans for fitness stations at the Clappts.</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>38</td>
<td>2018</td>
<td>Jindabyne Public Toilet Streetscape Upgrade REV D Plans</td>
<td>Grounded Structural Engineering</td>
<td>Detailed concept plans for public toilet upgrades in Jindabyne.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>39</td>
<td>2018</td>
<td>Jindabyne Skate Park Extension Funding Application</td>
<td>CONVIC</td>
<td>Summarises the pre-design consultation and development of the draft conceptual designs taking into account community demand and future community needs.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>40</td>
<td>unknown</td>
<td>Review of facilities at Jindabyne Pool and undertake key works</td>
<td>SMRC</td>
<td>Incomplete document relating to upgrading facilities at Jindabyne pool.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### Usefulness/relevance of reference:

Reports and studies already available through Council’s previous commissions:

- **High**
- **Medium**
- **Low**

#### Use in report:
- **Literature Review**
- **Environmental Analysis**

#### Environmental Analysis

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<th>Title:</th>
<th>Author:</th>
<th>Key features:</th>
<th>Aboriginal heritage</th>
<th>Non-Aboriginal heritage</th>
<th>Biodiversity</th>
<th>General environmental</th>
<th>General planning</th>
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<tbody>
<tr>
<td>41</td>
<td>unknown</td>
<td>Upgrade to Clay Pits area at Lake Jindabyne Foreshore</td>
<td>SMRC</td>
<td>Incomplete document relating to upgrading facilities at Clay Pits area.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>42</td>
<td>unknown</td>
<td>Development of Jerrara Drive Improvement Options</td>
<td>SMRC</td>
<td>Incomplete document relating to development of Jerrara Drive</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>43</td>
<td>unknown</td>
<td>Jindabyne Youth Centre</td>
<td>SMRC</td>
<td>Overview of the need for a facility catering for the youth and related youth issues. Includes proposed location and concept plans.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>44</td>
<td>2006</td>
<td>Landscape Development Plan Report - Kosciuszko Road Jindabyne</td>
<td>Landscape Architects</td>
<td>Includes identification of design issues related to improving the visual amenity of Kosciuszko Road via an upgrade of the landscape setting.</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>45</td>
<td>2018</td>
<td>Widows inlet boat ramp, Kosciuszko Road, Jindabyne, proposed parking area and access upgrades</td>
<td>Footprint sustainable engineering</td>
<td>Includes detailed plans, cross sections and ESCP’s.</td>
<td></td>
<td></td>
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<tr>
<td>46</td>
<td>2016</td>
<td>Boating and recreation improvement lake Jindabyne and Lake Eucumbene - concept design report</td>
<td>Royal Haskoning DHV</td>
<td>Includes assessment of environmental conditions within the project area.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>47</td>
<td>unknown</td>
<td>Proposed Improvements to the Widows Inlet Boat Ramp, Lake Jindabyne: Aboriginal Consultation</td>
<td>Sue Feary</td>
<td>Summary of project scope and potential impacts on Aboriginal Heritage. Useful background info but draft report that can’t be cited.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>48</td>
<td>2018</td>
<td>Widows Inlet Boat Ramp upgrade of parking and recreational facilities, Aboriginal Cultural Heritage Assessment</td>
<td>Sue Feary</td>
<td>Full ACHAR for proposed upgrade works at Widows Inlet Boat Ramp.</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>49</td>
<td>2010</td>
<td>Analysis of Residential Supply and Demand</td>
<td>Leader Property Practice Property Consultants and Valuers.</td>
<td>Analysis of supply and demand within Jindabyne including future land options.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>50</td>
<td>2006</td>
<td>Draft Snowy River Shire Rural Land Strategy</td>
<td>unknown</td>
<td>Identification and implementation of appropriate policies governing the use of rural land with the aim of sustainable development. Includes background information relating to core rural issues.</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>51</td>
<td>2017</td>
<td>Review of Environmental Factors - Snowy River Avenue, Jindabyne: Upgrade Stage 1</td>
<td>NGH Environmental</td>
<td>Assesses environmental impact of upgrades to Snowy River Avenue at Jindabyne. Includes planning pathways and general environmental background research for the project area.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>
### Usefulness/relevance of reference:

Reports and studies already available through Council’s previous commissions:

- **High**
- **Medium**
- **Low**

Use in report:

- Literature Review
- Environmental Analysis

<table>
<thead>
<tr>
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<th>Author:</th>
<th>Key features:</th>
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<tbody>
<tr>
<td>52</td>
<td>2018</td>
<td>NRMA Charging Station Jindabyne</td>
<td>STOWE Australia</td>
<td>Preliminary site layout plans for charging station</td>
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<tr>
<td>53</td>
<td>2018</td>
<td>Kalkite Street Carpark Expansion General Arrangement</td>
<td>SMEC</td>
<td>Preliminary site layout plans for Kalkite Street carpark expansion</td>
</tr>
<tr>
<td>54</td>
<td>2015</td>
<td>Parking configuration diagram</td>
<td>Tract</td>
<td>Preliminary concept design for specific features at Snowy River Avenue</td>
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<tr>
<td>55</td>
<td>2015</td>
<td>Snowy River Avenue - Concept design</td>
<td>Tract</td>
<td>Preliminary concept visualisation for specific features at Snowy River Avenue</td>
</tr>
<tr>
<td>56</td>
<td>2015</td>
<td>Snowy River Avenue - Concept visualisation</td>
<td>Tract</td>
<td>Final concept design plans for Snowy River Avenue precinct.</td>
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<tr>
<td>57</td>
<td>2015</td>
<td>Tract concept final design</td>
<td>Tract</td>
<td>A traffic and transport strategy to inform the Action Plan for Jindabyne as proposed by Snowy River Shire Council.</td>
</tr>
<tr>
<td>58</td>
<td>2010</td>
<td>Jindabyne Action Plan Traffic and Transport Assessment draft</td>
<td>GTA Consultants</td>
<td>Concept design for multi-storey carpark at Kalkite Street.</td>
</tr>
<tr>
<td>59</td>
<td>2018</td>
<td>50519009-ST_combined</td>
<td>Cardno</td>
<td>Includes producing and verifying a mathematical hydraulic model of the Jindabyne Sewerage Scheme. Includes background information relating the the catchment.</td>
</tr>
<tr>
<td>60</td>
<td>2009</td>
<td>ECM_202366_v1_MWH Jindabyne Sewerage Scheme December 2009</td>
<td>MWH</td>
<td>Includes producing and verifying a mathematical hydraulic model of the Jindabyne Sewerage Scheme. Includes background information relating the the catchment.</td>
</tr>
<tr>
<td>61</td>
<td>2010</td>
<td>ECM_226620_v1_Jindabyne Sewerage Scheme Report MWH October 2010</td>
<td>MWH</td>
<td>Provides an overview and analysis of Snowy River Shire Councils responsibilities and issues in providing water supply and sewerage services. Reference to Integrated Water Cycle Management (IWCM) as a strategic planning tool developed by NSW Office of Water.</td>
</tr>
<tr>
<td>62</td>
<td>2012</td>
<td>ECM_376945_v1_A326 SRSC IWCM Evaluation study Final (2)</td>
<td>HydroScience</td>
<td>Includes producing and verifying a mathematical hydraulic model of the Jindabyne Sewerage Scheme. Includes background information relating the the catchment.</td>
</tr>
</tbody>
</table>
### Usefulness/relevance of reference:

Reports and studies already available through Council's previous commissions:

- High
- Medium
- Low

Use in report:
- Literature Review
- Environmental Analysis

| ID  | Date   | Title                                                                 | Author                  | Key features                                                                 | Aboriginal heritage | Non-Aboriginal heritage | Biodiversity | General environmental | General planning |
|-----|--------|----------------------------------------------------------------------|                        |                                                                            |                     |                           |              |                       |                  |
| 63  | 2014   | ECM_443102_v1_Attachment 08 - IWCM Detailed Strategy (ED 15 2691)    | HydroScience            | Sets out a strategy to address issues raised in the 2012 Evaluation Study.  | Yes                 |                           |              |                       |                  |
| 64  | 2017   | Administrators Report to the Community                               | SMRC                    | Background information outlining key statistics and highlights related to  |                     |                           |              |                       |                  |
|     |        |                                                                      |                         | community, environment, planning, economics                                 |                     |                           |              |                       |                  |
|     |        |                                                                      |                         |                                                                            |                     |                           |              |                       |                  |
| 65  | 2018   | Future Transport Strategy 2056 (2018)                                 | NSW Government          | An overarching strategy, supported by a suite of plans to achieve a 40 year |                     |                           |              |                       | Yes              |
|     |        |                                                                      |                         | vision for our transport system                                             |                     |                           |              |                       |                  |
| 66  | 2018   | Draft South East and Tablelands Sport and Active Recreation Plan     | NSW Government (Office  | Identifies vision, outcomes and strategies to ensure the region provides    |                     |                           |              |                       | Yes              |
|     |        | (2018)                                                               |                         | increased sport and active recreation opportunities.                         |                     |                           |              |                       |                  |
| 67  | 2009   | ECM_212624_v1_Jindabyne Action Plan Update May 2010 Final Jindab     | Snowy River Shire       | Identifies a set of actions to help Jindabyne become a sustainable town    |                     |                           |              |                       | Yes              |
|     |        |                                                                      | Council                 | over 20 year to 2030. Includes a focus on economy, community, health,     |                     |                           |              |                       |                  |
|     |        |                                                                      |                         | amenity and sustainability with specific strategies set out until 2015.    |                     |                           |              |                       |                  |
| 68  | 2009   | Jindabyne Action Plan - Business Survey Workbook                      | the people for places   | Summary of survey completed by 33 businesses relating to the nature of     |                     |                           |              |                       | Yes              |
|     |        |                                                                      | and spaces (pps)        | their business, Jindabyne as a business location, future plans for their   |                     |                           |              |                       |                  |
|     |        |                                                                      |                         | business and interest in attending future town business meetings.         |                     |                           |              |                       |                  |
| 69  | 2009   | Jindabyne Action Plan - Community Groups Survey Workbook             | the people for places   | Summary of survey completed by 28 community and service groups relating   |                     |                           |              |                       | Yes              |
|     |        |                                                                      | and spaces (pps)        | to the nature and activity of their community group, anticipated needs    |                     |                           |              |                       |                  |
|     |        |                                                                      |                         | for Jindabyne in the next 5 years, barriers affecting their service       |                     |                           |              |                       |                  |
|     |        |                                                                      |                         | provision and availability of facilities within Jindabyne.                |                     |                           |              |                       |                  |
| 70  | 2009   | Jindabyne Action Plan - Volume 1                                     | Snowy River Shire       | Learnings from the workbook - Executive summary and emerging principles.   |                     |                           |              |                       | Yes              |
|     |        |                                                                      | Council                 |                                                                            |                     |                           |              |                       |                  |
| 71  | 2009   | Jindabyne Action Plan - Volume 2                                     | Snowy River Shire       | Learnings from the workbook - People and culture of Jindabyne.            |                     |                           |              |                       | Yes              |
|     |        |                                                                      | Council                 |                                                                            |                     |                           |              |                       |                  |
Usefulness/relevance of reference:

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<th>Medium</th>
<th>Low</th>
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<tr>
<td>72</td>
<td>2009</td>
<td>Jindabyne Action Plan - Volume 3</td>
<td>Snowy River Shire Council</td>
<td>Learnings from the workbook - Healthy and sustainable neighbourhoods</td>
<td>Yes</td>
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<td>73</td>
<td>2009</td>
<td>Jindabyne Action Plan - Volume 4</td>
<td>Snowy River Shire Council</td>
<td>Learnings from the workbook - Business, enterprise and learning</td>
<td>Yes</td>
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<td>74</td>
<td>2009</td>
<td>Jindabyne Action Plan - Volume 5</td>
<td>Snowy River Shire Council</td>
<td>Learnings from the workbook - Town appearance and revitalising the Jindabyne town centre</td>
<td>Yes</td>
<td></td>
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<td>75</td>
<td>2009</td>
<td>Jindabyne Action Plan - Volume 6</td>
<td>Snowy River Shire Council</td>
<td>Learnings from the workbook - Pedestrians, traffic, parking and public transport in jindabyne</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>76</td>
<td>2008</td>
<td>Jindabyne Action Plan - Workbook 2008</td>
<td>Snowy River Shire Council</td>
<td>Workbook created to present to the wider community for feedback to inform the Jindabyne Action Plan including topics such as community, environmental sustainability, health, amenity and economics.</td>
<td>Yes</td>
<td></td>
<td></td>
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<td>77</td>
<td>2003</td>
<td>Jindabyne Growth Options Plan A3</td>
<td>Inspiring Place Pty Ltd</td>
<td>Mapping of growth options for jindabyne including general residential, rural residential, special purpose, Environmental protection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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<td>78</td>
<td>2007</td>
<td>ECM_238198_v1_ Jindabyne Growth Structure Plan</td>
<td>unknown</td>
<td>identifies areas at a broad level to accommodate the growth Jindabyne.</td>
<td>Yes</td>
<td></td>
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<td>79</td>
<td>2015</td>
<td>Cooma-Monaro Settlements Strategy Discussion Paper (2015)</td>
<td>unknown</td>
<td>Discussion surrounding the direction Cooma-Monaro Shire Council should take with planning and development extending to 2036 in line with state government regional thinking.</td>
<td>Yes</td>
<td></td>
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<tr>
<td>80</td>
<td>2018</td>
<td>SMRC Community Strategic Plan 2040 (2018)</td>
<td>SMRC</td>
<td>Outlines objectives for the region and high level strategies to enable delivery. Includes up to date regional profile and comments from the community in relation to community, economy, environment and leadership. Overview of alignment with other relevant existing strategic plans.</td>
<td>Yes</td>
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<td>81</td>
<td>2013</td>
<td>SMRC Development Control Plan (2013)</td>
<td>SMRC</td>
<td>Details planning provisions to guide development within the Snowy River Shire.</td>
<td>Yes</td>
<td></td>
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<td>82</td>
<td>2018</td>
<td>SMRC Strategic Framework Diagram (2018)</td>
<td>unknown</td>
<td>Diagram including relationship between regional strategies and local strategies.</td>
<td>Yes</td>
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</table>
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<th>Author:</th>
<th>Key features:</th>
<th>Usefulness/relevance of reference:</th>
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<tr>
<td>85</td>
<td>2016</td>
<td>Jindabyne Demographic Analysis</td>
<td>DPE</td>
<td>Demographic profile for Jindabyne. Prepared for internal use only.</td>
<td>Low</td>
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<tr>
<td>86</td>
<td>2019</td>
<td>SMRC Final Draft DMP 250119</td>
<td>TRC Tourism Pty Ltd</td>
<td>An approach to destination management that draws on the comprehensive foundation of strategic and statutory reports and documents that have recently guided tourism in the Snowy Monaro. Includes key strategic priorities to be addressed.</td>
<td>High</td>
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<tr>
<td>87</td>
<td>2018</td>
<td>TRC Draft Destination Analysis (September 2018)</td>
<td>TRC Tourism Pty Ltd</td>
<td>An analysis of the region informing the final destination management plan. Includes key stakeholders and planning pathways.</td>
<td>High</td>
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<tr>
<td>89</td>
<td>2018</td>
<td>20181108 Snowy Monaro_REDS Current</td>
<td>Corview</td>
<td>Snowy Monaro Regional Economic Development Strategy 2018 - 2022 including strategies to facilitate economic growth opportunities across SMRC.</td>
<td>Yes</td>
</tr>
<tr>
<td>90</td>
<td>2017</td>
<td>SMRC Tourism Strategy (Canberra Uni) 2017</td>
<td>Canberra University</td>
<td>A draft plan outlining a tourism and tourism services strategy covering issues including governance, links to other organisations, tourism planning, product development, marketing and promotion, and management, infrastructure and performance measurement.</td>
<td>Yes</td>
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<tr>
<td>ID</td>
<td>Date</td>
<td>Title</td>
<td>Author</td>
<td>Key features</td>
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<td>91</td>
<td>2013</td>
<td>Snowy Mtns Experience Implementation Plan 270513 (3)</td>
<td>TRC Tourism Pty Ltd</td>
<td>Planning for the development of recreational experiences in the Snowy Mountains region. Includes background environmental information and planning pathways.</td>
<td>Yes</td>
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<tr>
<td>92</td>
<td>2016</td>
<td>Strategy Tourism Development Plan</td>
<td>Inspiring Place Pty Ltd</td>
<td>A high level strategic assessment of the tourism directions that should be considered for the shire that includes strategies that build on the Snowy Mountains Destination Management Plan 2013.</td>
<td></td>
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<tr>
<td>93</td>
<td>2016</td>
<td>Snowy Mountains Factsheet 15_16</td>
<td>unknown</td>
<td>Evaluation of tourism industry activity and performance. Measures the economic contribution of tourism to the region in absolute terms and as a contribution to the regional economy.</td>
<td></td>
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<tr>
<td>94</td>
<td>2016</td>
<td>Snowy Mountains Regional Economic Development Blueprint (LEK Report, 2016)</td>
<td>L.E.K Consulting</td>
<td>Includes a review of the regional economy with a focus on economic growth opportunities within the Visitor Economy and Agriculture sectors. Analyses the existing performance within these sectors and identifies current constraints on growth. Identifies potential Government interventions that could address these constraints.</td>
<td></td>
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<td>95</td>
<td>2015</td>
<td>From SEED validation - rules</td>
<td>NSW OEH</td>
<td>Verification and rules for identification of high conservation value.</td>
<td></td>
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<td>96</td>
<td>2015</td>
<td>HEV strategic planning mapping government guide</td>
<td>NSW OEH</td>
<td>Mapping and governance guide relating to developing maps of high environmental value for strategic planning</td>
<td>Yes</td>
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<tr>
<td>97</td>
<td>2012</td>
<td>OEH validation of vegetation south Jindabyne 2012</td>
<td>NSW OEH</td>
<td>Field notes from OEH site visit at south Jindabyne crown lands</td>
<td></td>
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<tr>
<td>98</td>
<td>2017</td>
<td>Validated Veg mapping around Leesville</td>
<td>ecological</td>
<td>Mapping of validated veg at Leesville.</td>
<td>Yes</td>
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<td>99</td>
<td>unknown</td>
<td>Jindy1Crown1-30k</td>
<td>unknown</td>
<td>Mapping including crown tenure and TSR's.</td>
<td>Yes</td>
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<tr>
<td>ID</td>
<td>Date:</td>
<td>Title:</td>
<td>Author:</td>
<td>Key features:</td>
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<tr>
<td>100</td>
<td>2015</td>
<td>SE LLS Vegetation Mapping Update FINAL_v2</td>
<td>ecological</td>
<td>Includes methods and key issues and findings associated with the compilation of a standardised biometric vegetation map</td>
<td>Yes</td>
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<td>101</td>
<td>2019</td>
<td>Convert vegetation types to PCT</td>
<td>OEH</td>
<td>Conversions required to be in line with the vis classification table</td>
<td></td>
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<tr>
<td>102</td>
<td>2019</td>
<td>Targeted on ground validation</td>
<td>OEH</td>
<td>Aim of ground truthing to fill in key gaps in existing mapping.</td>
<td></td>
</tr>
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</table>
APPENDIX B  HISTORIC PHOTOS

Aboriginal and Torres Strait Islander People are warned that the follow section contains photographs of deceased persons which may cause sadness or distress.
Plate 7 August 1967 Overlooking new town towards lake (Rosemary Stewart-Beardsley)

Plate 8 View over Lake Jindabyne (Greta Jones Collection)

Plate 9 Old Jindabyne Cemetery (Gretta Jones Collection)

Plate 10 New Jindabyne relocated cemetery gates and honour role

Plate 11 Sister Passmore outside Bush Nurses Cottage in old Jindabyne (Neen Pendergast Collection; Snowy Mountains Historical Society)

Plate 12 Sister Keiran (l) and Sister Passmore (R) (Neen Pendergast Collection; Snowy Mountains Historical Society)
Plate 13 Sister Passmore (Neen Pendergast Collection; Snowy Mountains Historical Society)

Plate 14 Sister Passmore (Neen Pendergast Collection; Snowy Mountains Historical Society)

Plate 15 Ryrie’s Flour Mill on the Snowy River (Snowy Mountains Historical Society)

Plate 16 James Thompson of Cobbon Station (IPSCC 1984)

Plate 17 Old Mill Creek Homestead (Greta Jones Collection)

Plate 18 Front of present-day Leesville Hotel (Barry way Historical report NGH)
Plate 19 Fishing on the Moonbah River pre damming ~1930’s (Greta Jones Collection)

Plate 20 Aboriginal place: Curiosity Rocks

Plate 21 James Brindle father of Alex Brindle (Jeanette Tahana Collection; provided by Iris White)

Plate 22 Alex Brindle Aboriginal tracker born at Cobbin (The Daily Telegraph 22 July 1932; provided by Iris White)
HISTORIC FAMILY NAMES

Local family name in the area, some which are no longer present in the region but could be incorporated into street names (some provided by Greta Jones)

- Adams
- Alexander
- Baggs
- Bale
- Barry
- Blewitt
- Bottom
- Bradshaw
- Brindle
- Bulmann
- Collins
- Collman
- Crawford
- Cullen
- Frances
- Freebody
- Hemming
- Holland
- Hyland
- Kidman
- McEvoy
- McGregor
- McGufficke
- Minehan
- Nixon
- Pendergast
- Rixon
- Roberson
- Ryrie
- Sheils
- Spellman
- Spencer
- Sturgeon
- Ward
- Weston
- Willes
- Woodhouse